



RIETI Discussion Paper Series 25-E-106

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Are Productivity and Wages Decoupling in Japan? Divergence between macro and micro relationships*

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Abstract

Using micro-level data on Japanese firms, this study analyzes the relationship between productivity and wages, with a focus on comparing aggregate-level and firm-level figures. The main findings are as follows. First, at the macro level, productivity growth and real wage growth are diverging, but, at the firm level, there is a strong positive relationship between productivity growth and wage growth, indicating that productivity and wages have not decoupled. Second, a divergence exists between simple average and aggregate (i.e., weighted average) wage trends, with aggregate real wages exhibiting a greater downward trend. Third, dynamic Olley-Pakes decomposition reveals that the covariance term contributes negatively to changes in real wages. In other words, the relationship between higher value-added share and higher wages at the firm level is weakening. In contrast, the covariance term has a large positive effect on productivity growth. These results suggest that while productivity growth is essential for raising real wages, policies that promote productivity through resource reallocation may conflict with those aimed at increasing labor's share of value-added.

Keywords: productivity, wage, labor share, dynamic Olley-Pakes decomposition

JEL Classification: D24, J31, O40

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* I would like to thank Kyoji Fukao, Eiichi Tomiura, and the seminar participants at RIETI for their valuable comments and suggestions. I am grateful to the Ministry of Economy, Trade and Industry for providing the micro data of the Basic Survey of Japanese Business Structure and Activities used in this study. This research is supported by the JSPS Grants-in-Aid for Scientific Research (21H00720, 23K20606).

Are Productivity and Wages Decoupling in Japan? Divergence between macro and micro relationships

1. Introduction

Amid rising price level, wage growth attracts attention in Japan. According to data compiled by the Japanese Trade Union Confederation and the Japan Business Federation, average wage has increased more than 5% for these two consecutive years. According to the result from the Business Outlook Survey (Cabinet Office and Ministry of Finance) regarding firms' priorities for profit distribution, the number of firms selecting "payment for employees" has surged. In particular, this has become the highest priority item among mid-sized and small businesses.

However, real wages, adjusted for consumer price inflation (CPI), have been stagnant. The real wage index published in the Monthly Labour Survey (Ministry of Health, Labour and Welfare) shows a decline of 0.3% per year over the 10-year period from 2014 to 2024. Notably, during the years 2022 to 2024, when CPI inflation accelerated, real wages fell year-on-year for three consecutive years. The real wage index published in the Monthly Labour Survey does not adjust working hours. Considering the declining trend in working hours, this may underestimate the growth rate of real hourly wages. Calculating real hourly wages using the working hours index from the same survey shows a slight annual increase of +0.3% over the past decade. However, in 2022 and 2023, the index shows year-on-year declines. Against the circumstance, the government's "Basic Policy on Economic and Fiscal Management and Reform 2025" advocates achieving a growth-oriented economy starting with wage increases, aiming to achieve a continuous real wage growth rate of around 1%.

To sustainably raise real wages, productivity growth is essential. However, macroeconomic data shows that Japan stands out among major economies for its large gap between productivity growth and real wage growth, with real wages increasing at a lower rate than productivity (Pension Subcommittee of the Social Security Council, 2024; Kono, 2025). At the macroeconomic level, wage increases do not appear to be keeping pace with productivity growth. One factor contributing to this gap is the terms of trade deterioration (e.g., Saito, 2023; Chun *et al.*, 2024). The terms of trade represent the ratio of Japan's export prices for goods and services to its import prices. When these terms deteriorate, they cause income leakage abroad in the form of negative terms of trade gains, thereby contributing to the divergence between productivity growth rates and real wage growth rates.

The real value-added (GDP) in the National Accounts (Cabinet Office) is a figure adjusted for price fluctuations using the GDP deflator, and the macro-level productivity growth rate is calculated based on this real value. On the other hand, the wage growth rate in the Monthly Labour Survey is price-adjusted using the CPI (excluding imputed rent). Between 1994 and 2024, the GDP deflator showed

an annual rate of -0.2%, while the CPI (excluding imputed rent) showed an annual rate of +0.5%, indicating a significant divergence (see **Table 1**).¹ Therefore, this becomes a factor causing a divergence between the real labor productivity growth rate and the real wage growth rate, with part of it stemming from deteriorating terms of trade. For example, the Pension Subcommittee of the Social Security Council (2024) conducted a decomposition of real wage growth from 1995 to 2022, showing that in Japan, the difference between the GDP deflator and the CPI growth rate has made a significantly larger negative contribution compared to major advanced countries.

As shown in Section 4, at the firm level, there exists a robust relationship: firms with higher productivity tend to have higher wage levels, and firms experiencing productivity growth tend to have higher wage growth rates. The divergence observed at the macro level mentioned above stems from various factors, including changes in the composition of firms due to entry and exit, and shifts in the share of value added among surviving firms. Not all firms exhibit the same divergence in productivity and wages as seen at the macro level. Given the heterogeneity of both productivity and wages across firms, analyzing microdata—not just observing aggregate data—is useful for revealing underlying mechanisms and developing prescriptions for raising real wages. Identifying the causes of this macro-micro divergence is central to this paper's research question.

As discussed in Section 2, there have been researches on the decoupling of productivity and wages. Research on productivity-wage decoupling (e.g., Pessoa and Van Reenen, 2013; Schwellnus *et al.*, 2017; Teichgraber and Van Reenen, 2021) generally point out that while there is a divergence between productivity growth and median wage growth due to widening wage inequality, labor productivity growth and average wage growth are tightly linked, meaning that no decoupling has occurred in this sense.

