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Market Power and Labor Shares : Evidence from Japanese Firm-Level Data

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Market Power and Labor Shares: Evidence from Japanese Firm-Level Data*

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Abstract

We analyze the association of market power with labor share in Japan. We first estimate markups as a proxy of market power and present the evidence on the patterns of markups. We find that aggregate markups were stable. This suggests no superstar firm effects, which Autor et al. (2020) find in the United States. While markups are stable at the aggregate level, we present evidence on the microeconomic dynamics of markups. We find the association of markups with firms' demographics: markups are negatively associated with firm age and size; thus, markups are higher for young and small firms. We also find the patterns of markups at the semi-macro level: markups are higher for nonmanufacturing industries than manufacturing industries. We then explore the macroeconomic implications of the patterns of markups. We show that the rise in market power *decreases* the labor share and *increases* the capital share.

JEL Classification: D22; D24; D40; E31

Keywords: capital share; markup; labor share; market power

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1 Introduction

A well-functioning economy requires vigorous competition between firms. The lack of competition enables firms to gain power, charge high prices, and lower consumer well-being. Additionally, market power decreases the demand for labor and dampens investment in capital. It distorts the distribution of economic rents and discourages business dynamics and innovation. This has ramifications for policy, from antitrust to monetary policy and income redistribution.

Despite the significance of market power in economics, less is known about its systematic patterns for the Japanese economy because measuring market power is difficult (De Loecker et al., 2020). To measure market power, we follow the approach proposed by De Loecker et al. (2020) and estimate markups as a proxy of market power.

Markups are the most common measure of whether firms can price their goods above their marginal cost. We first estimate markups and present empirical evidence for them. Based on Japanese firm-level data, we find that aggregate markups are stable. It suggests no superstar firm effects in Japan, which Autor et al. (2020) find in the United States. Although markups are stable at the aggregate level, we present evidence on the microeconomic dynamics of markups. We find the association of markups with firms' demographics: markups are negatively associated with firm age and size. Thus, markups are higher for young or small firms. We also find the patterns of markups at the semi-macro level: markups are higher for nonmanufacturing industries than for manufacturing industries. We then discuss the macroeconomic implications of the patterns of markups. Furthermore, we demonstrate that the increase in market power entails a decline in labor share and an increase in capital share.

This study contributes to the existing literature by providing evidence on the microeconomic and macroeconomic dynamics of market power. First, as a proxy of market power, we document the patterns of markups. For the United States, De Loecker et al. (2020) present that markups start to rise, and the increase is driven primarily by the upper tail of the markup distribution, which is consistent with the superstar firm effects that Autor et al. (2020) find. For Japan, De Loecker and Eeckhout (2018) find that markups in 2000 were flat. Cabinet Office, Government of Japan (2023) and Aoki et al. (2023) report similar evidence with De Loecker and Eeckhout (2018).[1][2] We demonstrate no superstar firm effects in Japan and provide the new facts that markups are associated with firms' demographics. Our evidence suggests that as is consistent with Porter and Sakakibara

[1] Ariga (1999) document that the distribution of markups in Japan is right skewed.

[2] Nishioka and Tanaka (2019) and Kondo (2020) estimate Japanese firms' markups while they focus on manufacturing industries and provide no evidence for nonmanufacturing industries. Furthermore, Nakamura and Ohashi (2019) and Nakamura and Ohashi (2022) estimate markups to examine the relationship between a firm's markup and its firm-to-firm transaction status.

(2006), competitiveness in Japan is fierce.[3]

Second, this study provides evidence on the firm's life cycle. The literature has explored whether firm age affects its performance and creativity for innovation. Evans (1987) demonstrates that firm age and size are negatively related to its growth, while Acemoglu et al. (2022) show that firm age is negatively associated with innovation quality, suggesting that younger firms are more creative. The literature also examines the relationship between the CEO's age and the firm's performance.[4] Using data from the United States, Cline and Yore (2016) find that CEO age is significantly negatively related to firm value and performance. Using data from European countries, Belenzon et al. (2019), Cline and Yore (2016), Navaretti et al. (2014), and Coad et al. (2016) conclude that as a CEO ages, the firm experiences lower investment, lower sales growth, and lower profitability. However, in the Japanese context, evidence on the effects of firm age on its value and performance is scant. Yasuda (2005) finds that firm age and size negatively affect firm growth. He focuses on manufacturing industries and provides no evidence for nonmanufacturing industries.[5] We contribute to the existing literature by adding evidence on the relationship between firm age and its performance.

Third, this study provides macroeconomic implications for the relationship between markups and labor share. Researchers have analyzed market power as a determinant of the secular declines in labor shares. Yeh et al. (2022) examine whether the U.S. labor market is perfectly competitive and demonstrates that the increase in market power decreases labor share. Using data from developed countries, Akcigit et al. (2021) find that the rise in the employer market power has adverse effects on economic growth, investment, innovation, and labor share. Several studies in the Japanese context report that the labor share was stable (Fukao and Perugini, 2021; Hirakata and Koike, 2018) while evidence on the association of markups with the labor share is scant, except for Aoki et al. (2023) and Cabinet Office, Government of Japan (2023). We measure the firm-level markups to examine the dynamics between the firm's markup and the labor share. We provide micro-level evidence on the association of markups with labor shares and discuss its macroeconomic implications.

In the remainder of this paper, Section 2 describes the Japanese firm-level data we use. Section 3 presents the estimation strategy for markups. Then, Section 4 provides the evidence on the patterns of markups, and Section 5 shows the microeconomic dynamics between markups and the labor share. Finally, Section 6 discusses the macroeconomic implications of our results, and Section 7

[3] Sakakibara and Porter (2006) point out that domestic competition in Japan is positively correlated with performance in the trade sector.

[4] Focusing on the career concerns of the young CEO, Li et al. (2017) demonstrate that younger CEOs are more likely to enter new lines of business and exit existing ones. Using auction records, Galenson and Weinberg (2000) demonstrate that the relationship between art prices and ages is U-shaped.

