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PRIORITIZING FOOD CONSUMPTION IN JAPAN: FACTORS OF UPTURN OF ENGEL'S COEFFICIENT

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Abstract

Expenditures on food tend to be proportionally higher in societies with lower income levels, as food constitutes one of the most essential elements of human life. Historically, Engel's coefficient has been lower in nations with more developed economies. However, in certain advanced economies, this coefficient has increased despite stable or rising per capita income levels. This study analyzes data from official surveys conducted between 2000 and 2023, with a particular focus on the period from 2013 to 2023, to discern consumption patterns and the underlying causes of this phenomenon. The findings suggest that this trend is influenced not only by the inherent necessity of food but also by recent price increases resulting from supply-side constraints and shifting demand dynamics, exacerbated by the global pandemic and geopolitical instabilities. Additionally, the conceptualization of food has evolved, transcending its basic role as nutritional sustenance to include a wider array of services and experiences that are gaining increasing significance.
Keywords: *Consumption, Engel's Coefficient, Expenditure, Food, Income*
Jel Codes: *E21, E25, Q11*

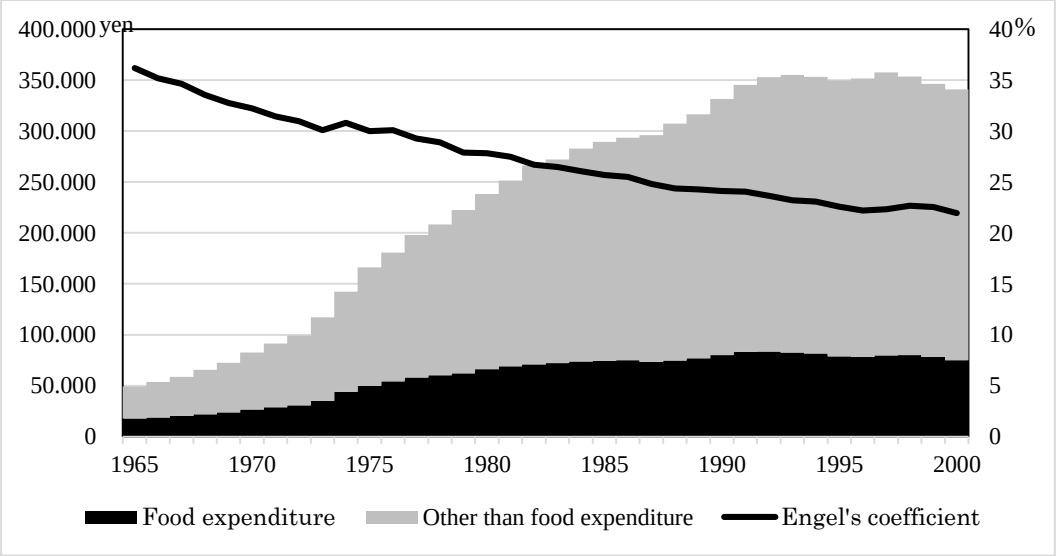
1. Introduction

1.1. Engel's Coefficient

Engel's coefficient is defined as the proportion of household expenditure allocated to food and beverages. Named after the German social statistician Ernst Engel, who published a seminal study in 1857, the coefficient posits that as household income increases, the share of income spent on food generally decreases. In essence, wealthier households devote a smaller fraction of their income to food. Despite the persistent issue of food insecurity in various regions, food production has outpaced population growth, driven by technological innovations. As economies transition from industrial to service-based models, Engel's coefficient has generally diminished across numerous countries.

In the context of Japan, during the period of rapid economic growth before the 1990s, the nation emerged as a global economic powerhouse, with significant advancements in the financial and real estate sectors. Commodity and land prices soared, making Tokyo a global hub. However, following the collapse of the economic bubble in the 1990s, Japan's relative economic standing began to decline, with land prices experiencing a marked reduction and stagnating. At the close of the 20th century, Tokyo boasted one of the highest standards of living worldwide, but this has since been eclipsed by cities such as New York and Geneva.

Engel's coefficient in Japan is derived from data provided by the Family Income and Expenditure Survey conducted by the Statistics Bureau of the Ministry of Internal Affairs and Communications. The data, however, cannot be retroactive before 2000 since they excluded data for single-person households. Historical trends showed a consistent decline in Engel's coefficient for worker households with multiple members (excluding agricultural and fishing households) from 1965 to 2000, as depicted in Figure 1.

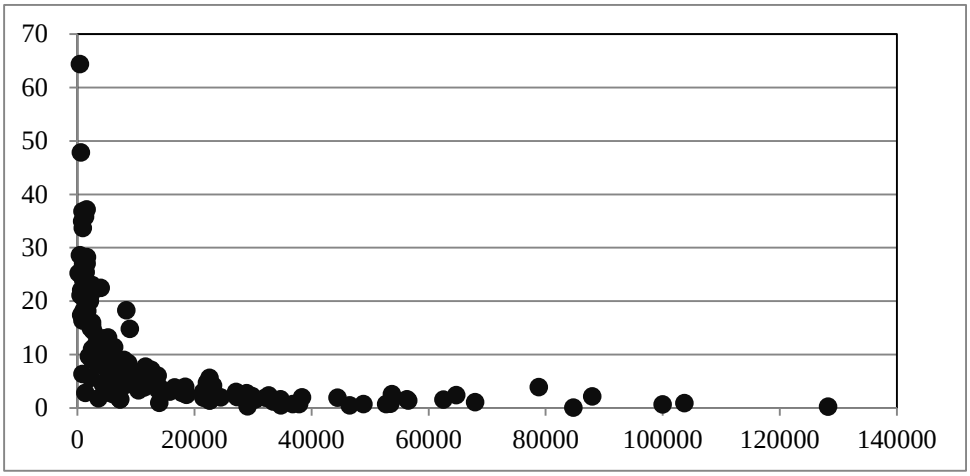


Data Source: Family Income and Expenditure Survey, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 1. Monthly Expenditure and Engel's Coefficient for Workers' Households with Multiple Members Except for Agricultural, Forestry and Fisheries Households of Japan

1.2. Global Primary Industry Landscape

The primary sectors—agriculture, forestry, and fisheries—constitute the cornerstone of food production. Nonetheless, in Japan, these sectors contribute a mere 0.9% of the nation's Gross Domestic Product (GDP) in 2023, according to the Economic and Social Research Institute, Cabinet Office, Government of Japan (2024). Comparative analysis with data from the World Bank (2023) illustrates an inverse correlation between the proportion of GDP derived from primary industries and national income levels (per capita GDP), as depicted in Figure 2. In 2023, Liechtenstein recorded the highest per capita GDP at $128,000, whereas countries like Sierra Leone demonstrated a significantly higher share of their GDP originating from primary industries, reaching 64%.



Note. 1$=141.40 yen at the end of 2023
Data Source: World Development Indicators, World Bank

Figure 2. Relationship between Per Capita and Primary Industry Share of Gross Domestic Product (GDP) of Countries and Areas over the World in 2023 Share of Agriculture, Forestry and Fisheries (%)

Food consumption, however, extends beyond primary industries, encompassing secondary and tertiary sectors such as food processing, retail, transportation, dining establishments, and a wide array of supporting industries, including energy, design, telecommunications, and advertising. Imamura (2017, March 19) highlighted that these interconnected sectors are often collectively referred to as the "sixth industry," a term introduced in 1992, which equates to the combined effect of the "1st + 2nd + 3rd industries," and later evolved into the "1st × 2nd × 3rd industries" concept three and a half years thereafter. Onishi et al. (2021) asserted that, in Japan, the sixth industry has been established to revitalize rural areas and augment farmers' incomes. This concept refers to initiatives that merge agriculture with secondary and tertiary sectors to generate new value, including farmers' markets, direct sales, food processing, agritourism, bed-and-breakfasts operated by farmers, farmers' restaurants, and more. Ministry of Agriculture, Forestry, and Fisheries, Government of Japan (2024) reported that total sales for businesses linked to agricultural production in FY2022, such as processing and direct sales by farmers engaged in the "6th industrialization," surged by 109.9 billion yen compared to the previous year, reaching 2,176.5 billion yen. As the global economy progressively transitions towards service-oriented sectors, the significance of primary industries—particularly in the context of food supply chains—has become increasingly apparent, especially in light of disruptions such as the COVID-19 pandemic and geopolitical crises.

In Japan, the proportion of sectors involved in food production within domestic output increased from 5.0% in 2005 to 5.1% in 2011, and further to 5.2% in 2015, mirroring broader trends within the food production sector in the manufacturing domain, as derived from data in the Linked Input and Output Tables. The evolution of food production is intricately linked to technological advancements, including smart agriculture powered by information and communication technologies (ICT), the application of big data, artificial intelligence, and robotics, as well as advancements in food delivery systems. Ministry of Agriculture, Forestry and Fisheries, Government of Japan (2024) highlighted that technological innovations

enhancing agricultural productivity, such as smart agricultural technologies, have progressed significantly. Given the anticipated decline in the agricultural workforce and the advancement of digital technologies, promoting smart agriculture remains crucial to sustain the food supply base and establish a highly productive agricultural industry. These advancements have facilitated the global distribution of food. Moreover, various industries are collaborating in innovative ways, with agricultural producers joining forces with other sectors to market branded foods, farmers managing restaurants, and food sales occurring at railway stations across Japan.