The decline in labor share is also a potential factor creating a gap between productivity and wages. This is an issue of significant global interest, particularly in the United States. Numerous studies have examined the declining labor share and its causes, with many utilizing firm-level data.² Many studies covering major economies generally show that the labor share has declined, and Japan is not an exception. However, some studies suggest that when accounting for the treatment of self-employed or the treatment of intellectual property rights, the labor share in Japan and Europe remains stable (e.g., Gutiérrez and Piton, 2020; Koh *et al.*, 2020).

Several studies examining Japan's labor share have pointed to a decline in the labor share at the macro level (e.g., Fukao and Perugini, 2021; Haneda *et al.*, 2021; Fukunaga *et al.*, 2024). Meanwhile,

¹ Employee compensation in the National Accounts is deflated using the household final consumption expenditure deflator, resulting in a real growth rate of +0.1% per annum over the 30-year period from 1994 to 2024. The difference from the CPI (excluding imputed rent) growth rate (+0.5% per annum) over the same period stems from differences in index construction methods and coverage.

² Recent surveys on the labor share include Grossman and Oberfield (2022) and Karabarbounis (2024).

the Pension Subcommittee of the Social Security Council (2024) shows that while changes in the labor share have contributed relatively negatively to real wage growth in countries like the United States and Germany, the contribution of labor share changes in Japan is virtually zero. Aoki *et al.* (2023) indicate a reduction in firm markups and a strengthening of wage markdowns in Japan, while the labor share has remained stable. Higo (2023), who estimated Japan's labor share using the National Accounts and the Financial Statements Statistics of Corporations by Industry (Ministry of Finance), concluded that the primary causes of the decline in the labor share at the macro level were the mixed income of self-employed and the reduction in compensation for business owners of small and medium-sized enterprises (SMEs). Wage decreases for employees contributed little to the decline in the labor share. In short, the movement of the labor share at the macro level is sensitive to its definition and method of measurement.

This study analyzes the relationship between productivity and real wages, focusing on comparisons between aggregate and firm levels, rather than the labor share of income, which is significantly influenced by definition and measurement. The rest of this paper is structured as follows. Section 2 briefly surveys literature. Section 3 explains the firm-level data and method of analysis employed in this study. Section 4, after confirming the divergence between labor productivity and real wages using macro data from the National Accounts, reports results based on firm-level data. Finally, Section 5 summarizes the conclusions with policy implications.

2. Literature review

Recently, studies on the decoupling of productivity and wages have been emerging. For example, Pessoa and Van Reenen (2013) and Teichgraber and Van Reenen (2021) argue that while no decoupling between productivity and mean wages has occurred in the UK and US, a significant gap exists between the growth rates of median wages (the 50th percentile of the wage distribution) and labor productivity, indicating decoupling in that sense. Schwellnus *et al.* (2017) compare labor productivity growth rates with median real wage growth rates using data from 24 OECD countries since 1995. They found that wage growth rates have fallen below labor productivity growth rates, and that the divergence between the two stems from the widening wage inequality (median wage/average wage). Japan is included among the 24 OECD countries, and in Japan too, the ratio of median wages to average wages is declining. Meloni and Stirati (2023) report findings from an analysis using panel data of 22 OECD countries indicating a decoupling between labor productivity and mean wages. Chun *et al.* (2024) analyzed the factors behind real wage stagnation in Japan and South Korea using industry-level data. They concluded that the slowdown in labor productivity growth since 1995 is the primary cause of stagnant real wage growth, and that the divergence between productivity and real wage growth is

attributable to deteriorating terms of trade, observable as the gap between GDP deflator and CPI inflation rates. In summary, while a decoupling between median wages and productivity is evident, findings regarding mean wages and productivity are mixed.

The labor share in national income is also one potential factor driving the divergence between productivity and wages. Numerous studies examine the trend decline in the labor share and its causes, including biased technological change such as IT and robotics (e.g., Karabarbounis and Neiman, 2014; Bergholt *et al.*, 2022), increased markups and markdowns due to rising market concentration (e.g., Autor *et al.*, 2020; Barkai, 2020; Deb *et al.*, 2022), declining bargaining power of labor unions and easing of employment protection legislation (e.g., Ciminelli *et al.*, 2022), globalization (e.g., Böckerman and Maliranta, 2012; Elsby *et al.*, 2013; Dao *et al.*, 2020), and reductions in corporate tax rates (e.g., Kaymak and Schott, 2023). However, there is no consensus on the primary cause, and the survey by Grossman and Oberfield (2022) argue that many studies present different sides of the same coin.

These studies seek to find factors behind the decline in the labor share, but some research cast doubt on the decline in the labor share itself (e.g., Cette *et al.*, 2020; Gutiérrez and Piton, 2020; Koh *et al.*, 2020). Cette *et al.* (2020) state that, based on an analysis covering 10 advanced countries, considering starting periods for the analysis, accounting for self-employment, and accounting for residential real estate income, the labor share in the business sector appears not to be a general downward or upward trend. Gutiérrez and Piton (2020) report that international comparisons of the labor share are affected by differences in how SNA data treat mixed income from self-employment and housing across countries. When measuring a harmonized labor share, they find it is stable or rising in most advanced economies except the United States and Canada. Koh *et al.* (2020) point out that changes in the treatment (capitalization) of intellectual property rights in SNA explain the decline in the macro-level labor share in major advanced economies, including the United States. To summarize, when analyzing international comparisons and time-series trends in the labor share, it is necessary to understand these various measurement issues.