[5] In the literature on banking, Sakai et al. (2010) examine firm age and the evolution of borrowing costs.

concludes.

2 Data

We use panel data between 2008 and 2020 from the Basic Survey of Japanese Business Structure and Activities conducted by the Ministry of Economy, Trade and Industry (METI). The survey aims to clarify the business activities of Japanese firms to obtain basic data for business-related policy-making by METI. The survey was launched in 1991 as an annual survey to obtain a collective and quantitative understanding of the actual conditions of diversification, globalization, and internationalization of Japanese firms. It provides basic information on Japanese enterprises in terms of financial status, enterprise composition, R&D activities, IT use, and foreign direct investment. The survey is a mail/online survey based on self-declaration survey forms given to parent companies. The number of sample firms is greater than 25,000 each year.

This survey focuses on companies with 50 or more employees; companies whose paid-up capital or investment fund is over 30 million yen; companies whose operation falls under the mining, manufacturing, wholesale and retail trade, eating and drinking places, and other industries such as electricity and gas service, information service, etc. The companies covered by the survey are engaged in one of the following categories based on the Japan Standard Industrial Classification: (1) Division-C: Mining and Quarrying of Stone and Gravel; (2) Division-E: Manufacturing; (3) Division-F: Electricity, Gas, Heat Supply and Water; (4) Division-G: Information and Communications; (5) Division-I: Wholesale and Retail Trade; (6) Division-J: Finance and Insurance; (7) Division-K: Real Estate and Goods Rental and Leasing; (8) Division-L: Scientific Research, Professional and Technical Services; (9) Division-M: Accommodation, Eating and Drinking Services; (10) Division-N: Living-Related and Personal Services and Amusement Services; (11) Division-O: Education, Learning Support; and (12) Division-R: Services, not elsewhere classified. We classify Divisions C through F and Divisions F through R as the manufacturing and nonmanufacturing industries, respectively.

3 Estimating markups

Following the so-called production function approach proposed by De Loecker et al. (2020), we estimate markups at the firm level. Consider N firms ($i = 1, \ldots, N$) in the economy. Each firm's productivity Ω_{it} and production technology $Q_{it}(\cdot)$ are heterogeneous. Assume that at time t, firm i

minimizes its costs;

$$Q_{it} = Q_{it}(\Omega_{it}, \boldsymbol{V_{it}}, K_{it}),$$

where $\boldsymbol{V} = (V^1, \ldots, V^J)$ is the vector of variable costs of labor, intermediate input goods, and materials for production. K_{it} indicates the capital stock. Ω_{it} is productivity. We assume that variable costs would adjust immediately in one year, but capital takes longer to adjust. We use the cost of sales as an aggregate rather than individual variable costs. We consider the following Lagrangian objective function for cost minimization in a firm:

$$\mathcal{L}(V_{it}, K_{it}, \lambda_{it}) = P_{it}^V V_{it} + r_{it} K_{it} + F_{it} - \lambda_{it}(Q(\cdot) - \bar{Q}_{it}),$$

where P^V is the price of variable costs, r is the cost of using capital, F_{it} is the fixed cost, $Q(\cdot)$ is the production technology, and λ is the Lagrange multiplier, respectively. Here, it is assumed that the prices of variable costs are given. The first-order condition with respect to variable costs V is as follows:

$$\frac{\partial \mathcal{L}_{it}}{\partial V_{it}} = P_{it}^V - \lambda_{it} \frac{\partial Q(\cdot)}{\partial V_{it}} = 0.$$

By multiplying all terms by $\frac{V_{it}}{Q_{it}}$, we obtain the production elasticity of variable cost V:

$$\theta_{it}^v \equiv \frac{\partial Q(\cdot)}{\partial V_{it}} \frac{V_{it}}{Q_{it}} = \frac{1}{\lambda_{it}} \frac{P_{it}^V V_{it}}{Q_{it}}.$$

The Lagrange multiplier λ is a measure of marginal cost, and if the markup is defined as the ratio of production price P_{it} to marginal cost $\left(\mu = \frac{P}{\lambda}\right)$, then the markup can be derived as:

$$\mu_{it} = \theta_{it}^v \frac{P_{it} Q_{it}}{P_{it}^V V_{it}}. \tag{1}$$

We benefit from the production function approach because Equation (1) allows us to estimate markups directly. The production function approach does not require setting up a model for each firm and imposing elasticities of substitution with respect to other products or returns to scale.[6]

[6]The estimation of the output elasticity θ_{it}^v is discussed in De Loecker et al. (2020). See De Loecker et al. (2020) for more details.

4 Markups at the firm level

Using the firm-level markups we estimated, we present five facts about the evolution of the distribution and the patterns of markups.[7]

First, we report the average markup. We calculate the average markup as a weighted average by revenue. Then, we use the share of revenue as the weight. Figure 1 shows the evolution of our baseline measure of average markups. Throughout the sample period, the weighted average and median markups have been stable at slightly above 1.0. Aggregate markups are close to one. The evolution of average markups is partly similar to that of the United States. De Loecker et al. (2020) document that the median of markups in the United States did not change, while the weighted average began to increase to 61% in 2016. We confirm the stability of markups when focusing on markups at the industry level. Figure 2 shows that the evolution of average markups at the industry level was stable from 1.0 to 1.2; while markups declined in Panel (5) Transportation and Postal Services and Panel (7) Accommodation, Food and Drink Services, they are stable around 1.0 or 1.1 in the other industries.