Food has assumed increasing importance as a matter of national security, particularly in the wake of the pandemic and geopolitical instability, as it is fundamental to the health and survival of populations. Japan, in particular, relies heavily on food imports, with its food self-sufficiency ratio standing at 38% on a calorie basis in FY2022, as noted in Ministry of Agriculture, Forestry, and Fisheries, Government of Japan (2024). Disruptions or price fluctuations in international supply chains could therefore have far-reaching consequences. As a result, there has been a renewed emphasis on local food production, with communities increasingly cultivating food locally to mitigate the risks posed by supply chain disruptions. This movement, referred to as "local food," signifies a shift towards enhanced food self-sufficiency.

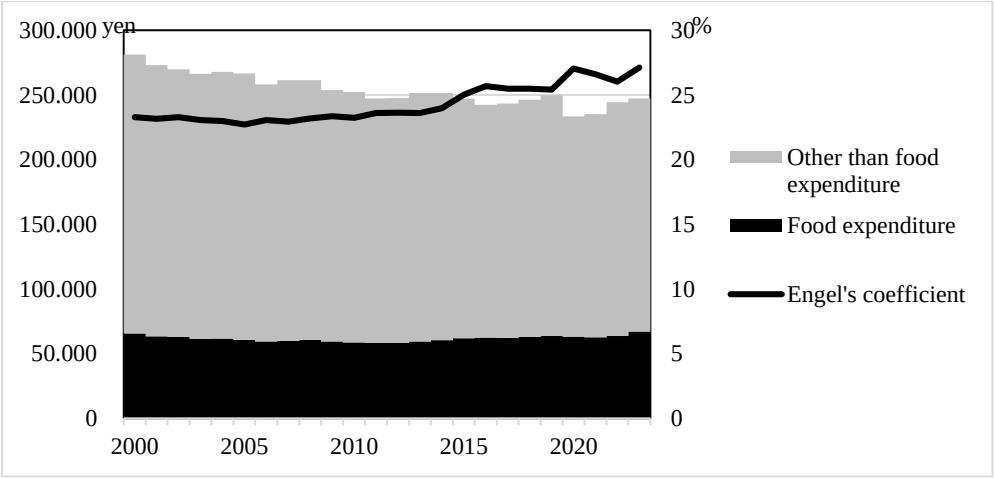
Efforts to minimize food waste have also gained prominence. Consumers have adapted their purchasing habits to reduce waste, often purchasing only what they are able to consume. Additionally, producers are selling aesthetically imperfect or damaged produce at reduced prices, while advanced technologies have enabled the repurposing of surplus food into animal feed. These practices, indicative of a broader commitment to sustainability, are fostering a more efficient use of food resources in Japan, where food production is limited. Indeed, the Food Loss and Waste & Recycling report by the Ministry of Agriculture, Forestry, and Fisheries, Government of Japan (2024) indicates that household and commercial food loss and waste decreased from 632 thousand tons in 2013 to 472 thousand tons in 2022. Moreover, technological advancements in monitoring agricultural and livestock production, including the use of surveillance cameras and data analytics, have enabled more accurate alignment of supply with consumer demand. The Food and Agriculture Organization of the United Nations (2017) posited that mixed systems may emerge in the coming years, with certain indigenous food producers leveraging technology more intensively. Modern communication technologies (e.g., mobile phones, internet, and satellites) and self-certification systems will facilitate market access, reduce reliance on intermediaries, and allow producers to capture a larger share of the final product’s added value. The seasonal availability of fruits has also been extended. Despite the relatively modest share of the primary sector in Japan's economy, its impact on food availability and consumer welfare is increasingly significant.

1.3. Increase in Engel’s Coefficient in Japan

In Japan, since the inclusion of single-person households in the Family Income and Expenditure Survey in 2000, Engel's coefficient has exhibited an upward trend. Food expenditures have remained relatively stable but have shown an increasing trajectory in recent years, while expenditures on other goods and services have either remained steady or declined.

Although the coefficient fluctuates annually, it has generally risen in recent years, with notable spikes in 2020 and 2021 during the COVID-19 pandemic. The pandemic led to a shift in consumer behavior, with a marked decrease in expenditures on transportation, accommodation, and entertainment. According to the 2020 Family Income and Expenditure Survey, the categories experiencing the largest declines were clothing and footwear, as fewer people went out. Conversely, expenditures on essential items such as masks, disinfectants, and, notably, food, remained critical. Even in times of crisis, food consumption remains

indispensable, and the logistics of stockpiling have their limits. Despite restrictions and state-of-emergency measures, consumers continued to line up at grocery stores, and online home delivery services flourished. As a result, Engel's coefficient increased during this period, a trend likely observed globally. Although the economic downturn led to lower household incomes, the coefficient's rise highlights the robustness of food-related expenditure, even during emergencies. This phenomenon may continue in the future, particularly in light of potential future crises such as pandemics. Even as the world emerges from the pandemic, lifestyle changes may sustain a higher Engel's coefficient. In 2022, soaring food prices, driven by the Russia-Ukraine conflict, led to reduced consumer purchases. However, Engel's coefficient remained higher than pre-pandemic levels, peaking at 27.1% in 2023, as illustrated in Figure 3. This prompts critical questions for further investigation: Why is Engel's coefficient rising in developed countries, and what are the broader implications for economic structures?

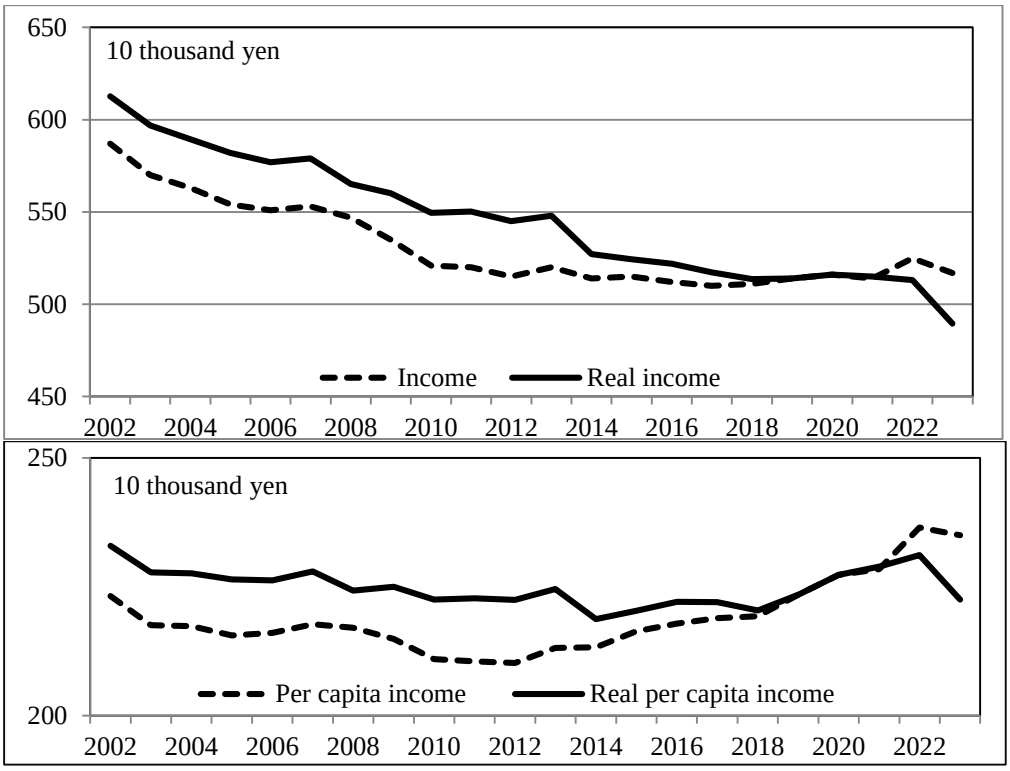


Data Source: Family Income and Expenditure Survey, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 3. Monthly Expenditure and Engel's Coefficient for Households of Japan

1.4. Income Stability in Japan

To interpret changes in Engel's coefficient, one must account for fluctuations in household income. While nominal income is frequently analyzed, it is crucial to adjust for inflation to assess real income changes. Since 2008, Japan's population has been in decline, owing to a reduced birth rate. Concurrently, household sizes have also decreased, with single-person households becoming more prevalent than traditional multi-person households with children. While Engel's coefficient is typically analyzed in relation to household income, it is important to adjust for demographic changes to ensure accurate comparisons of income levels. Data from the Family Income and Expenditure Survey reveals a modest decline in real income levels, particularly following the global financial crisis, although income per capita has remained relatively stable, fluctuating between ¥2.0 million and ¥2.5 million, as shown in Figure 4.



