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Which Employers Share Rents? A Firm-level Analysis for Japan*

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Abstract

The aim of the paper is to contribute to the debate on wage inequality in Japan by looking at the role of rent-sharing. The existing knowledge on rent-sharing drivers and asymmetries in Japan is very limited and we contribute to this research field by exploring the heterogeneity in rent-sharing associated with employers' characteristics. Namely, we first explore differences in rent-sharing associated with a set of structural and workforce characteristics (firm size, age, share of managers, share of college workers) and with internationalisation processes (exports and FDI). We then focus our attention on the heterogeneity in rent-sharing between firms with high/low intensity of investments in intangible assets and digital technologies.

The empirical analysis is based on employer-employee matched data obtained by combining the Basic Survey of Japanese Business Structure and Activities (BSJBSA) and the Basic Survey on Wage Structure (BSWS). The matching allows for the assembly of a large longitudinal firm-level dataset for the period 2005-2018 and for taking advantage of the many features of panel econometric techniques. The empirical methods used (IV models, split sample analysis) allow us to simultaneously shed light on a variety of relevant factors and address the many identification challenges related to endogeneity/reverse causality for key relationships.

Keywords: wage inequality, rent sharing, employers' characteristics
JEL Classification Codes: J30; J50; O33

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1. Introduction

The widespread increase in economic inequalities observed in the past decades in virtually all economies of the world has raised concerns about their social sustainability and stimulated extensive research on its drivers. It is widely documented that inequality in labour compensations accounts for the most part of existing income disparities; however, despite firms being the crucial place where decisions on the distribution of the value are taken, only recently the attention of scholars has been directed to micro-level drivers The majority of these contributions link firms' characteristics to their propensity to pay higher remunerations in general or to specific groups of workers (Aghion et al., 2019, Cirillo et al., 2017; Card et al., 2013; Ikeuchi et al., 2021). One specific segment of the micro-level literature has focused on the role played by the capacity of workers to appropriate rents (e.g., Bell et al, 2023; Card et al., 2018). This large body of empirical evidence has offered valuable novel insights, complementary to the achievements of the macro-level contributions that had populated the earlier stage of research (e.g., Christofides and Oswald 1992; Blanchflower et al., 1996; Estevao and Tevlin, 2003).

This paper aims at contributing to this strand of literature focusing on the case of Japan, where the research on rent-sharing has been so far limited, despite many specific features of interest that include distinctive organisational and business models, industrial relation systems, labour market developments and a recent history of prolonged macroeconomic and wage stagnation (see, e.g., IMF, 2016; Aoyagi et al., 2016). With the exception of Fukao et al. (2022 and 2023), who carry out a long-run analysis on rent sharing at detailed industry level and for different demographic (age/gender/education) groups, rent-sharing in Japan has been dealt with in broader contexts or for specific segments of the economy. Stansbury and Summers (2017, p.29), in a comparative investigation on the "delinkage" between productivity and average compensations, find a correlation between productivity and average wages of 0.20 in Japan, which is much lower than that they report for other developed countries. Dobbelaere and Kiyota (2018) and Tanaka (2018) hypothesize rent sharing among other mechanisms explaining the wage premiums paid by exporting and domestic owned multinational firms in Japan. The former find rent sharing only in exporting firms, while the latter does not find any support for the so called "international rent sharing" conjecture (Helpman et al., 2010; Egger and Kreickemeier, 2013).

Our study complements and advances the industry/cell analyses by Fukao et al (2022 and 2023) by providing an equally comprehensive analysis at firm-level and for the most recent years available. Our focus is on the heterogeneity in rent-sharing that can be associated to a set of employers' characteristics that decribe structural and organisational features as well as pay policies more/less conducive to rent-sharing. Namely, we first explore differences in rent-sharing associated to a set of structural and workforce characteristics (firm's size, age, share of managers, share of college workers) and to internationalisation processes (exports and FDI). Then we focus our attention on heterogeneity in rent-sharing between firms with high/low intensity of investments in intangible assets and digital technologies.

The empirical analysis is based on employer-employee matched data obtained by combining Basic Survey on Wage Structure (BSWS) and the Basic Survey of Japanese Business Structure and Activities (BSJBSA). The matching allows assembling a large longitudinal firm-level dataset over the period 2005-2018 and taking advantage of the many features of panel econometric techniques. This allows us, at the same time, shedding light on a variety of relevant aspect and facing the many identification challenges related to endogeneity/reverse causality of key relationships.

The following of the paper is organised as follows. In Section 2 we provide an overview of the relevant literature that serves as the conceptual background of our analysis. Section 3 describes the dataset used and provides some descriptive evidence. In Section 4 we present our empirical model and the way it allows tackling crucial econometric challenges. In Section 5 we present and discuss our results, while Section 6 concludes.