Second, we present the evidence on the characteristics of the distribution. Our estimation strategy enables us to obtain markups for each firm. It reflects the underlying distributional characteristics of markups. A key finding is a right-skewed distribution, as shown in Figure 3. The figure plots the kernel density of the unweighted markups for 2009 and 2019 and the percentiles of the markup distribution. We find that the upper tail is long, whereas the variance is stable. As the kernel density does not consider the weights, we then plot the percentile markup distribution. We rank the firms by markup to obtain the percentiles, where we weigh each firm by its market share in the entire sample. This makes the percentiles directly comparable to our share-weighted average. The ranking is updated each year; therefore, the firms at the top may be different for each year. Figure 4 shows that all percentiles are invariant over time, while the upper tail is long. This confirms a right-skewed distribution and no change in average markups at any percentile over the last decade in Japan.

Third, we find that markups are negatively correlated with firm age. Figure 5 shows that markups are lower with "old" firms than with the "young." While the inverse U-shaped curve below 40 years of firm age, the relationship between markups and firm age is basically negative. The relationship is statistically significant. Table 1 presents the result of regressing markups on firm age. It suggests that an increase in age by 10% leads to a significant decrease in markups by 0.2%. Columns (3) and (4) in the table show that the negative association is robust when the sample

[7] We check the robustness of the five facts using surveys from the Financial Statements Statistics of Corporations and financial statements of the listed firms from Nikkei NEEDS. However, we do not report the evidence to save space.

is split into manufacturing and nonmanufacturing industries.

Fourth, we find that markups are negatively correlated with firm size. We use revenue as a proxy for firm size and draw a scatterplot. Figure 6 shows that markups are lower for large firm sizes than for small firm sizes. The negative association is robust when the sample is split into manufacturing and nonmanufacturing industries. We demonstrate the negative relationship in manufacturing and nonmanufacturing industries by the circle and triangle points, respectively. The relationship is statistically significant. Table 1 presents the result of regressing markups on firm size. It suggests that an increase in firm size by 10% leads to a significant decrease in markups by 0.5%. Columns (3) and (4) in the table show that the negative association is robust when the sample is split into manufacturing and nonmanufacturing industries.

Fifth, we find that markups are higher in nonmanufacturing industries than in manufacturing industries, as shown in Figure 6. Panels (1) and (2) in Figure 2 show the average markups in manufacturing and nonmanufacturing industries, respectively. The panels suggest higher markups in nonmanufacturing industries, approximately by 0.15 points, than in manufacturing industries.[8]

5 Markups and labor shares

Thus far, we have documented the time series and cross-sectional evolution of markups. We now discuss the microeconomic dynamics and macroeconomic implications of the relationship between markups and labor share.

In our setup, the change in markups impacts the change in the labor share; they are *negatively* correlated. Rewriting the first-order condition (1) where $V = L$, $P^V = w$, and $\theta^V = \theta^L$, the output elasticity of labor, the labor share satisfies

$$\frac{w_t L_{it}}{P_t Q_{it}} = \frac{\theta^L_{it}}{\mu_{it}}.$$

Profit maximization by individual firms implies that the labor share is inversely proportional to the markup. Moreover, the negative relationship is a natural consequence of our setting. It follows immediately from the firm's optimization decision that high markups necessarily lead to lower expenditure on inputs such as labor. In our setup, the rise in markups leads to a decrease in the labor share.

To examine the association of firm-level markups with labor share, we plot it graphically.[9] The

[8] We confirm that markups are significantly higher in nonmanufacturing industries than manufacturing industries by regressing markups on industry dummies. However, we do not report the result to save space.

[9] We compute the firm-level labor share. Our definition is the ratio of the total compensation of employees to the

top panel in Figure 7 shows the negative correlation between changes in the markup ($d(Markup)$) and the labor share ($d(Labor\ share)$). The figure implies that the rise in markups leads to a decrease in the labor share.

The negative relationship between changes in markups and the labor share is supported by the *positive* relationship between the changes in markups and the capital share. We consider dividend payouts to shareholders as a proxy of the capital share. The bottom panel in Figure 7 shows the positive correlation between changes in the markup ($d(Markup)$) and dividends paid to shareholders ($d(\ln(Dividend))$). We find that the rise in markups coincides with a decrease in the labor share and a rise in the capital share.

Then, we statistically test the inverse relationship. We regress the labor share and the dividends paid to shareholders on the firm-level markup, controlling for firm-fixed effects. Table 2 reports the results from the regression of the labor share on the firm's markup. In the table, we consistently find negative coefficients. Table 2 suggests that a 10% rise in the markup leads to a 4% decrease in the labor share at the macro level. Columns (2) and (3) in the table suggest that the negative relationship is robust when we focus on manufacturing and nonmanufacturing industries. While we find the negative relation between markups and the labor share, we find the positive coefficients between markups and the capital share. Table 3 reports the results from the regression of the capital share on the firm's markup. Table 3 suggests that a 10% rise in a firm's markup is associated with an 8% increase in the dividend paid to shareholders at the macro level. Columns (2) and (3) in the table suggest that the positive relationship is robust when we focus on manufacturing and nonmanufacturing industries. To check for robustness, we regress the dividend ratio to revenue on the firm-level markup. Table 4 presents the results. We consistently find positive coefficients. The table presents the positive relationship between markups and capital shares in all cases. In addition, it suggests that a 10% rise in a firm's markup is associated with an 8.6% increase in the ratio at the macro level. Our results support the view that the rise in the markup causes a decrease in the labor share and an increase in the capital share.

value added. Value added is the sum of operating income, total compensation of employees, and depreciation. Figures A.1 and A.2 in Appendix show the evolution of our baseline measure of average labor shares at the macroeconomic and industry levels, respectively. The (weighted) average of labor shares varies between 52% and 55%, while the median is approximately 62% over the sample period. This value is not different from that found in the literature, e.g., Aoki et al. (2023).

6 Discussion

Our results suggest no change in markups in Japan over the last decade. Although we find that the weighted average and median of markups have been stable at slightly above 1.0 over the sample period, the evolution of average markups is partially similar to that of the United States. De Loecker et al. (2020) document that the median of markups in the United States is unchanging.