This study is closely related to past studies that use microdata from firms or establishments to decompose changes in the aggregate-level labor share (e.g., Kyrya and Maliranta, 2008; Böckerman and Maliranta, 2012; Autor *et al.*, 2020; Kehrig and Vincent, 2021; Gouin-Bonenfant, 2022; Bellocchi *et al.*, 2023; Guschanski and Onaran, 2025). Many studies have examined how changes in market structures such as firm entry and exit, or market share redistribution affect aggregate-level productivity. These studies apply the decomposition methods to the labor share. For example, if the share of small firms with high labor shares and low productivity shrinks, and the share of large firms with low labor shares and high productivity expands, the labor share at the macro-level will decline. Nearly all studies indicate that changes in the composition of firms or establishments contribute to a decline in the aggregate labor share. While it is generally agreed that market share reallocation is important for

macroeconomic productivity growth, the studies mentioned above suggest that such market mechanisms may lead to a decline in the labor share.

Recent studies examining trends in Japan's labor share and their determinants include Fukao and Perugini (2021), Haneda *et al.* (2021), Aoki *et al.* (2023), and Higo (2023). Fukao and Perugini (2021) analyze the factors determining Japan's long-term labor share using industry-level data (the Japan Industrial Productivity Database). Unlike in the United States, the authors argue that the labor share has declined significantly in the service sector, with the low-knowledge-intensity market services sector being the primary cause of Japan's labor share decline over the past 40 years. Haneda *et al.* (2021) report that while the introduction of industrial robots and the increase in non-regular employment have reduced the labor share, no clear relationship is observed between globalization and the labor share. They also find that an increase in R&D intensity is associated with a higher labor share. Furthermore, based on data from the Basic Survey of Japanese Business Structure and Activities (BSJBSA) for FY2006–FY2015, they decompose the factors behind changes in the labor share using the decomposition method of Foster *et al.* (2001). They indicate that within effect and exit effect contribute positively, while covariance term and entry effect contribute negatively to the labor share. Aoki *et al.* (2023) construct a large-scale dataset of Japanese firms (FY2005–FY2020) to analyze price and wage setting behavior. They indicate that the labor share has remained stable as a result from reduced price markups and increased wage markdowns.

Higo (2023), who estimated Japan's labor share using the National Accounts and the Financial Statements Statistics of Corporations by Industry, states that since the 1990s, there has been a clear downward trend in the labor share both for the economy as a whole and for the corporate sector. However, the primary causes of this decline are attributable to reductions in the income of self-employed (mixed income) and the compensation for business owners of SMEs. He finds that decreases in wages and bonuses for employees have contributed little to the decline in the labor share at the macro-level. When analyzing the labor share, we should be careful that significant differences can arise depending on the definition and measurement method used.

Against the background, this study avoids delving deeply into the labor share, which is significantly influenced by definitions and measurement and prone to outliers at the firm-level. Instead, we analyze the relationship between productivity and wages based on microdata from Japanese firms, focusing on comparisons between the aggregate and firm levels. The contributions of this study are its focus on Japan, where the divergence between productivity and real wages is particularly pronounced, and the decomposition of real wages rather than the labor share.

3. Data and methodology

This study analyzes the relationship between productivity and wages at the firm-level using microdata from the Basic Survey of Japanese Business Structure and Activities (BSJBSA) for FY2010–FY2023). The analysis focuses on 1) Comparing aggregated values (weighted averages) with simple averages, 2) decomposition of changes in real wages at the aggregate level into within effect and covariance effects by the dynamic Olley-Pakes decomposition method.

The BSJBSA is a fundamental statistical survey based on the Statistics Act and is widely used in empirical research at the firm-level in Japan. It covers approximately 30,000 firms belonging to the mining, manufacturing, wholesale/retail/restaurant, and certain service industries with 50 or more regular employees and capital of 30 million yen or more. Since the survey assigns permanent firm identification numbers to the surveyed firms, panel data can be easily constructed. The survey covers a wide range of items, including basic financial information such as capital, number of employees, sales, operating expenses, total wages, and fixed assets, enabling to calculate firm-level productivity and mean wages.

Since the BSJBSA lacks data on firm-level working hours, when measuring productivity, it is usual to employ the Monthly Labour Survey's industry-specific working hours. However, this approach has a significant limitation: it cannot capture differences in working hours between firms within the same industry. In this study, the mean wage at the firm-level is calculated as the total payroll (including bonuses) plus welfare expenses (including retirement benefits), divided by the number of full-time equivalent employees at that firm. The BSJBSA surveys the number of employees other than regular employees (such as part-time employees and temporary workers) in full-time equivalent terms. Adding this figure to the number of regular employees yields the total number of employees in full-time equivalent terms.³ However, when estimating the relationship between productivity (labor productivity, total factor productivity (TFP)) and wages, hourly wages are used to be consistent with productivity measurement.⁴

4. Results

4.1. Productivity and real wages at the macro-level

³ The 2023 survey (based on FY2022 figures) changed the classification from full-time and part-time to indefinite-term employees and fixed-term employees, resulting in discontinuity. However, in this study, the number of employees converted to indefinite-term equivalents is used for FY2022 and FY2023.