Note: Real income is based on the CPI with 2020=100.
Data Source: Family Income and Expenditure Survey, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 4. Annual Household Income of Japan

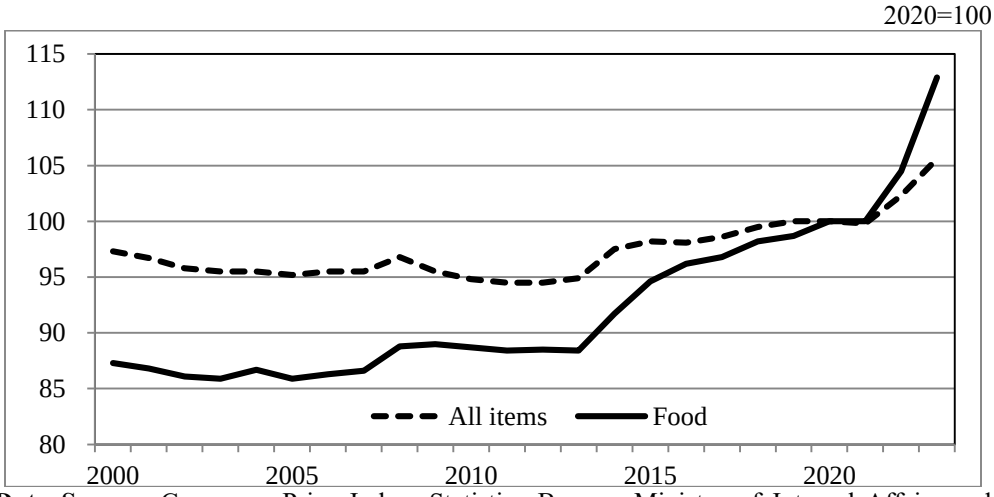
Notably, income levels rose during the COVID-19 pandemic, primarily due to government allowances and subsidies. Calculation from data in National Tax Agency, Government of Japan (2023) indicates that tax revenue increased by 4.1% in FY2020 and by 10.2% in FY2021 compared to the previous years, marking a new record high for two consecutive years.

1.5. Price and Household Size Effects

Expenditures are subject to price fluctuations in Japan, particularly those reflected by the Consumer Price Index (CPI) compiled by the Statistics Bureau of the Ministry of Internal Affairs and Communications. Between 2000 and 2013, changes in Japan's CPI remained close to zero, reflecting the deflationary environment that distinguished Japan from other developed nations. However, in recent years, the CPI has experienced a significant increase, particularly following consumption tax hikes from 5% to 8% in 2014, and from 8% to 10% in 2019. While inflation has been less pronounced compared to other countries, disruptions in global supply chains and export restrictions, driven by the pandemic and geopolitical events, have notably impacted food prices.

The following results are based on year-over-year changes in the CPI, disaggregated by item group. Food inflation has outpaced inflation in other sectors, as depicted in Figure 5. This trend has contributed to the increase in the Engel's coefficient. Contributing factors such as the depreciation of the yen and Japan's reliance on imported food have escalated food prices.

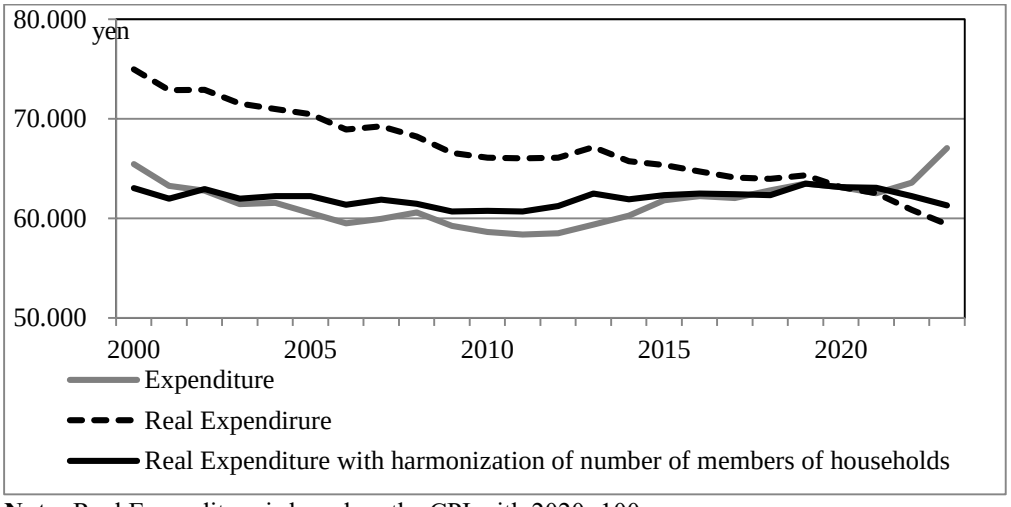
Inflation rates exhibit variability across different food categories, with fish, shellfish, and fruits experiencing more substantial price increases, while non-alcoholic and alcoholic beverages have seen more gradual inflation.



Data Source: Consumer Price Index, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 5. Consumer Price Index (CPI) of Japan

Excluding the effects of price changes, real food consumption expenditures have shown a notable decline, while nominal expenditures have remained stable. When adjusted for price changes and household size, real expenditure per capita has remained relatively constant since 2010, with only minor fluctuations in recent years (Figure 6).



Note: Real Expenditure is based on the CPI with 2020=100.
Data Source: Consumer Price Index and Family Income and Expenditure Survey, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 6. Monthly Food Consumption Expenditure by Household of Japan

In accordance with International Labour Organization et al. (2020), the CPI is adjusted for quality, meaning that changes in real expenditures are influenced not only by changes in quantity but also by improvements in product quality.

2. Literature Review

Numerous scholarly articles on Engel's coefficient have been published globally. Utilizing unpublished data from the World Bank's International Comparison Program encompassing 31 food items across more than 150 countries, Wang et al. (2018) asserted that dietary patterns in affluent nations are significantly more diverse than those in less wealthy countries. They emphasized that measuring inequality in dietary diversity is more appropriately done by volumes. Furthermore, they discovered that the quality of the food basket—evaluated through the consumption-based distinction between luxury and necessity goods—tends to improve with rising income, although the associated elasticity is minimal. Employing a two-country model of directed technical change characterized by a continuum of sectors and nonhomothetic preferences, Matsuyama (2019) offered a comprehensive framework that encapsulates the multifaceted effects and interactions of economic growth and globalization on structural transformation, innovation, and international trade, all within the context of Engel's Law.

Richard (2011) provided a synthesis of findings demonstrating that Engel's Law remains empirically valid across both countries and household groups. Nonetheless, the correlation between food expenditure shares and per capita income is insufficiently robust to guarantee consistent alignment with Engel's Law among countries possessing similar income levels. This relationship further weakens among nations with particularly high per capita incomes.

A considerable body of literature in Japanese has addressed the recent uptick in Japan's Engel's coefficient. Kojima et al. (2018) examined the contributing factors by decomposing both food and non-food consumption into price and quantity components, alongside indicators such as disposable income, average propensity to consume, and food consumption during 2008 and 2014–2015—a period marked by rising food prices. Takeuchi et al. (2020) found that the recent increase in the Engel's coefficient was primarily driven by a decline in overall living expenditures coupled with pronounced inflation in the prices of foodstuffs, prepared meals, and dining out. Haijima (2021) demonstrated that food price inflation significantly contributed to the elevation of the Engel's coefficient. Ohishi (2024) observed a recent rise in Engel's coefficients in ¥3.5-4, 7-7.5 and 10-12.5 million income brackets.

Additionally, in the context of other nations, Olipra (2024) highlighted that several Central and Eastern European (CEE) countries have experienced either a stabilization or an increase in the proportion of household expenditure allocated to food, despite rising per capita incomes and progressive convergence with Western European economic standards.

3. Data and Methodologies

The paper centers on an in-depth analysis of consumption behavior. Most existing literature on consumption in Japan has limited its scope to households comprising two or more members. However, single-person households represent the largest proportion of all households in Japan. Consequently, this study incorporates data for all household types, including single-person households.

As a preliminary methodological approach, the study disaggregates food expenditure from the Family Income and Expenditure Survey by commodity group to assess changes in their respective shares. Consumption expenditures are categorized into two primary classifications: "use" and "commodity" in the Family Income and Expenditure Survey. Engel's coefficient is derived from the "use" category, which distinguishes between essential household consumption and discretionary social expenditures. To gain a more nuanced understanding, it

is crucial to focus on the "commodity" classification rather than the "use" classification. In 2023, social spending on food amounted to 4,641 yen, a substantial contrast to the 67,078 yen allocated for personal food consumption. Consequently, a detailed estimation of expenditure proportions can be inferred from the "commodity" category.

From a microeconomic perspective, individual food consumption tends to increase post-retirement due to a decline in income, consistent with Engel's law. At the macroeconomic level, demographic aging shifts Engel's coefficient accordingly. To control for age-related effects, analyses based on fixed age cohorts—i.e., disaggregation by age—are required. Furthermore, to isolate consumption patterns independent of income fluctuations, disaggregation by income is essential. In addition, as household consumption is financed not only by income but also by assets, disaggregating data by asset holdings enhances understanding of consumption behavior.