In contrast to the United States, there is no superstar firm effects in Japan. De Loecker et al. (2020) demonstrate that the weighted average of markups began to rise to 61% in 2016. They find that the increase is primarily driven by the upper tail of the markup distribution; the upper percentiles have risen sharply. This is not similar to the case in Japan. We find that the upper tail is long, whereas the variance has been stable. Our results suggest that there is no evidence in Japan of the so-called superstar firm effect with strong market power that Autor et al. (2020) find. This contrasts with the United States. Our evidence suggests that as is consistent with Porter and Sakakibara (2006), competitiveness in Japan is fierce.

Our results are slightly different from the literature that estimates firm-level markups in Japan. Aoki et al. (2023) document the declining trend in markups. The dataset they use is a firm-level dataset that includes those for large firms and small and medium-sized firms. The declining trend documented in Aoki et al. (2023) imply that markups are higher for small firms than for large firms. Figure 6 plots markups by revenue as a proxy for firm size. While our dataset does not include data for small firms, the figure may suggest higher markups for smaller firms. If only small firms experienced a decline in markups over the sample period, we would not observe a decline in average markups. Further analysis using large data sets is left for our future research.[10]

7 Conclusion

We analyze the association between markups and labor share in Japan. We estimate markups as a proxy of market power and present empirical evidence on the patterns of markups. First, we find that aggregate markups are stable. It suggests no superstar firm effects, which Autor et al. (2020) find in the United States. Although markups are stable at the aggregate level, we present evidence on their microeconomic dynamics. We find a relationship between markups and firms' demographics: markups are negatively associated with firm age and size. Thus, markups are higher

[10]We use firm surveys such as the Annual Survey of Corporate Behavior conducted by the Economic and Social Research Institute, Cabinet Office of Japan, and Business Outlook Survey jointly conducted by the Economic and Social Research Institute, Cabinet Office of Japan, and Ministry of Finance to analyze the relationship between a firm's markup and its price-setting behavior. Although we obtain several interesting findings, we could not verify their robustness. It is also left for our future research.

for young and small firms. We also find the patterns of markups at the semi-macro level: markups are higher for nonmanufacturing industries than for manufacturing industries. Furthermore, we discuss the macroeconomic implications of the patterns of markups. We demonstrate that the increase in market power entails a decline in labor share and an increase in capital share.

Our results suggest no change in markups in Japan over the last decade. Although we find that the weighted average and median of markups have been stable at slightly above 1.0 over the sample period, the evolution of average markups is partially similar to that of the United States. Moreover, unlike the United States, Japanese firms' markups do not increase. Therefore, we find that the upper tail is long, while the variance is stable. Our evidence suggests that as is consistent with Porter and Sakakibara (2006), competitiveness in Japan is fierce.

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Figure 1: Average markups (revenue weight)

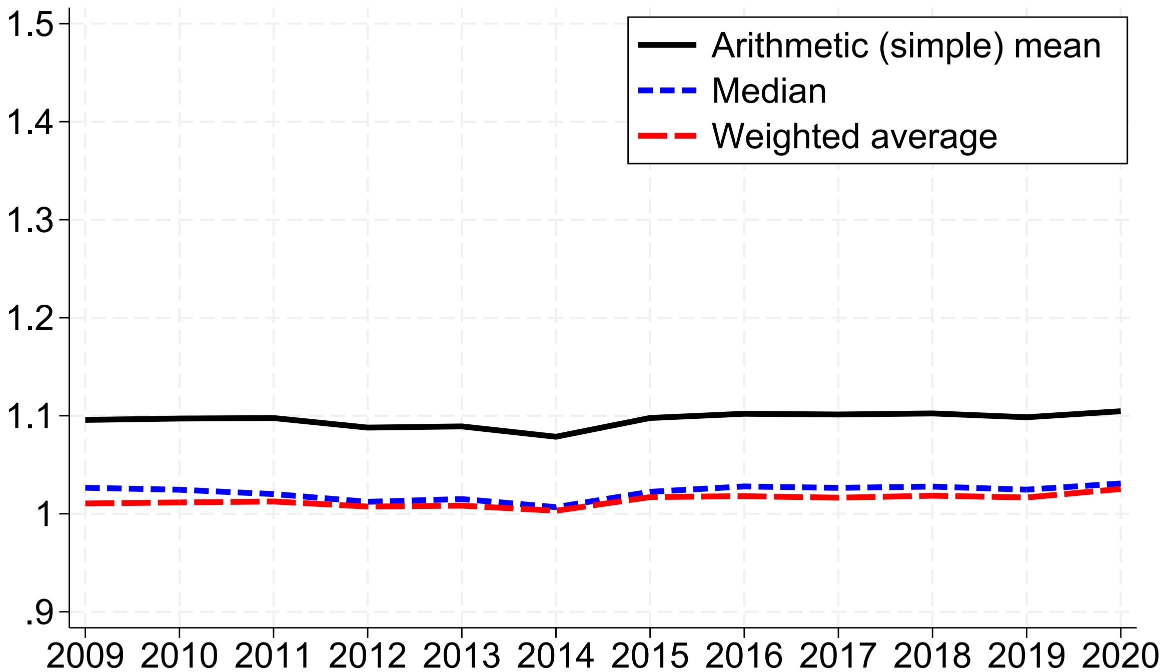

Figure 2: Average markups at industry level (revenue weight)