⁴ The correlation coefficient between labor input (total working hours) using industry-specific working hours from the Monthly Labour Survey and the full-time equivalent number of employees exceeds 0.99, meaning the choice of which to use does not significantly alter the results.

Before analyzing firm-level data, we briefly overview the trends in Japan's macro-level labor productivity and real wages using data from the National Accounts. Calculations based on the published data from National Accounts from 1994 to 2023 (calendar years) show that the growth rates of nominal labor productivity and compensation of employees are the same at an annual rate of +0.9% (see **Table 2**). Meanwhile, real labor productivity increased at an annual rate of +1.2%, and real compensation per employee increased at an annual rate of +0.8%. From 1994 to 2023, the GDP deflator (annual rate: -0.3%) and the deflator applied to compensation of employees (the household final consumption expenditure deflator, annual rate: +0.1%) are diverging (see **Table 1** presented before). It is certain that deteriorating terms of trade have contributed to the stagnation of real wages relative to real productivity growth.⁵

A comparison of the real labor productivity growth rate and the real compensation per employee growth rate by industry, using industry-specific data from the National Accounts, reveals a significant divergence between the two for some industries (see **Table 3**). The machinery industry, particularly the electronic components and devices, and information and communications equipment manufacturing sectors, has seen remarkably high real productivity growth rates, largely due to significant price declines for (quality-adjusted) products. However, since real wage growth rates in these sectors do not differ significantly from other industries, the gap between productivity and real wages is extremely large. On a nominal basis, such a large gap is not observed, indicating that differences in the value-added deflator across industries play a major role. In contrast, sectors with low productivity growth rates—such as construction, transportation, and accommodation and food services—show the opposite gap, where real wage growth rates are higher than productivity growth. The result suggests that change in industrial structure where expansion of sectors with technological innovation significantly lowers goods and service prices, also plays a role to widen the gap between productivity growth rate and real wage growth rate at the macro-level.

4.2. The relationship between productivity and wage at the firm-level

Table 4 presents the results of simple estimates (OLS, FE) explaining mean wages at the firm-level using productivity (labor productivity, TFP) as explanatory variable. TFP is calculated nonparametrically using an index number method within three-digit industry classifications. Real wages are measured using the CPI (excluding imputed rent), but using the household final

⁵ The real wage index in the Monthly Labour Survey is adjusted for inflation using the CPI (excluding imputed rent). However, it has been pointed out that the CPI (excluding imputed rent) inflation rate is higher than the household final consumption expenditure deflator, leading to a tendency to underestimate real wage growth (Chun *et al.*, 2024).

consumption expenditure deflator instead yields results with little difference, including the size of the coefficients.

A clear positive relationship exists both in cross-sectional level regression and in growth regression (here, five-year growth rates). This holds true whether labor productivity or TFP is used as the explanatory variable: the relationship that higher (increasing) firm productivity correlates with higher (increasing) wages is robust. The relationships between nominal wages and nominal productivity, and between real wages and real productivity, are essentially the same. Of course, the estimation results do not indicate a causal relationship from productivity to wages: bidirectional mechanisms are possible.

Quantitatively, the elasticity of wages with respect to productivity is approximately 0.6 in all estimates. Whether labor productivity or TFP is used as the productivity measure, whether nominal or real, and whether OLS or FE estimation is employed, the elasticity remains nearly identical in magnitude, indicating an extremely robust relationship. The elasticity being below unity is likely because wage fluctuations are smaller than profit fluctuations, both during economic expansions and contractions.⁶

4.3. Trend in wages: aggregate value and simple average

Why is there a divergence at the macro- and micro-levels? At the macro-level, where the real productivity growth rate and the real wage growth rate are significantly divergent, while at the firm-level, real productivity and real wages are strongly correlated. The regression results above capture the average relationship at the firm-level. For example, if larger firms are not adjusting wages following productivity changes, this could lead to a divergence between productivity and wage movements at the weighted average ($\approx$ macro) level.

Figure 1 and **Table 5** show the movement of wages per full-time equivalent employee. The aggregate value (weighted average) is calculated as $\Sigma (\text{Total wages} + \text{Welfare expenses}) / \Sigma \text{Full-time equivalent employees}$. While the simple average of nominal wages shows a gradual increase (annual rate +0.26%), the aggregate value (weighted average) shows a slight decrease (annual rate -0.05%). In the case of real wages (see **Figure 2**), both are decreasing, but the rate of decrease for the aggregated value is greater than that for the simple average (simple average: -0.63%, aggregated value: -0.93%).

However, this calculation includes the impact of changes in the composition of sample firms—such as entries, exits, and firms moving above or below the 50-employee threshold of the BSJBSA—

⁶ Regarding the relationship between real productivity and real wages, differences in deflators due to terms-of-trade effects (productivity using sectoral GDP deflators, wages using CPI) could be a factor behind the elasticities below unity. However, since the difference in elasticity between nominal and real bases is small, this is unlikely to be the primary cause.

between the beginning (FY 2010) and end (FY 2023) of the period. In order to eliminate these confounding effect, focusing only on firms present in both years (referred to as “panel firms”) and removing outliers (samples with wage growth rates exceeding ± 3 standard deviations from the mean), the figures show (see **Table 5**) that nominal wages increased by a simple average of +0.66% and a weighted average of +0.16%, while real wages decreased by a simple average of -0.23% and a weighted average of -0.71% (all annualized).