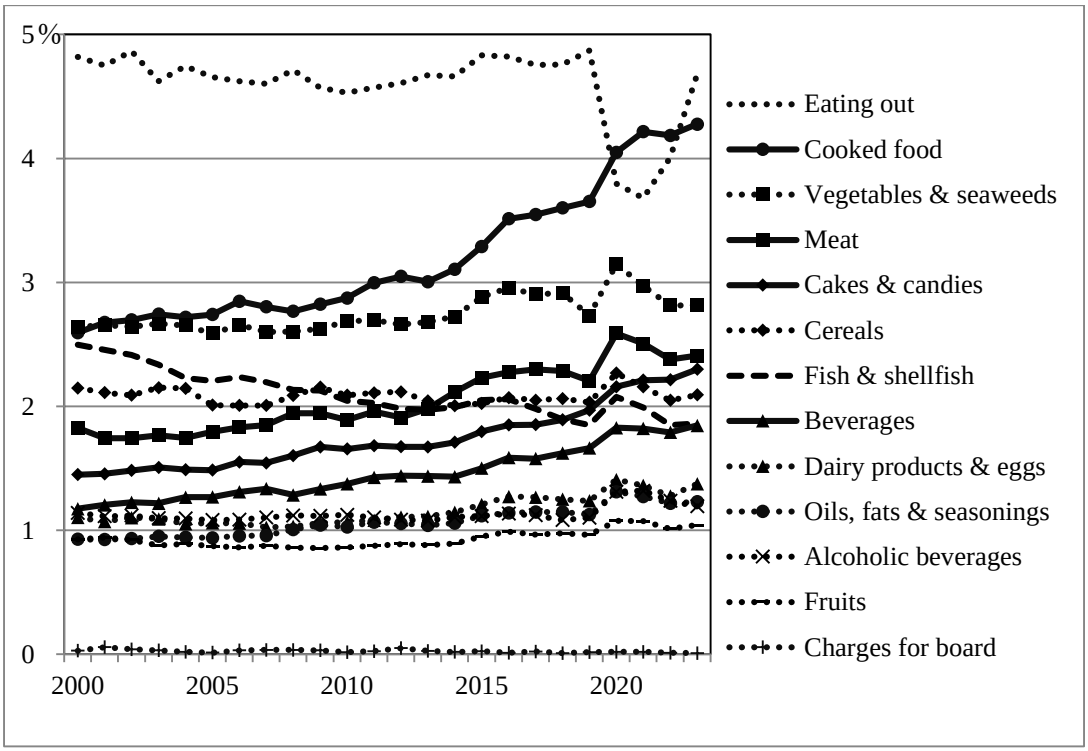
While previous studies in Japan primarily utilized the Family Income and Expenditure Survey, this paper employs both the Family Income and Expenditure Survey and the National Survey of Family Income, Consumption, and Wealth. The former is conducted monthly with a sample of approximately 9,000 households, whereas the latter, previously known as the National Survey of Family Income and Expenditure, is conducted quinquennially and covered 93,000 households in 2019. The extensive scale of this latter survey offers a more robust dataset, enabling a nuanced examination of consumption patterns across varied demographic segments. Socioeconomic group analyses are based on this dataset, exploring disparities in food consumption across different cohorts categorized by household head age, income brackets, and asset classifications from 2014 to 2019. Additionally, the paper quantifies the contribution of various commodity groups to shifts in household food consumption, segmented by income and asset categories.

How do Engel's coefficients vary internationally? A practical proxy for Engel's coefficient is the proportion of household expenditure on food and non-alcoholic beverages—excluding dining out—relative to total household consumption expenditure within GDP. Although this measure does not perfectly replicate Engel's coefficient due to the exclusion of dining out and alcoholic beverages, it provides a reasonably comparable indicator of food expenditure distribution across countries.

4. Results

4.1. Shifts in Food Consumption Patterns

An analysis of food expenditure data presented in Figure 7 reveals notable shifts in consumption patterns. Traditionally, the largest portion of food expenditure was allocated to dining out; however, this share diminished during the pandemic. The category demonstrating the most significant growth between 2000 and 2023 is cooked food, which increased from 2.6% to 4.3% of total expenditure. This change can be attributed to innovations in food production technologies, which have enabled the widespread availability of prepared meals, often distributed via online delivery platforms. The pandemic further accelerated this trend, with food delivery services experiencing substantial expansion as consumers' increasingly prioritized convenience and safety.



Data Source: Family Income and Expenditure Survey, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 7. Commodity Group Share for Food in Household Consumption Expenditure of Japan

Upon further examination of specific details regarding cooked food within the "commodity" classification, the demand for ready-to-eat meals has experienced a significant surge, with sales of frozen foods, particularly frozen meals and salads, witnessing an extraordinary increase of over 100%.

Other categories, such as meat, confectionery, and beverages, have also shown upward trends, while the proportion spent on fish and shellfish has declined, mirroring broader global dietary shifts. Among meats, pork, chicken, and ground meat have seen the most considerable increases in consumption, while beef and ham have declined. Within the confectionery category, chocolate, biscuits, and ice cream and sherbet have experienced the most significant growth, whereas traditional Japanese sweets, such as "Yokan" (sweet bean jelly) and "Manju" (bean-jam cakes), have decreased. In the beverage sector, carbonated drinks saw the highest increase at 180.9%, followed by a 126.8% rise in other beverages, including mineral water and sports drinks. Tea beverages and fermented lactic drinks have also risen, while green tea and fruit and vegetable juices have seen declines.

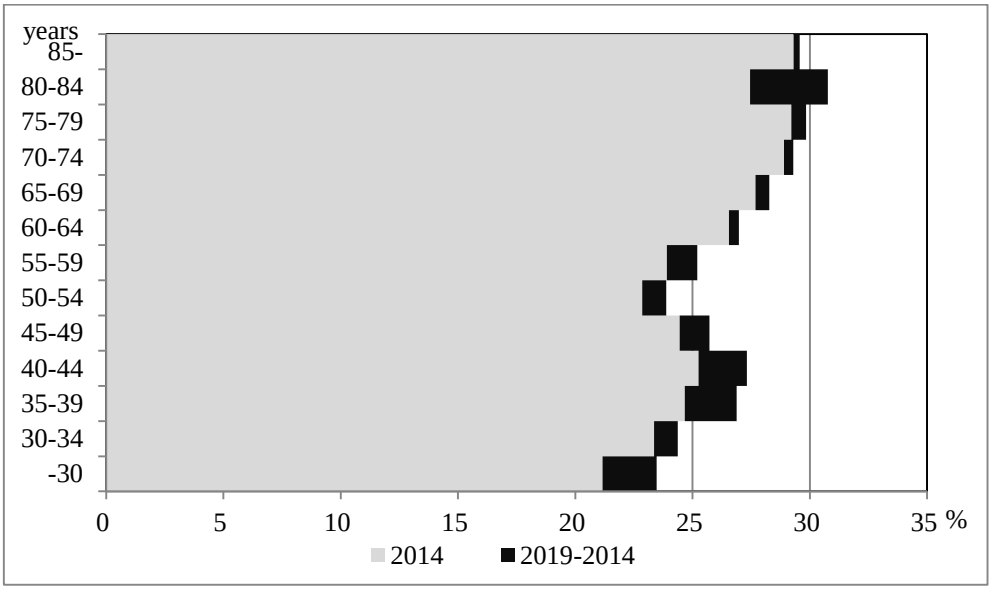
Daily consumables, such as eggs, oils, fats, seasonings, alcoholic beverages, and fruits, although comprising relatively minor expenditures, have exhibited growth, albeit at a more modest pace. The “charges for board”, which represent a minor expenditure, refer to the expenses incurred by restaurants in providing meals for their employees. When adjusted for price fluctuations with data from the CPI, these trends reveal a slightly altered perspective, though they continue to follow a generally consistent trajectory.

Overall, these findings regarding food consumption patterns suggest that the increase in recent food expenditures is driven not by essential needs for survival, which can be satisfied by staples such as cereals and tap water, but by added values such as convenience and savings from cooked food, taste from confectionery and beverages, and nutrition from meat. These added values represent a key factor in the rise of Engel's coefficient.

4.2. Socioeconomic Group Analyses

4.2.1. Age Groups

A defining feature of Japanese society is its rapidly aging population, coupled with one of the highest life expectancies globally. Older individuals typically experience a decline in income, although their caloric needs also decrease. Consequently, Engel's coefficients tend to be elevated among the elderly. Figure 8 illustrates the distribution of Engel's coefficients across various age groups, represented by grey bars, and the changes observed from 2014 to 2019, indicated by black bars. For individuals aged 75 and older, the coefficient is approximately 30%, in contrast to around 25% for those under 60. Japan's aging demographic has played a significant role in the upward trend of Engel's coefficients. Notably, an increase is observed across most age groups, especially among those under 60 and those aged 80-84.