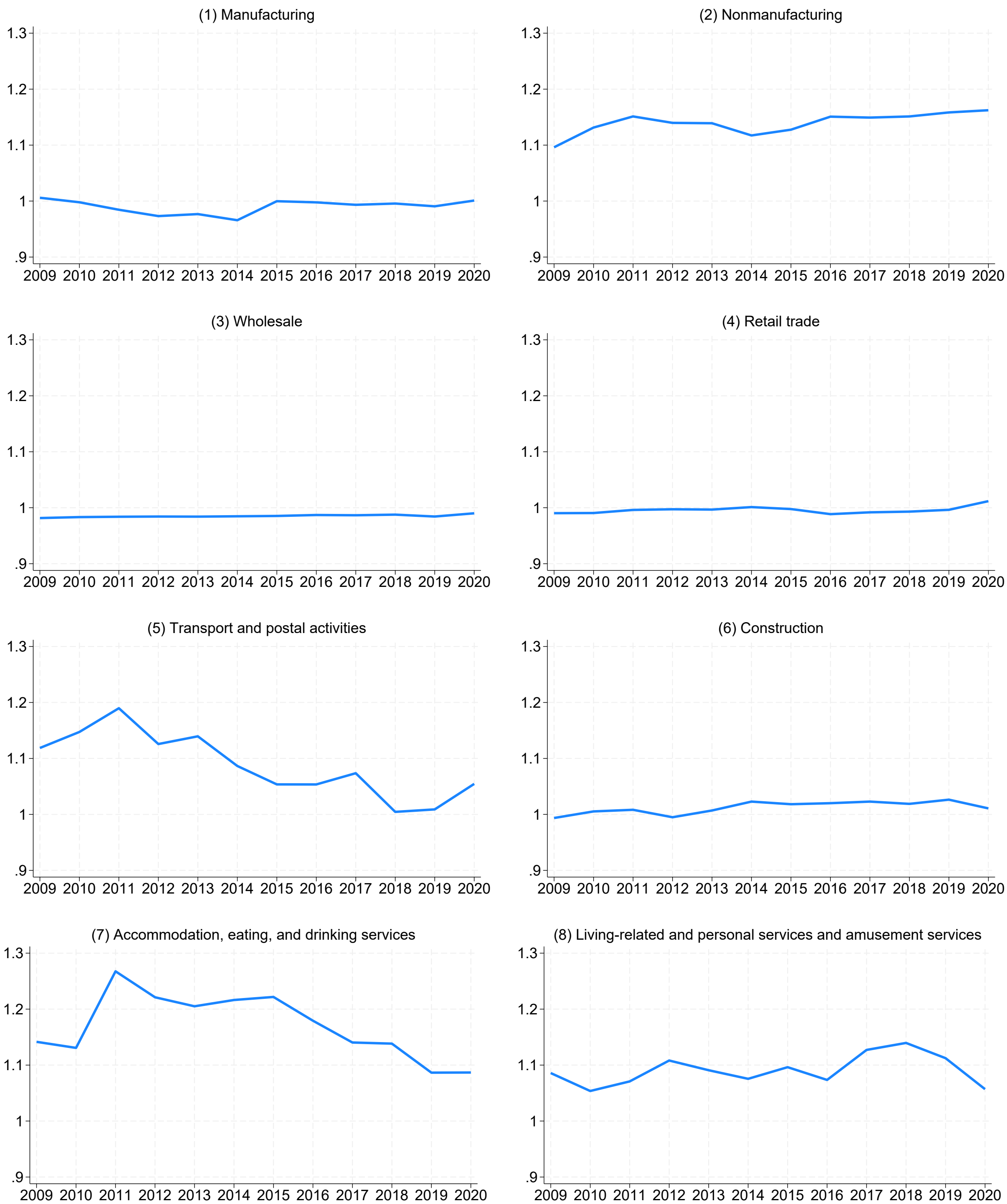

Figure 3: Distribution of markups: Kernel density (unweighted)

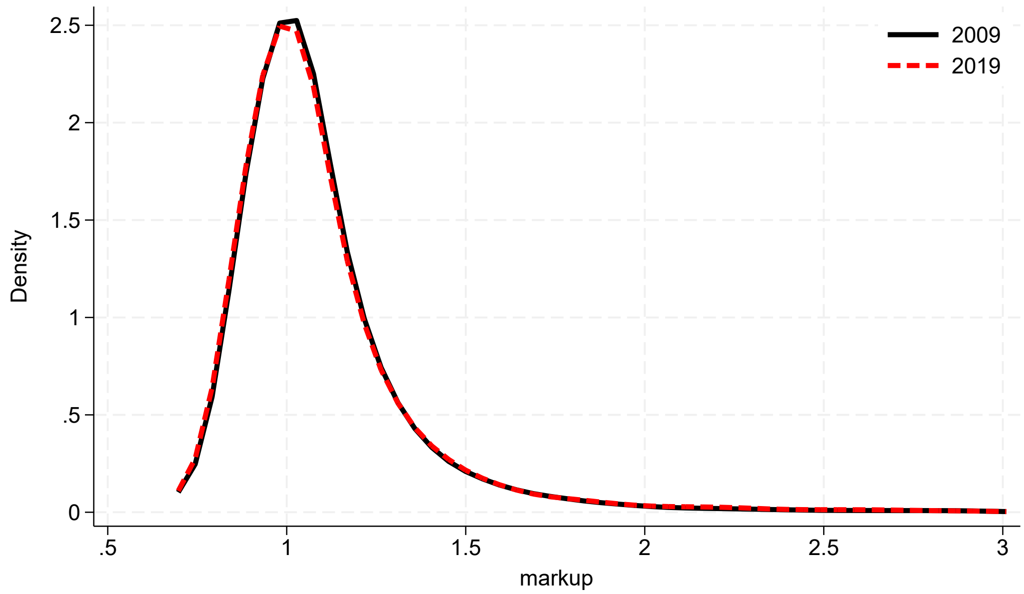

Figure 4: Distribution of markups: Percentiles markup distribution (revenue weight)