In the case of aggregated values (weighted average), the wage growth rate is lower (or the decline rate is larger) than the simple average. This suggests that, apart from the entry and exit of firms from the sample of the BSJBSA, changes in the value-added share of surviving firms constitute a relatively important factor (contributing approximately 0.2% annually) creating differences between the firm-level and the macro-level. Of course, it should be reserved that the BSJBSA used here covers only firms with 50 or more regular employees and does not cover all industries, so it is not representative of the entire Japanese economy.

4.4. Dynamic decomposition of wage growth

To further explore the wage dynamics, we decompose changes in nominal and real wages over 13 years for panel firms existing in both FY2010 and FY2023. The mean wage for each firm is calculated as per-employee (full-time equivalent) figures. The dynamic Olley-Pakes decomposition (see Olley and Pakes, 1996; Melitz and Polanec, 2015; Autor *et al.*, 2020) is applied. The sample of BSJBSA is affected by changes in firm size or industry classification, making it unsuitable for entry-exit analysis. Therefore, this decomposition is simplified for the balanced panel firms, disregarding entry and exit.

Let W denote per-employee (full-time equivalent) wages, s_i denote the weight (value-added share) of firm i , and $\bar{W}$ denote the simple sample average. The dynamic Olley-Pakes decomposition is expressed as the following equation.

$$\Delta W = \Delta \bar{W} + \Delta [\sum (s_i - \bar{s})(W_i - \bar{W})]$$

The first term on the right-hand side represents the change in the simple average (within effect), while the second term represents the reallocation effect—the change in the covariance between firm size (value-added share) and mean wages. The covariance term becomes more positive as the positive correlation between a firm’s value-added share and mean wages increase. Therefore, dynamically, if the relationship between higher value-added share and higher mean wages strengthens, the covariance term contributes positively to aggregate-level wages; conversely, if it weakens, it contributes negatively.

According to the results for the decomposition of nominal wages, the within effect term contributes positively, while the covariance term contributes negatively (see **Figure 3**). On the other hand, in the decomposition of real wages, both the within term and the covariance term contribute negatively. The key point is that the negative covariance term indicates a weakening link between firms' value-added share and wages—firms that increased their value-added share during this period experienced lower wage growth rates.⁷ It is confirmed that not only wage changes at individual firms but also changes in market structure—specifically the redistribution of value-added shares—are influencing movements in aggregate real wages.

When applying the similar decomposition for TFP, the covariance term is significantly positive, exhibiting a pattern markedly different from wage dynamics (see **Figure 4**). In the case of productivity, a natural mechanism operates whereby firms with higher productivity growth rates gain a larger share of value added.

Why does the covariance term contribute negatively to the wage growth rate? In both FY2010 and FY2023, the covariance is positive, indicating a cross-sectional relationship where firms with higher value-added shares have higher wage levels. However, the covariance term contributes negatively as a result of the weakening relationship. In the decomposition of real wage changes, for example, the covariance was 0.309 in FY2010 and 0.245 in FY2023, resulting in a change in covariance of -0.064. To confirm the result, when performing a simple cross-sectional regression explaining mean wages (expressed in log) using value added (expressed in log) as explanatory variable, the coefficient for value added is positive, but the coefficient for FY2023 is smaller compared to FY2010 (see **Table 6**). This relationship shows little quantitative difference whether calculated in real or nominal terms, suggesting the deflator is unlikely to be an important factor. Furthermore, controlling for three-digit industry dummies yields similar results, indicating it is probably not due to industry-level factors.

Interpreting the above results, wages tend to increase more in firms with relatively smaller scale measured by added value, while wage growth was relatively smaller in larger firms. In relation to this point, **Figure 5** plots the wage gap among firm size classes based on published data from the Basic Survey on Wage Structure (Ministry of Health, Labour and Welfare). This figure shows the per-employee total compensation (regular wages + annual bonuses/12) for full-time workers (all industries, all genders, all educational backgrounds, all ages) in medium-sized firms (100-999 regular employees) and small firms (10-99 regular employees), calculated relative to large firms (1,000 or more regular employees). The Basic Survey on Wage Structure changed its estimation method in 2020. Therefore, figures for 2019 and earlier use data from “past periods estimated using the same method,” which are published as reference series. This survey also confirms that wage disparities between firms of

⁷ This decomposition may yield different results depending on the sample period, but even when measured over a 10-year interval such as FY2013 to FY2023, the result of a negative contribution of the covariance term remains unchanged.

different sizes have continued to narrow in recent years.⁸ Although there is a difference in that firm size is measured by the number of employees rather than value-added, this is consistent with the negative contribution of the covariance term reported above.

The reasons and mechanisms behind the narrowing wage gap between large and small firms remain speculative. However, factors such as the continuous increase in the minimum wage and policy support for wage increase in small and medium-sized firms may raise wages in relatively smaller firms disproportionately. At the same time, several factors may be contributing to depressing wages in large firms: seniority-based wage curves are flattening and tenure is shortening among large firms; large firms are gaining greater monopsony power in the labor market⁹; and larger firms are increasingly prioritizing non-wage amenities for workers—such as flexible work arrangements and employment stability—over wage increases.

Additionally, if firms with higher wage levels at the beginning of the period exhibit lower growth rates in real value added, the covariance term could contribute negatively. Indeed, a simple OLS estimation using mean wages in FY2010 as the explanatory variable and the real change rate in value-added from FY2010 to FY2023 as the dependent variable shows that the coefficient for mean wages is negative at a high level of statistical significance (see **Table 7**). This holds even after controlling for industries at the three-digit classification. The relationship where firms with higher (lower) mean wages exhibit lower (higher) value-added growth rates is somewhat unexpected, but it may stem from high labor costs impacting competitiveness in the market.