Data Source: National Survey of Family Income, Consumption and Wealth, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 8. Engel's Coefficient by Age Group for Household Heads of Japan

4.2.2. Income Groups

Household income distribution exhibits a right-skewed pattern, with a long tail extending toward higher income brackets. The largest number of households, approximately four million, was recorded in the ¥3-3.5 million income group for both 2014 and 2019. Figure 9 depicts the distribution of expenditure across various food categories by income group in 2019. Although fluctuations are observable due to the limited sample size for some groups, discernible trends

emerge as income levels rise. As income increases, the proportion allocated to cereals and prepared foods declines, while the share devoted to dining out expands. A notable example of this trend is the food expenditure composition for the lowest income group (below ¥1 million), where the allocation for cooked food is 18.0%, followed by 14.0% for dining out, 11.7% for vegetables and seaweeds, and 8.8% for cereals. In contrast, for the highest income group (¥20 million or more), dining out constitutes the largest share at 27.2%, followed by 11.9% for cooked food, 9.6% for vegetables and seaweeds, and 9.4% for meats. While rice, a staple of Japanese cuisine, remains central to the diets of lower-income households, wealthier individuals exhibit a greater propensity for dining out. Conversely, certain expenditures peak in middle-income groups, particularly for alcoholic beverages in the ¥13-13.5 million range, and for oils, fats, seasonings, and confectionery in the ¥16.5-17 million range.

As anticipated, higher-income households exhibit lower Engel's coefficients. However, there was a notable increase in these coefficients across most income brackets from 2014 to 2019, excluding some groups earning over ¥15.5 million annually. The data highlights that expenditure on cooked food and beverages rose in most groups, whereas spending on cereals, fish, and alcoholic beverages declined (Figures 10 and 11).

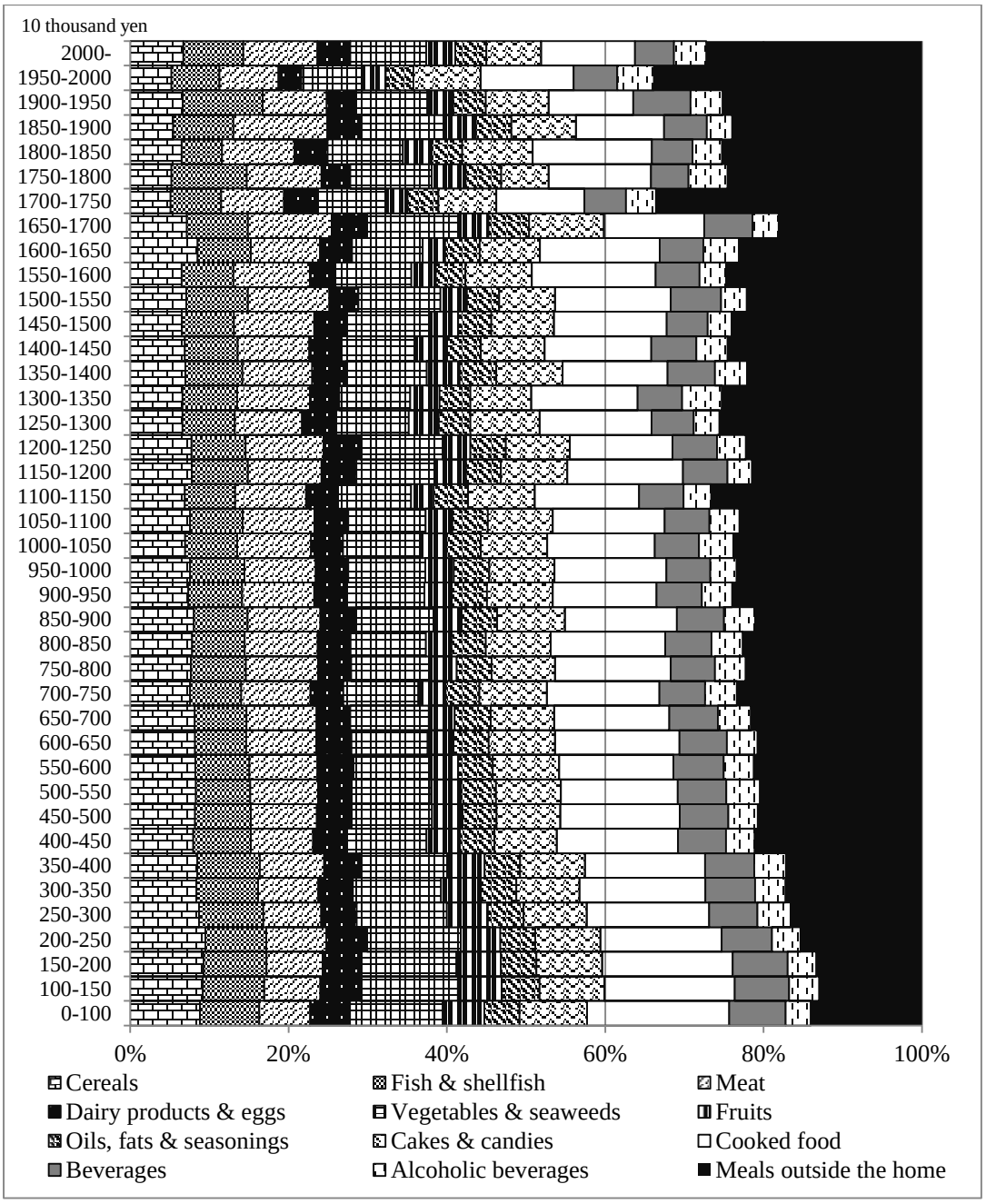
4.2.3. Asset Groups

While Japan faces significant challenges related to income flow, it remains the world leader in terms of accumulated household assets. Assets are the net financial assets, land and houses. Historically, it has been noted that Japanese households maintain considerable savings for the future. In recent years, however, there has been a shift towards prioritizing consumption over saving. Nevertheless, with increasing life expectancy and a declining birthrate, concerns about future reliance on pensions persist, prompting individuals to save more and limit unnecessary spending. Cabinet Office, Government of Japan (2024) illustrates that household holdings of cash and deposits have continued to grow, surpassing ¥1,100 trillion in 2022, additionally that financial assets, including insurance, pension funds, stocks, and investment trusts, exceeded ¥2,000 trillion in 2022.

Among asset categories, Engel's coefficient is the highest for households with net assets approximately amounting to ¥15 million. However, it is crucial to observe that lower asset groups tend to display relatively lower Engel's coefficients. Between 2014 and 2019, wealthier households saw an increase in their Engel's coefficients. Within these groups, expenditures on prepared foods and beverages generally rose, while spending on cereals, fish, and alcoholic beverages declined (Figures 12 and 13). This trend mirrors that observed in income groups.

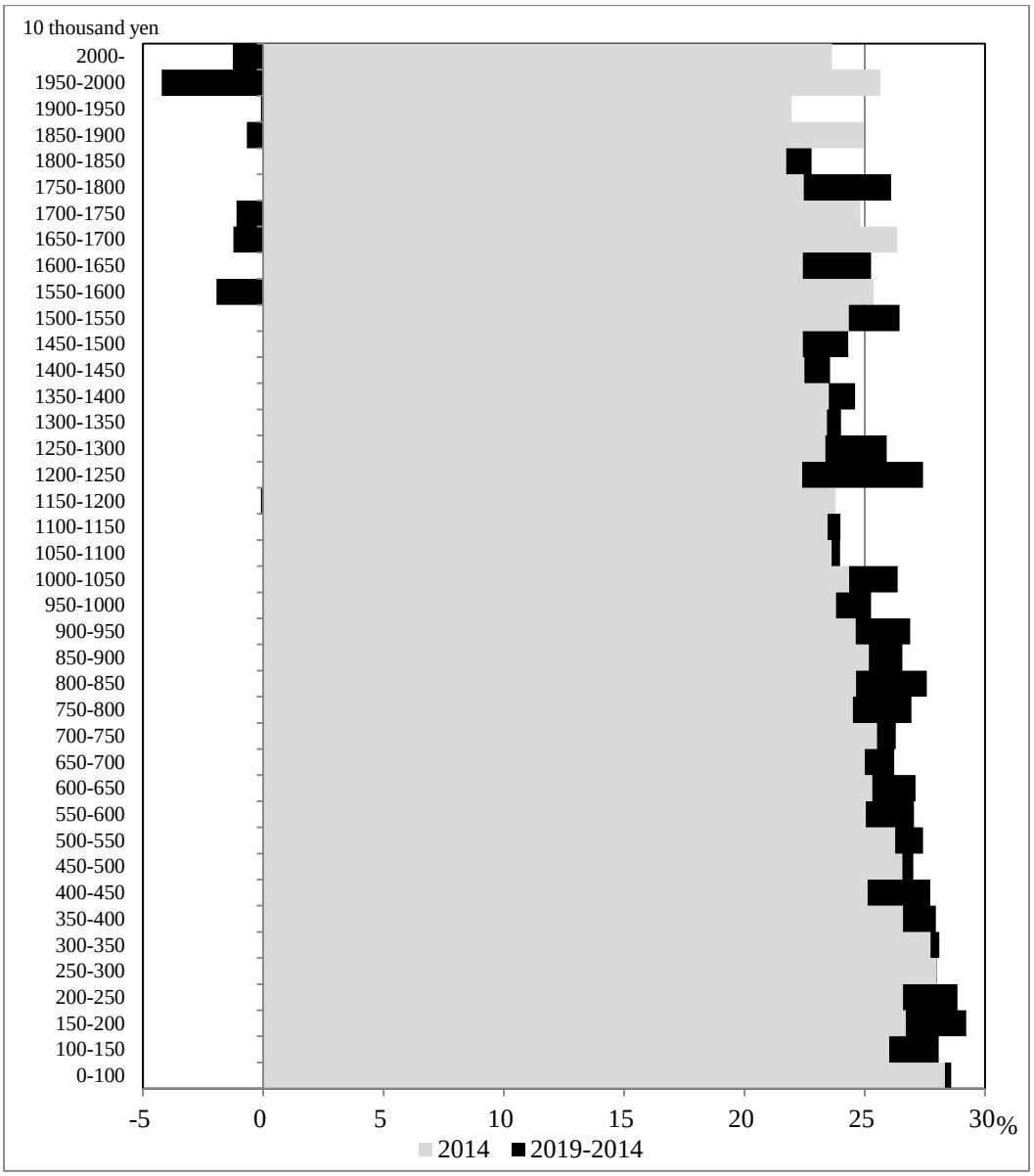
However, the disparity in coefficients across asset groups is not as pronounced as those observed in age and income groups, suggesting that asset holdings have a limited effect on Engel's coefficients.