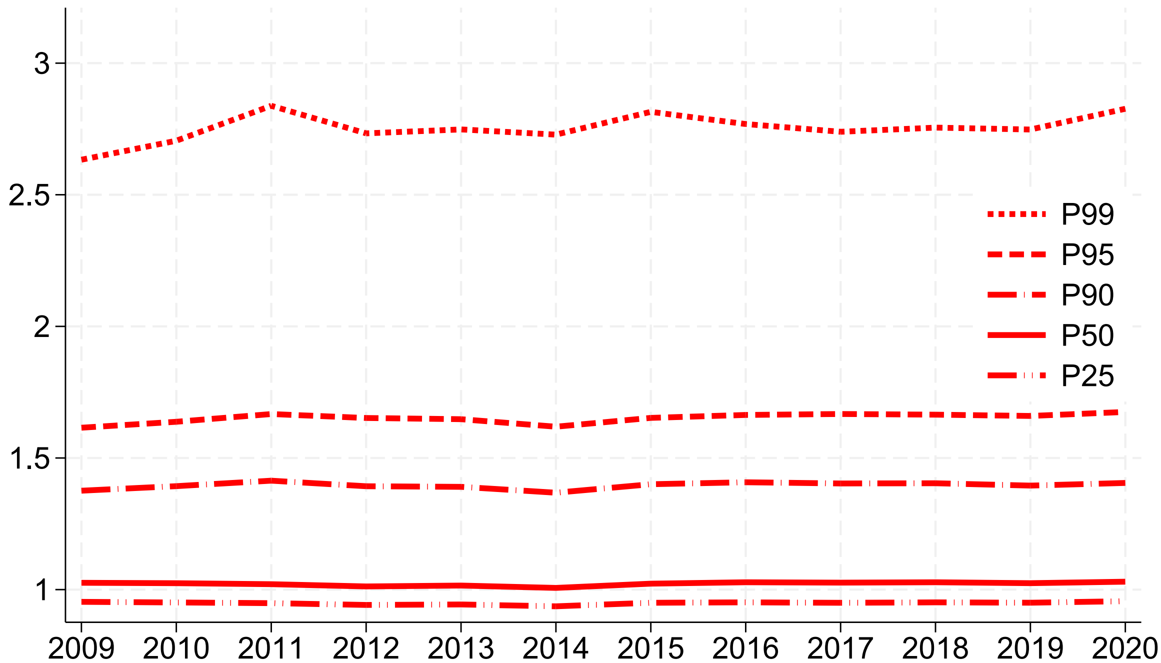

Figure 5: Markups and firm age

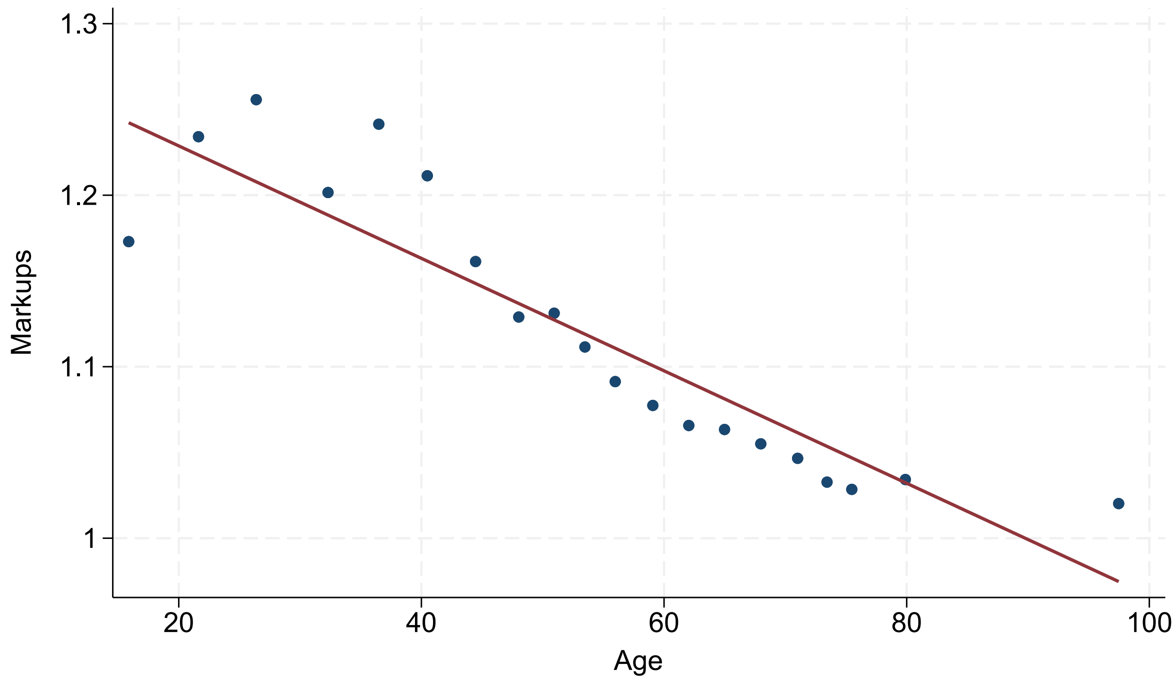

Figure 6: Revenue as a proxy of firm size and markups: Manufacturing and nonmanufacturing industries