2. Literature based conceptual background

Rent sharing is often defined as a firm-level relationship between wages and economic rents, a variation in this relationship reflects changes in balance of power between workers and firm (Bell et al., 2023). This is of key interest for policy makers, as shrinking rent sharing may unveil mechanisms underlying the falling labour share and the stagnating wages observed in many advanced economies (Acemoglu et al., 2022). In imperfect competitive markets a positive rent sharing occurring within firms may be the result of monopsonistic behaviour (Manning 2011; Card et al. 2018; Kline et al. 2019; Lamadon et al. 2019) or rather it stems from bargaining power of workers (Nickel and Wadhwani 1990; Blanchflower et al. 1996; Van Reenen 1996).

In a recent survey of the empirical literature, Card et al. (2018) analysed over 20 influential papers on rent-sharing in Europe, Canada and the US. Adjusting all measures of rents used to a single metric, value added per worker, they find that the first generation of studies (industry-level average profits and wages) estimate an average elasticity of wages of approximately 0.14–0.29 (e.g., Christofides and Oswald, 1992; Hildreth and Oswald, 1997; Estevão and Tevlin, 2003). The rent-sharing parameter declines to 0.16–0.02 when the estimation is based on finer-grained data, such as industry-level value added combined with wages observed for different demographic groups (Fukao et al., 2022; 2023), or firm-level value added combined with wages observed at the firm or individual level (Margolis and Salvanes, 2001; Guertzgen, 2009; Arai and Heyman, 2009; Card et al., 2014, among others).

As highlighted by Bell et al. (2023), the strand of literature addressing rent-sharing against the background of bargaining power depicts a context in which employers and workers seek to maximise and bargain over their respective shares of quasi-rents, which consist of employers' profits and workers' remuneration over and above the alternative wage—their outside option (Van Reenen, 1996; Blanchflower et al., 1996; Estevão and Tevlin, 2003). As argued by Estevão and Tevlin (2003), within this framework, *right-to-manage* bargaining models are much more realistic than *efficient* bargaining models, especially where labour relations are highly decentralised, such as in the US and Japan. In such contexts, it is indeed more plausible to assume that workers and employers, rather than agreeing on wages and employment simultaneously, bargain over wages in the first place; based on the negotiated wage, firms decide the level of employment (*right-to-manage*). In both the monopsonistic-driven and power bargaining-driven models, labour heterogeneity and specific characteristics of workers play a key role in determining the magnitude of rent sharing (Bell et al., 2023; Fukao et al., 2022 and 2023; Card et al., 2018).

Other studies, in addition to controlling for workers' gender, education and skills, also explicitly consider the role of context-specific factors. Bagger et al. (2014) investigate over the dispersion of value added per worker and wages across Danish firms and highlight that sectoral specificities, such as capital intensity and TFP heterogeneity, play a major role through the rent-sharing channel. Numerous other studies indirectly deal with rent-sharing by focusing on the effect of ICT on wage structures (see Dunne and Schmitz, 1995; Krueger, 1993, and Entorf and Kramarz, 1998). Van Reenen (1996) obtains more direct evidence of quasi-rent sharing arising from major innovations, finding that more innovative contexts favour greater sharing capacity. More in general, rent sharing may occur in all those situations where intangible capital generates rents, that is, the stream of appropriable returns generated by the intangible in excess of its user cost (Crouzet et al., 2022). Besides the non-physical part of ICT (that is, database and software), the intangible capital encompasses R&D investments, trademarks and franchise agreements, among many other assets (Corrado et al., 2005; 2009). For example, in a business franchise, the intangible asset is the combination of the brand with the logistical and organizational instructions provided to the franchisee (Crouzet et al., 2022). To generate rents, the asset must produce returns that exceed cost of using it (paying the franchiser, implementing organizational instructions, and possibly further promoting the brand through

advertising). It may be possible that the generation of rents in these contexts increase the probability of a positive rent sharing in favour of workers.

An interesting part of the literature has focused on the interplay between rent-sharing and internationalisation patterns, which are closely related to productivity/innovation/technology capacities (see Melitz, 2003 and the extensive literature that followed). Theoretical and empirical findings tend to support the so-called "international rent-sharing" conjecture, as rent-sharing is identified as one of the mechanisms behind the wage premium paid by exporting and multinationals firms (see Helpman et al., 2010, and Egger and Kreickemeier, 2013). Empirical findings on the role of multinational enterprises (MNEs) indicate that they also share profits internationally by paying higher wages to their workers in foreign affiliates in periods of higher headquarter profits (Martins and Yang, 2015; Budd et al., 2005). The case of MNEs is particularly relevant for Japan given their importance in the national economy. However, the existing evidence is mixed: Dobbelaere and Kiyota (2018) find rent-sharing only in exporting (and not in multinational) Japanese firms; and Tanaka (2018), although confirming higher wages for exporting and multinational firms, does not identify rent-sharing as one of their possible drivers.

In our opinion, Acemoglu et al. (2022) provide a tentative and interesting explanation for the inconclusive results on the "international rent-sharing" conjecture discussed above. These authors study rent sharing in a sample of US and Danish firms and find that managers with a business degree, compared to managers with education background in other studies ("non-business managers"), notably reduce their employees' wages through depressing rent sharing. Among many other specifications, they particularly exploit exogenous export demand shocks and show that in contexts characterised by positive demand shocks, non-business managers share profits with their workers, whereas business managers do not. The emphasis in preserving shareholder value in any circumstance, that business managers learnt by attending their MBA courses during their education period, is one of the main explanations for wage cuts and reduced rent sharing.