The findings in this section indicate that the majority of categories, segmented by age, income, or assets, followed a similar trend to that observed in the overall phenomenon, demonstrating an increase in Engel's coefficient, which is driven by the rising consumption of cooked food and beverages.



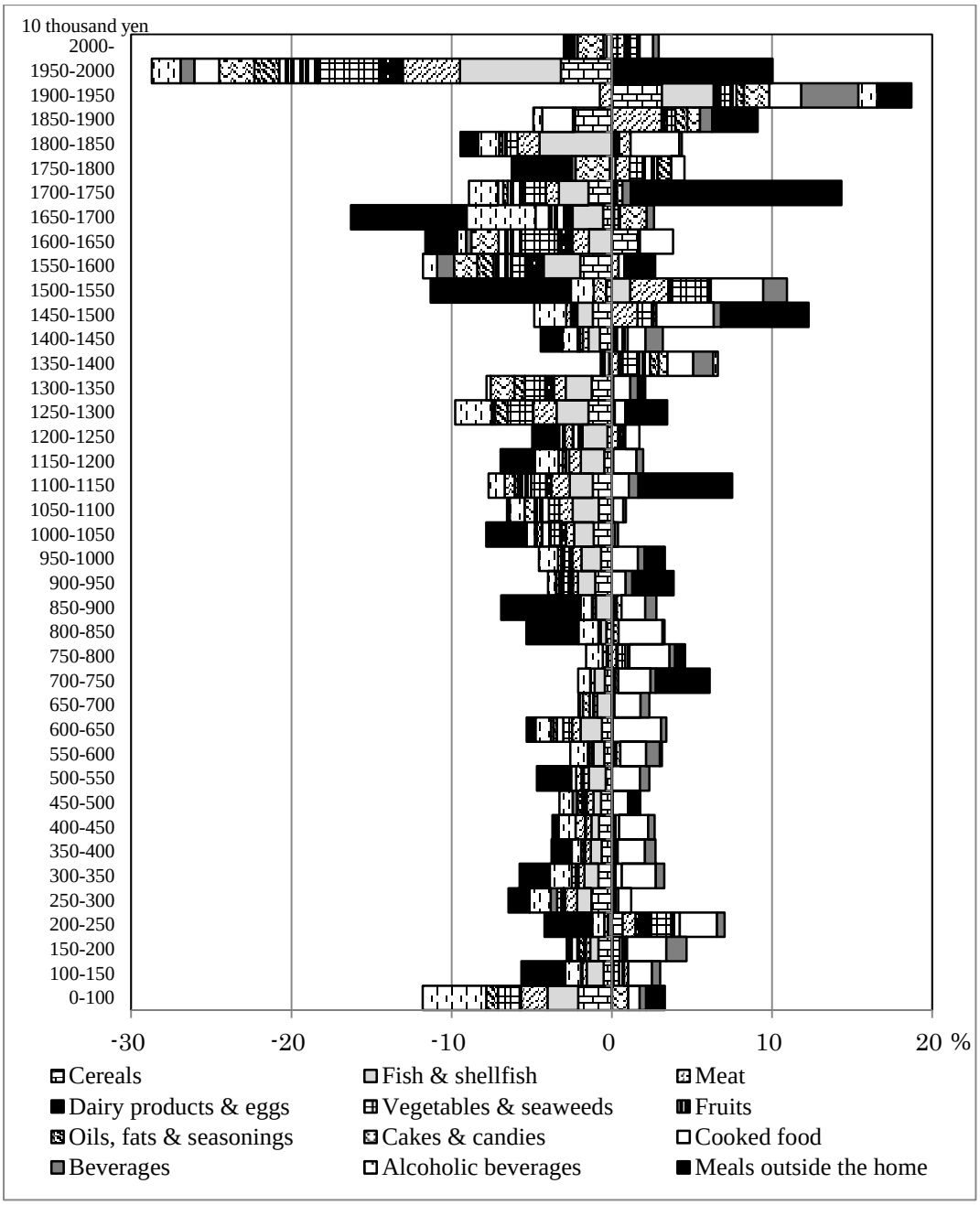
Data Source: National Survey of Family Income, Consumption and Wealth, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 9. Commodity Group Share among Food Consumption by Income Group of Japan in 2019



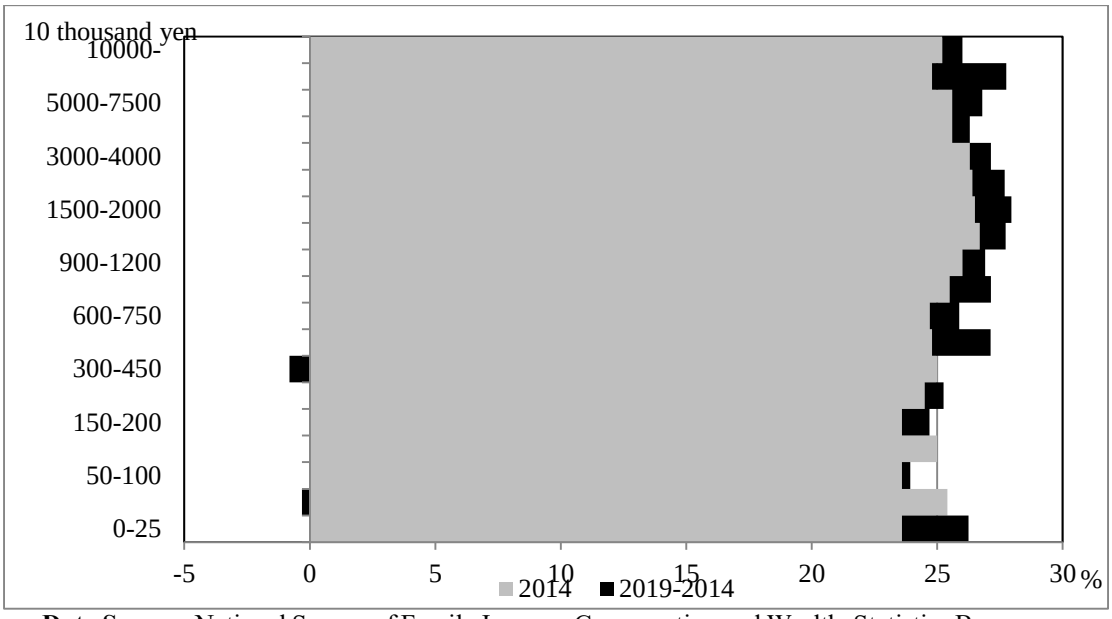
Data Source: National Survey of Family Income, Consumption and Wealth, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 10. Engel's Coefficient by Income Group of Japan



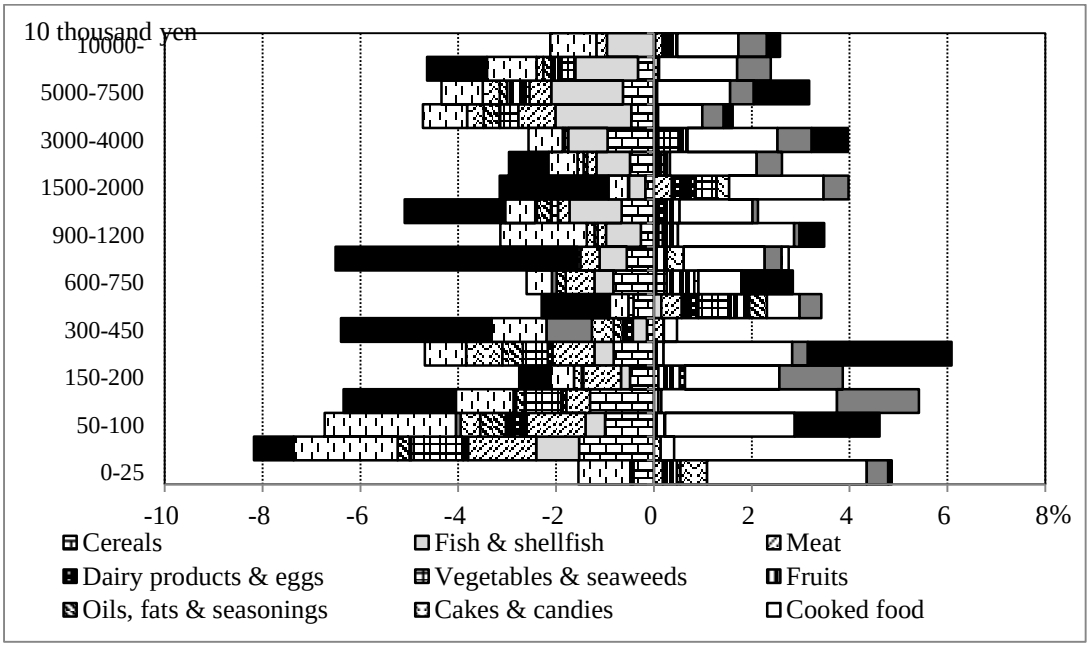
Data Source: National Survey of Family Income, Consumption and Wealth, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 11. Contribution to Household Food Consumption Change by Income Group of Japan from 2014 to 2019