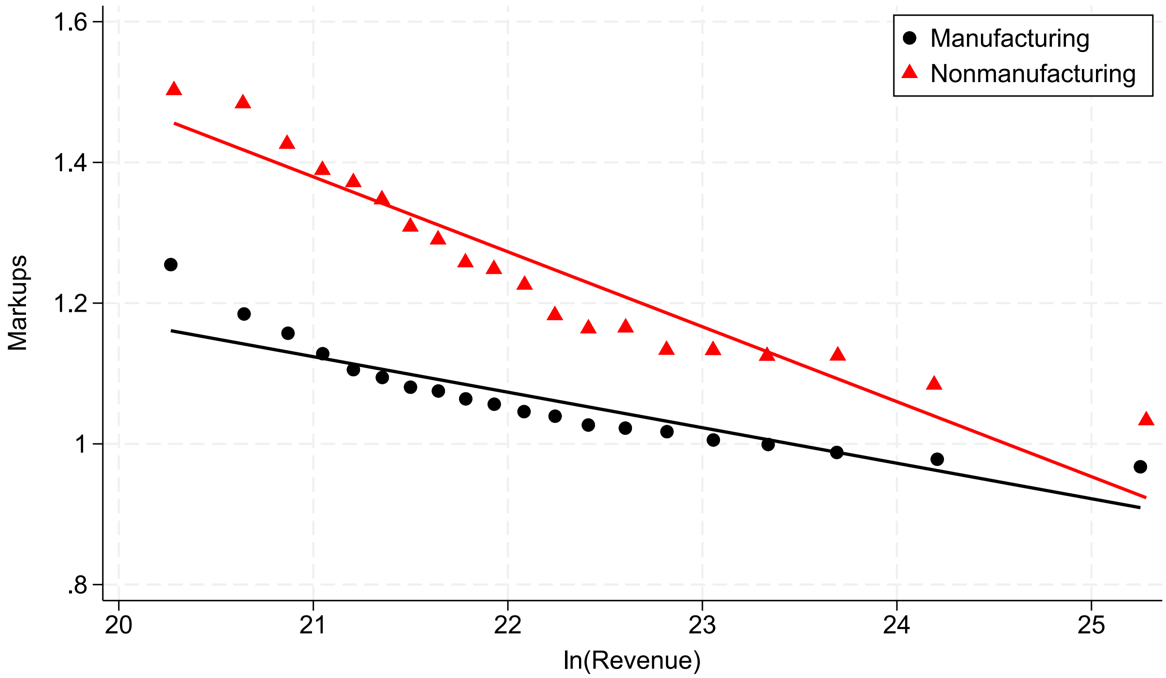

Figure 7: Changes in the markup and labor share (top) and dividend (bottom): All industries

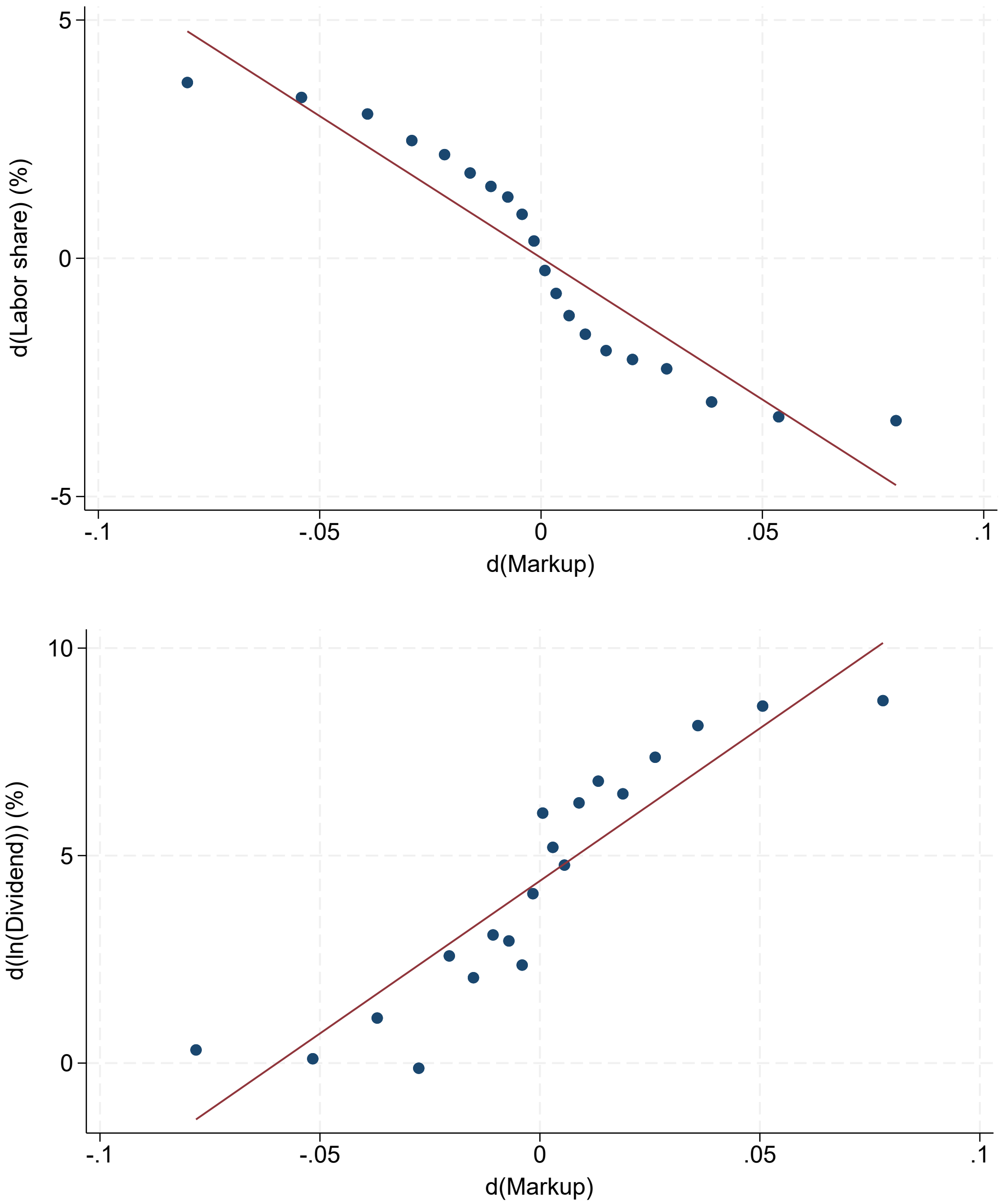

Table 1: Regression of markups on revenue: firm size effects

	(1) $\ln(Markup)$ Entire sample	(2) $\ln(Markup)$ Entire sample	(3) $\ln(Markup)$ Manufacturing	(4) $\ln(Markup)$ Nonmanufacturing
$\ln(Revenue)$	−0.0555***	−0.0483***	−0.0490***	−0.0348***
	(0.000245)	(0.000256)	(0.000331)	(0.000326)
$\ln(Age)$		−0.0179***	−0.0047***	−0.0213***
		(0.000684)	(0.000915)	(0.000794)
Year fixed effect	YES	YES	YES	YES
Industry fixed effect	NO	YES	YES	YES
Observations	326,564	300,363	134,291	110,815

Notes: *, **, and *** indicate 10%, 5%, and 1% significance, respectively. Robust standard errors are in parentheses.