5. Conclusion

This study analyzes the relationship between productivity and wages using microdata from Japanese firms (FY2010–FY2023). Beyond the widely accepted impact of deteriorating terms of trade on the divergence between productivity growth and real wage growth observed at the macro-level, the primary focus is on how firm-level dynamics contribute to this gap. Key findings are as follows.

First, firms with high productivity (growth rate) have high wages (growth rate), meaning that productivity and wages are not decoupled at the firm-level.

Second, there is a difference in the movements between the simple average and the aggregate value

⁸ *The Annual Report on the Japanese Economy and Public Finance (2025 Edition)* (Cabinet Office, 2025) indicates that the disparity in regular wages among full-time workers across different firm sizes, as measured by the Basic Survey on Wage Structure, has narrowed, arguing that wage increases in small and medium-sized enterprises have progressed.

⁹ Monopsony power in the labor market has been confirmed by many empirical studies (see Azar and Marinescu, 2024, for a survey). Examples of research suggesting the existence of monopsony power in Japan's labor market include Okudaira *et al.* (2019) and Aoki *et al.* (2023).

(weighted average) of mean wages, with the aggregate value showing a larger downward trend in real wages. This suggests that, in addition to individual firms' wage-setting, firm entry and exit, and reallocation of value-added shares, are contributing factors weakening the link between productivity and wages at the macro-level.

Third, according to the dynamic Olley-Pakes decomposition, the covariance term exerts a downward pressure on real wage changes, consistent with the above observation. In contrast, productivity dynamics show the covariance term significantly boosting aggregate-level productivity, differing from wage dynamics. The finding that the covariance term negatively contributes to aggregate wage growth reflects the pattern where relatively smaller firms experience higher wage growth rates, while larger firms exhibit relatively lower wage growth rates. Factors such as recent minimum wage increases and the strengthening monopsony power of large firms may be related to this phenomenon. However, elucidating this mechanism is outside the scope of this study and should be addressed in future research.

It is difficult to draw strong policy implications solely from these results, but it is undeniable that productivity growth is essential for sustained real wage increases. However, policies that seek to promote productivity growth through reallocation may not necessarily increase real wages. Regarding the measurement of real wages, figures adjusted for price fluctuations using the CPI are often employed, making them suitable for capturing high-frequency movements such as monthly changes. However, for observing medium- to long-term changes in real wages, using the household final consumption deflator is more appropriate than the CPI. In this case, the divergence between productivity growth and real wage growth becomes somewhat smaller.

Finally, it should be reserved that the BSJBSA used in this study, although a reliable large-scale firm panel data, do not represent of the whole Japanese economy.

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Table 1. Comparison of price indices.

	1994-2023CY	1994-2024CY
CPI (excluding imputed rent)	0.4%	0.5%
GDP deflator	-0.3%	-0.2%
Deflator applied to compensation of employees	0.1%	0.1%

Note: The percentages are annualized figure.

Table 2. Annual growth rates of labor productivity and wages.

	Annual rate
Labor productivity growth (nominal)	0.9%
Wage growth (nominal)	0.9%
Labor productivity growth (real)	1.2%
Wage growth (real)	0.8%

Notes: Calculated from the National Accounts, CY1994-CY2023. Labor productivity and wage (compensation) are hourly figures.

Table 3. Annual labor productivity and real wage growth rate by industry.

Industry	(1) Labor productivity	(2) Real wage	(3) (2)-(1)
1. Agriculture, forestry and fishing	1.9%	1.9%	0.0%
2. Mining	-1.2%	1.0%	2.1%
3. Manufacturing	2.5%	0.8%	-1.7%
(1) Food	-0.2%	0.8%	0.9%
(2) Textile products	0.3%	1.2%	0.9%
(3) Pulp, paper, paper products	0.4%	0.7%	0.4%
(4) Chemistry	2.1%	0.3%	-1.8%
(5) Petroleum and coal products	-1.3%	0.1%	1.4%
(6) Ceramic and Stone Products	0.8%	0.5%	-0.2%
(7) Primary metal	1.0%	0.3%	-0.7%
(8) Metal products	0.2%	0.2%	0.0%
(9) General-purpose, production, and industrial machinery	1.8%	0.7%	-1.1%
(10) Electronic Components and Devices	11.5%	1.8%	-9.7%
(11) Electric machinery	3.7%	0.6%	-3.1%
(12) Information and Communication Equipment	8.9%	0.5%	-8.4%
(13) Transport machinery	1.4%	0.8%	-0.6%
(14) Other manufacturing industry (including printing)	1.4%	0.7%	-0.7%
4. Electricity, gas and water supply, waste management service	0.6%	-0.7%	-1.3%
5. Construction	0.2%	0.8%	0.6%
6. Wholesale and retail	1.2%	0.7%	-0.5%
7. Transport and postal service	-0.2%	0.3%	0.4%
8. Accommodation and food service activities	-0.7%	-0.4%	0.3%
9. Information and communications	1.5%	0.6%	-1.0%
10. Finance and insurance	1.6%	0.4%	-1.1%
11. Real estate	0.4%	1.1%	0.7%
12. Professional, scientific and technical activities	1.4%	0.8%	-0.6%
13. Public administration	0.9%	0.4%	-0.5%
14. Education	1.0%	0.7%	-0.4%
15. Human health and social work activities	0.0%	0.0%	0.0%
16. Other service activities	-1.0%	0.3%	1.3%

Notes: Calculated from the National Accounts, CY1994-CY2023. Labor productivity and compensation are per hour.