Data Source: National Survey of Family Income, Consumption and Wealth, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 12. Engel's Coefficient by Property Group of Assets of Japan

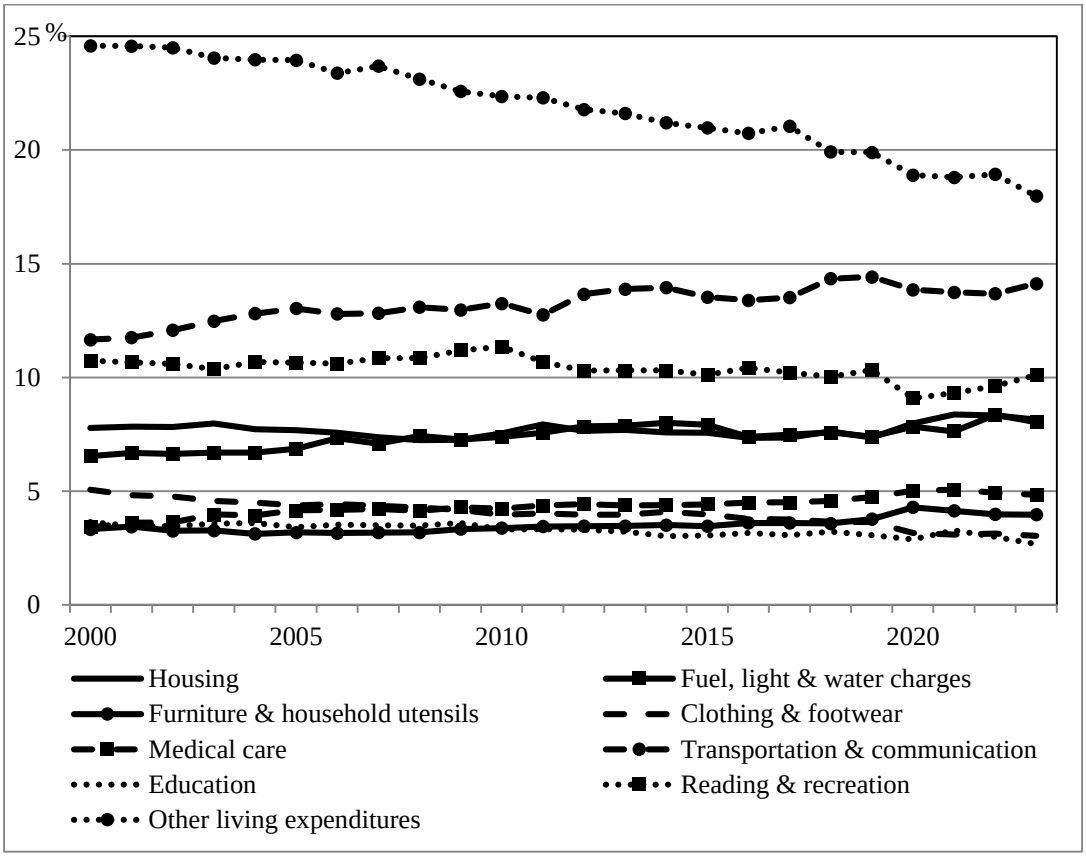


Data Source: National Survey of Family Income, Consumption and Wealth, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 13. Contribution to Household Food Consumption Change by Property Group of Assets of Japan from 2014 to 2019

4.3. Decline in Non-Food Expenditures

The concurrent reduction in non-food expenditure categories may contribute to the increase in Engel's coefficient. The chart delineates the distribution of expenditures across various categories from 2000 to 2023 based on data from the Family Income and Expenditure Survey, emphasizing the declining trends in "other living expenses" and "clothing & footwear" (Figure 14). Within the "other living expenses" category, allocations for pocket money (with unspecified recipients) and social expenditures have diminished, while spending on miscellaneous items has risen. Social expenses encompass food, furniture and household goods, clothing and footwear, recreation and leisure, various goods and services, monetary gifts, and additional social outlays. Notably, monetary gifts have undergone a substantial reduction, declining from 4.7% in 2000 to 2.5% in 2023. Expenditures on "clothing & footwear" have similarly experienced a pronounced contraction.



Data Source: Family Income and Expenditure Survey, Statistics Bureau, Ministry of Internal Affairs and Communications, Government of Japan

Figure 14. Commodity Group Share of Household Other Consumptions of Japan

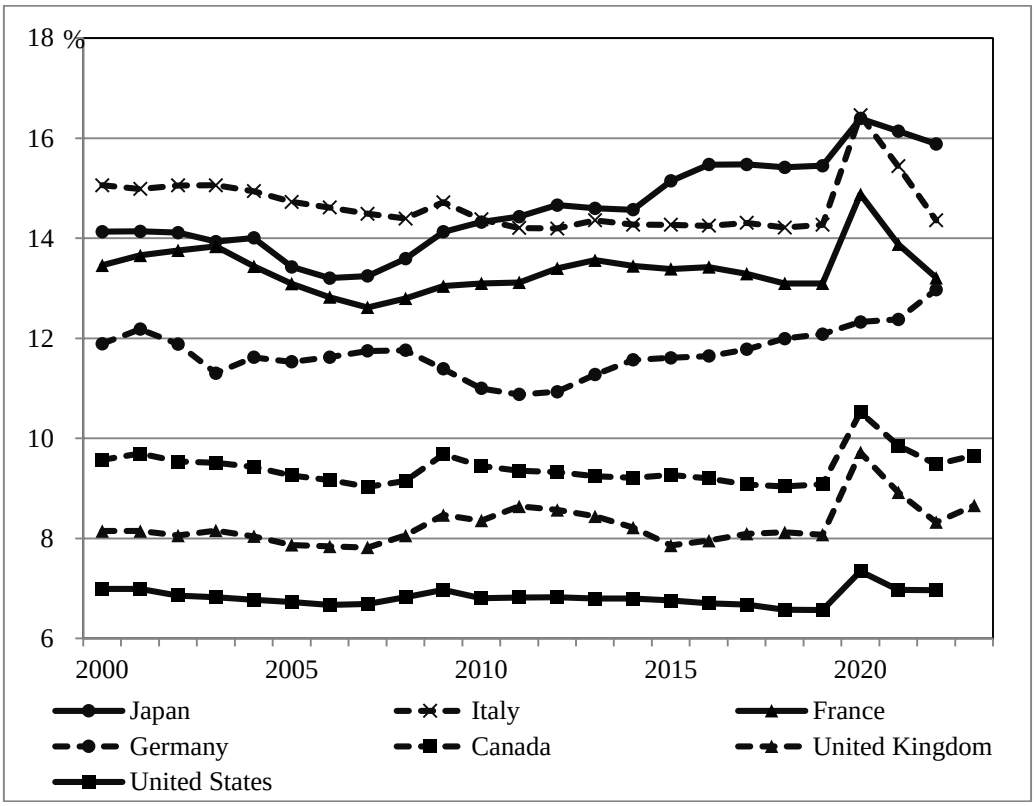
In contrast, expenditure on "transportation & communication" has exhibited an upward trajectory. The advancement of ICT industries has stimulated increased consumption in communication, particularly through the proliferation of smartphone sales. Expenditure on "medical care" saw a decline in 2020, attributed to the reluctance to visit healthcare facilities

due to fears of COVID-19 contagion, but subsequently surged in the aftermath. With Japan's aging demographic, there has been a heightened demand for healthcare products and services, which are now regarded as indispensable for both well-being and longevity, on par with food.

4.4. Global Trends in the Increase of Engel's Coefficient

4.4.1. Comparison in G7 Nations

The figure below compares G7 nations since 2000 from data of Organisation for Economic Co-operation and Development (OECD). Countries such as Japan, Italy, and France, with rich culinary traditions, demonstrate relatively high proxy Engel's coefficients of approximately 15%. In contrast, the United States, with its fast-food culture, exhibits a lower rate of just above 5%. Temporal trends reveal that Japan experienced a decline in the early 2000s, followed by an increase post-2000s. Germany also showed a downward trend until the early 2010s, before exhibiting an upward shift. Trends in other countries remain inconclusive, requiring further monitoring (Figure 15).