Table 2: Regression of labor shares on markups

	(1) $\ln(Labor\ share)$ Entire sample	(2) $\ln(Labor\ share)$ Manufacturing	(3) $\ln(Labor\ share)$ Nonmanufacturing
$\ln(Markup)$	−0.397***	−0.716***	−0.710***
	(0.0347)	(0.0279)	(0.0592)
$\ln(Revenue)$	−0.242***	−0.311***	−0.199***
	(0.00921)	(0.0106)	(0.0143)
Year fixed effect	YES	YES	YES
Industry fixed effect	YES	YES	YES
Firm fixed effect	YES	YES	YES
Observations	314,660	141,667	116,644

Notes: The firm-level labor share is the ratio of total compensation of employees to value added. Value added is the sum of operating income, total compensation of employees, and depreciation expense. *, **, and *** indicate 10%, 5%, and 1% significance, respectively. Robust standard errors in parentheses are clustered at individual levels.

Table 3: Regression of dividends paid out to shareholders on markups

	(1) $\ln(Dividend)$ Entire sample	(2) $\ln(Dividend)$ Manufacturing	(3) $\ln(Dividend)$ Nonmanufacturing
$\ln(Markup)$	0.799***	1.138***	1.478***
	(0.0366)	(0.0558)	(0.0712)
$\ln(Revenue)$	0.767***	0.786***	0.649***
	(0.0306)	(0.0152)	(0.0316)
Year fixed effect	YES	YES	YES
Industry fixed effect	YES	YES	YES
Firm fixed effect	YES	YES	YES
Observations	165,836	74,281	58,221

Notes: *, **, and *** indicate 10%, 5%, and 1% significance, respectively. Robust standard errors in parentheses are clustered at individual levels.

Table 4: Regression of the ratio of dividends to revenue on markups

	(1) $\ln\left(\frac{Dividend}{Revenue}\right)$ Entire sample	(2) $\ln\left(\frac{Dividend}{Revenue}\right)$ Manufacturing	(3) $\ln\left(\frac{Dividend}{Revenue}\right)$ Nonmanufacturing
$\ln(Markup)$	0.857***	1.167***	1.576***
	(0.0336)	(0.0547)	(0.0793)
Year fixed effect	YES	YES	YES
Industry fixed effect	YES	YES	YES
Firm fixed effect	YES	YES	YES
Observations	165,836	74,281	58,221

Notes: *, **, and *** indicate 10%, 5%, and 1% significance, respectively. Robust standard errors in parentheses are clustered at individual levels.

Appendix

Average labor shares

Figure A.1: Average labor shares (revenue weight)

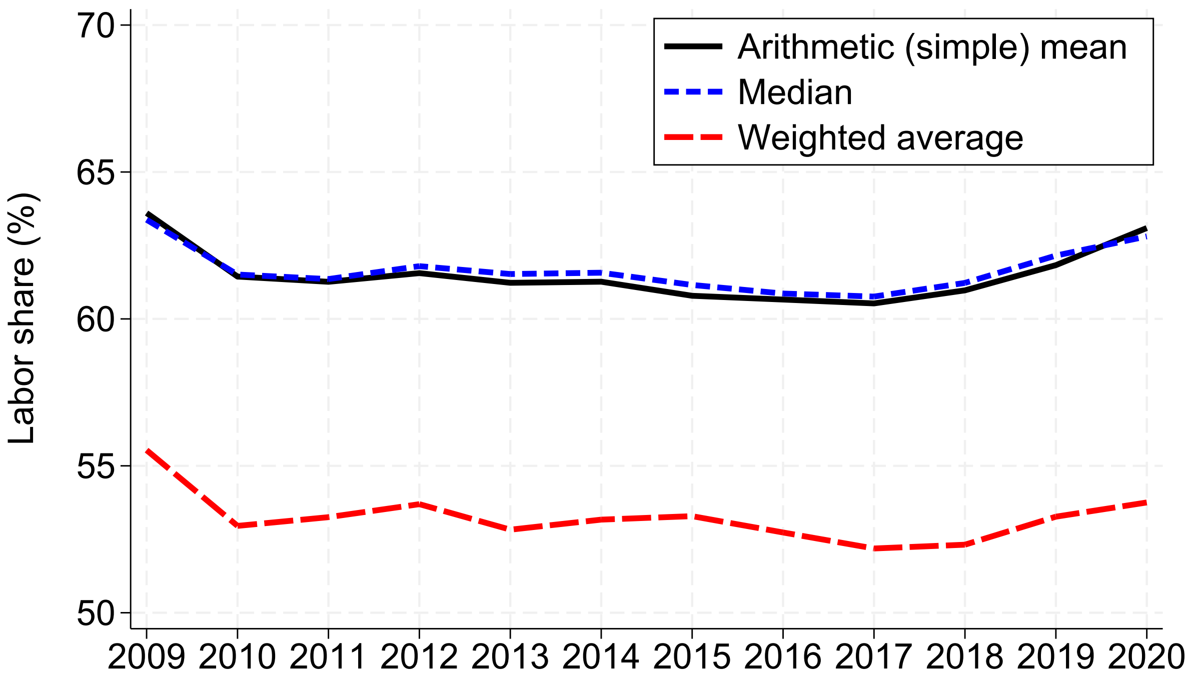

Figure A.2: Average labor shares at industry level (revenue weight)