Table 4. Wage elasticity with respect to productivity.

A. Level		(1) Nominal wage	(2) Real wage
Labor productivity (level)	OLS	0.616 *** (0.002)	0.604 *** (0.002)
	FE	0.648 *** (0.001)	0.623 *** (0.001)
	OLS	0.549 *** (0.002)	0.546 *** (0.002)
	FE	0.585 *** (0.001)	0.571 *** (0.001)
B. 5-year growth		(1) Nominal wage	(2) Real wage
Labor productivity growth	OLS	0.635 *** (0.005)	0.612 *** (0.005)
	FE	0.640 *** (0.002)	0.626 *** (0.002)
	OLS	0.566 *** (0.005)	0.558 *** (0.005)
	FE	0.573 *** (0.002)	0.562 *** (0.002)

Notes: OLS and fixed-effects (FE) estimations using panel data of the BSJBSA, FY2010-FY2023.

***: $p < 0.01$.

Table 5. Change in nominal and real wages.

	Nominal wage		Real wage	
	All firms	Panel firms	All firms	Panel firms
Simple average	0.26%	0.66%	-0.63%	-0.23%
Weighted average	-0.05%	0.16%	-0.93%	-0.71%
Gap	-0.30%	-0.50%	-0.30%	-0.49%

Notes: Annual rate for FY2010-FY2023. Samples where the wage growth rate exceeds the mean ± 3 standard deviations are removed as outliers.

Table 6. Relationship between value-added and mean wage.

	(1) 2010FY	(2) 2023FY	(3) 2010FY	(4) 2023FY
ln Value-added	0.1272 *** (0.0027)	0.1085 *** (0.0026)	0.1295 *** (0.0025)	0.1055 *** (0.0023)
3-digit industry dummies	no	no	yes	yes
Nobs.	15,568	15,568	15,568	15,568
R ²	0.1563	0.1333	0.3507	0.3781

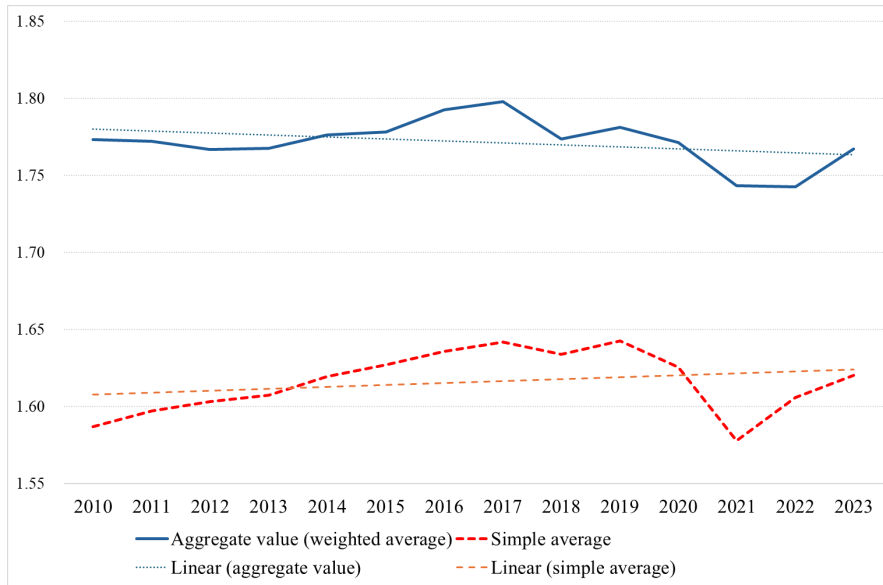
Notes: OLS estimations with robust standard errors in parentheses. ***: p<0.01. The dependent variable is the mean wages (expressed in log).

Table 7. Mean wage and real value-added growth.

	(1)	(2)
ln Mean wage (FY2010)	-0.1251 *** (0.0144)	-0.2665 *** (0.0152)
3-digit industry dummies	no	yes
Nobs.	15,568	15,568
R ²	0.0065	0.1650

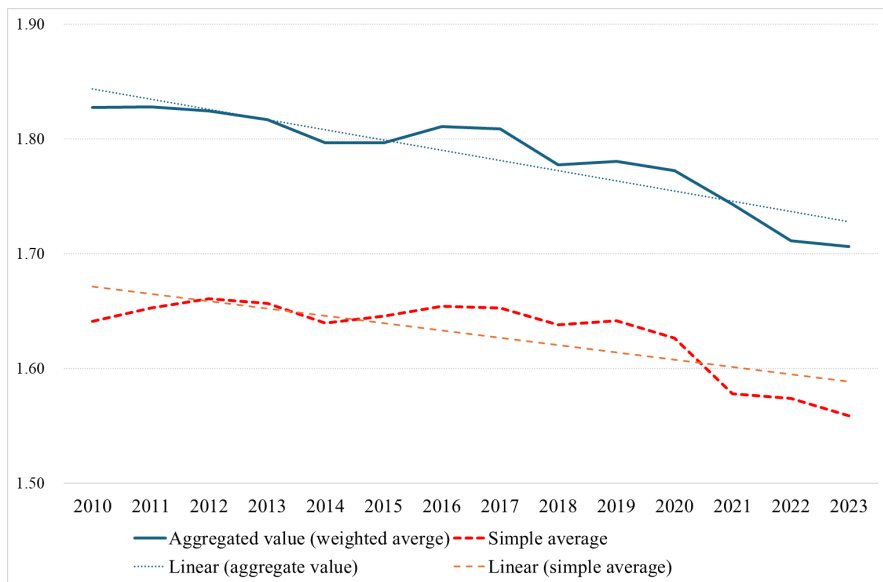
Notes: OLS estimations with robust standard errors in parentheses. ***: p<0.01. The dependent variable is Δ real value-added (expressed in log, FY2010-FY2023).