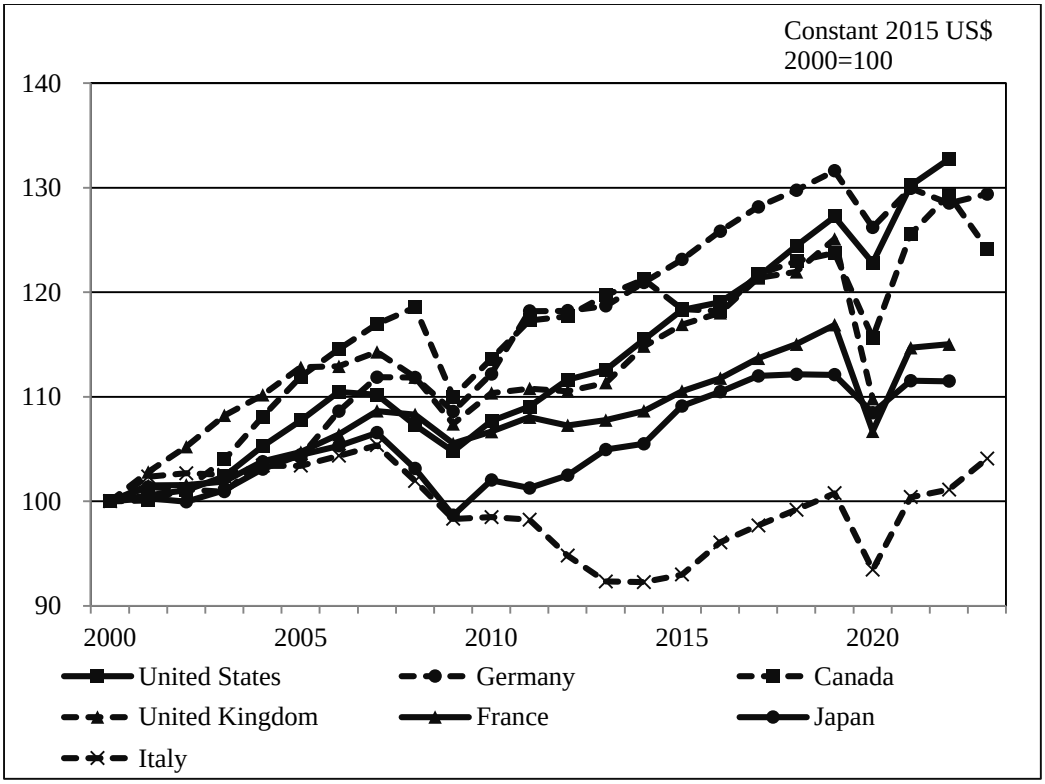


Data Source: OECD Data Explorer

Figure 15. Share of Food and Non-alcoholic Beverages in Household Consumption Expenditure in G7 Countries

Direct cross-country comparisons of household income are fraught with challenges due to varying standards. Real Gross National Income (GNI) per capita is a more consistent measure of income levels. Figure 16 presents indices for GNI per capita (constant 2015 US$), with a

base year of 2000 from World Bank. These indices show a general upward trend in 2000s, with the exception of the global financial crisis around 2009. Since 2015, the GNI indices have steadily increased, with the exception of 2020, when the COVID-19 pandemic exerted a substantial impact. GNI per capita now ranges from 110 to 130, with Italy being an exception due to the debt crisis of the 2010s. Notably, GNI data for the United Kingdom has not been updated since 2021.



Data Source: World Development Indicators, World Bank

Figure 16. Indices for Gross National Income (GNI) Per Capita of G7 Countries

Given the rise in Engel's coefficients and the relatively stable or increasing income levels in Japan and Germany, Engel's coefficient has become less effective as a measure of living standards. In advanced economies, food is not only a basic necessity but also a means of enhancing health and enriching life experiences.

4.4.2 Comparison in Nations Outside the G7

The study also examined the proportion of household consumption expenditure allocated to food and non-alcoholic beverages in thirty non-G7 countries from 2013 to 2023, utilizing OECD data, albeit with some gaps in coverage. Twenty-four countries witnessed a peak in their coefficients in either 2020 or 2021. Colombia experienced its peak in 2022. Numerous countries, including Austria, Chile, Czechia, Denmark, Finland, Greece, Israel, Latvia, Luxembourg, Mexico, Poland, Portugal, Slovakia, Spain, Sweden, and Turkiye, sustained levels in 2022 that exceeded those observed in 2019, the final year of the pre-pandemic period.

In Finland, Iceland, Norway, Poland, and Slovakia, the coefficients rose in 2023 compared to the previous year. These developments indicate a broader upward trend in the coefficients across certain nations. It is important to underscore that these figures exclude expenditures on dining out, a category that has seen a notable revival in the post-pandemic era. As a result, the actual Engel's coefficients may be higher than the reported values.

According to Olipra (2024), panel regression analysis demonstrated that the persistence or even escalation of Engel's coefficient in Central and Eastern European countries may be attributed to aspirational behavior, wherein these societies seek to emulate Western lifestyles. This is particularly evident in the disproportionately high share of processed food in their total expenditure on food and non-alcoholic beverages, which is incongruent with their per capita income levels.

4.5. Evolving Needs for Food

Expenditure on food tends to be proportionally higher in lower-income societies, where food is viewed as a critical component of survival. In such nations, Engel's coefficient remains an effective indicator of food expenditure. Conversely, in more developed countries, Engel's coefficient is generally lower. However, in certain developed nations, Engel's coefficient has risen, despite stable or increasing per capita incomes. This indicates that the metric is becoming less reliable for assessing income levels in these contexts. This shift can be attributed not only to the continued necessity of food but also to rising food prices, influenced by factors such as the recent pandemic, geopolitical tensions, and supply chain disruptions. Furthermore, climate change and natural disasters have accentuated the demand for food security, leading individuals to prioritize local and sustainable food sources amidst increasingly unstable living conditions.

Moreover, this trend underscores the growing focus on food quality, encompassing attributes such as taste, health benefits, ease of preparation, longevity, ethical production, environmental sustainability, and aesthetic appeal. These "added values" are integral to the consumer experience, extending beyond mere nutrition. In contrast, expenditures on gifts and social interactions have decreased, reflecting the weakening of social bonds within households. Similarly, spending on entertainment, particularly information technology, has declined due to intense competition and technological advancements that have driven down prices.

As living costs decrease in sectors such as newspapers, tours, and telephone charges, food has evolved from a mere necessity to a source of pleasure and well-being. Consumers are increasingly seeking high-quality ingredients and culinary experiences. This demand for quality is not solely driven by taste but also by considerations such as ingredient availability, ease of cooking, long-term storage, and the dining environment as a whole. The rise in Engel's coefficient, therefore, reflects the increasing quality of essential goods. This shift is exemplified by the transformation of transport hubs, such as train stations, which now feature shops and restaurants offering convenient and high-quality food options, thereby enhancing the commuter experience.

The demand for high-quality food, which surged during the COVID-19 pandemic, continues to expand, with expectations of continued growth in the years to come. This demand is fueled by consumers' desire for tangible, authentic experiences rather than virtual interactions mediated by technology and artificial intelligence.

5. Conclusion and Future Research Directions

Expenditure on food is generally higher in impoverished societies, as food represents one of the most fundamental elements of human existence. Indeed, the proportion of income spent on food tends to be considerably greater in low-income nations. Engel's coefficient effectively

elucidates this trend. In contrast, Engel's coefficient is relatively lower in developed countries. However, in certain developed nations, this coefficient has been rising despite the absence of a decrease in per capita income. This phenomenon can be attributed not only to the essential nature of food but also to the recent inflation in food prices, driven by factors such as the ongoing pandemic and geopolitical conflicts. Additionally, climate change and natural disasters have further intensified the impetus to secure food supplies. In vulnerable circumstances, ensuring food security has become a paramount concern. Moreover, this shift is also influenced by the growing importance of food's added value, encompassing aspects such as taste, health benefits, ease of processing, long-term storability, ethical production, environmental sustainability, and aesthetic qualities, alongside the surrounding services like accessibility, atmosphere, convenience, and the overall reputation of dining establishments. These added values represent new dimensions beyond the mere nutritional requirements for human survival.

In Japan, particularly amid a low food self-sufficiency rate and fragile trade conditions, public concern over food security has intensified. Furthermore, surging food prices—including those of rice—have contributed to a marked increase in the Engel's coefficient. While previous studies have focused on brief inflationary episodes within a broader context of deflation, it is more appropriate to address the phenomenon as a structural transformation of the economy.

To understand the evolving economic structure in response to the growing demand for food, it is crucial to analyze disaggregated data from Japan in the post-COVID-19 era. The National Survey of Family Income, Consumption, and Wealth in Japan in 2024, will provide valuable data for future research. Additionally, case studies from other countries, particularly disaggregated data from Germany, will be instrumental in establishing a benchmark for changes in Engel's coefficient.

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