Figure 1. Trends in mean wage (nominal).



Notes: Nominal mean wages per full-time equivalent employee calculated from the BSJBSA. Horizontal axis indicates fiscal year.

Figure 2. Trends in mean wage (real).



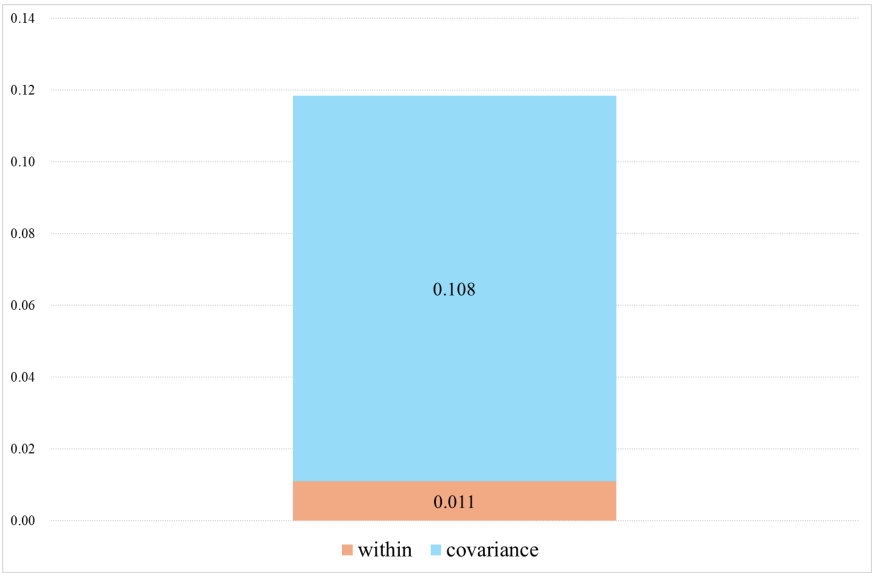
Notes: Real mean wages per full-time equivalent employee calculated from the BSJBSA. Horizontal axis indicates fiscal year.

Figure 3. Dynamic Olley-Pakes decomposition of mean wage.



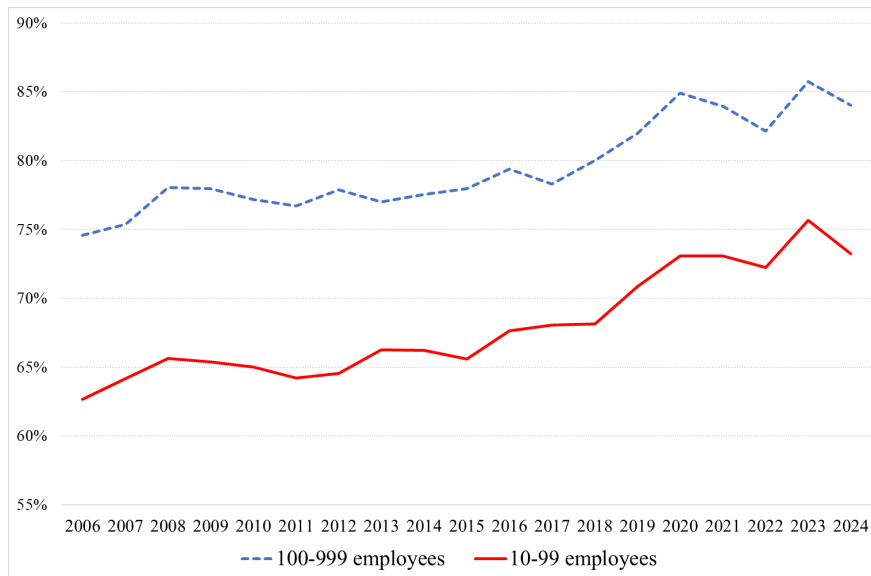
Notes: The figures (expressed in log) are changes between FY2010 and FY2023. Samples where the wage growth rate exceeds the mean ± 3 standard deviations are removed as outliers.

Figure 4. Dynamic Olley-Pakes decomposition of TFP.



Notes: The figures (expressed in log) are changes between FY2010 and FY2023. Samples where the wage growth rate exceeds the mean ± 3 standard deviations are removed as outliers.

Figure 5. Wage gap among firm size classes (Basic Survey on Wage Structure).



Notes: The figure is depicted from the Basic Survey on Wage Structure (Ministry of Health, Labour and Welfare) data for total wages of full-time employees. Firms with 1,000 or more employees are set as 100%. Total wages = Regularly paid wages + Annual bonuses and other special wages ÷ 12. For years prior to 2019, historical series estimated using the same method as 2020 are used.