3. Data and descriptive evidence

Our empirical analysis relies on a matched employer-employee dataset obtained by combining the Basic Survey on Wage Structure (BSWS) and the Basic Survey of Japanese Business Structure and Activities (BSJBSA), using the Establishment and Enterprise Census (EEC) as key (see Kodama and Odaki, 2012). The first one (BSWS) is conducted by the Japanese Ministry of Health, Labour and Welfare (MHLW). The survey supplies information, on an annual basis, on the wage structure of Japanese employees in major industries by a number of relevant features that include the type of employment, type of work, occupation, sex, age, school career, length of service and occupational career. Employees are selected by a uniform sampling method from the establishments in the survey (establishments with 10 regular employees or more – private establishments and specific establishments of public corporations; private establishments with 5-9 regular employees). It is therefore possible to connect workers' information to establishment attributes such as industry, prefecture of location, size (number of regular employees) and a number of indicators based on the establishment workforce characteristics (such as average wages, relative importance of job positions, shares of employees by education, age, occupation, gender, etc.). Unfortunately, neither the worker-level nor the establishment-level information have a longitudinal dimension. The Survey is implemented since 1948 but, since 1982, it has been carried out on the same scale and on an annual basis. We limit our analysis to the period 2005-2018, when detailed information on the type of employment (regular / non-regular work) is available; this is a crucial information for the aims of our analysis as, for the reasons explained in the previous section, we limit the investigation of rent sharing to regular workers[2].

[2] In the BSWS the classification of the type of employment is: (i) regular staff for an indefinite period; (ii) regular staff for a definite period; (iii) non-regular staff for an indefinite period; (iv) non-regular staff for a definite period. The first category identifies permanent

Our first key variable is labour remuneration, constructed as overall hourly cash earnings (*hwage*). This wage rate is obtained by dividing the monthly cash earnings by the actual number of scheduled and overtime hours worked. The monthly cash wage is obtained by adding two components: (i) contractual cash earnings, defined as before-tax amount of cash wages paid to employees including overtime allowances, based on paying conditions specified in advance in the labour contract or agreement and in the working rules of the establishments; and (ii) special cash earnings that include bonuses and term-end allowances. The first component refers to the monthly wage rate paid in June of a given year *t*; therefore, it accounts for the contractual evolutions decided during negotiations that take place annually between March and April (in what is known as the *shunto* or spring wage offensive). The second component refers to the bonuses paid in the previous calendar year; therefore, the yearly amount paid surveyed in year *t+1* has been divided by twelve and this amount added to the base wage (the contractual cash earnings) in year *t*. The set of workers' characteristics includes gender, age, highest level of education attained, tenure (length of service in the establishment), number of days and hours worked (scheduled and overtime), occupation and industry of the establishment. Education levels are classified into four groups: (i) graduates of junior high schools; (ii) graduates of senior high schools; (iii) graduates of higher professional schools and junior colleges; (iv) graduates of universities or graduate schools.

BSWS data are at establishment level, and it is possible to link all establishments belonging to the same company using the Establishment and Enterprise Census (EEC). This allows creating company level variables by aggregating the individual information on workers belonging to the establishment of the same company, either as averages (wage, age, tenure) or as shares of employees with a given characteristic (gender, education, occupation).

The EEC company level codes can be finally matched with the BSJBSA codes, so to add to BSWS-based variables (with a longitudinal dimension) a rich set of information. The BSJBSA is conducted annually by the Ministry of Economy, Trade and Industry (METI) and covers all companies with at least 50 employees and 30 million yen of paid-in capital in the Japanese manufacturing, mining and most of service sectors. The questionnaire of the Survey covers firms' broad activities and characteristics such as sales, total wages, depreciation, number of employees, firm's establishment year, tangible assets and intangible investment, and firms' international activities.

We draw from BSJBSA our second key variable, the metric or rent; for the reasons explained in the following section, we use as measure of rents value added per hour worked by regular workers. Value added is computed by summing up the amount of profits, regular labour cost and capital depreciation. Non-regular labour cost is not considered part of vale added as, consistent with Fukao et al. (2023), it is treated as a flexible input.

employees on a regular (standard) contract and can be identified as belonging to the primary segment of the Japanese labour market; this is category of workers that we consider in our analysis. The remaining three groups of workers (on fixed-term and/or non-standard contracts) belong to the secondary segment and are therefore excluded. For the same reasons, we exclude from the sample the workers identified in the BSWS as 'temporary' (employed on very short-term contracts, i.e., less than one month). They represent about 2.5% of the total sample. Similarly, 'Part-time' workers (17% of the sample) are also not included in the analysis. For both temporary and part-time workers, in addition, crucial information on education and some important job characteristics is missing.

Table 1. Sample summary descriptive statistics (2005-2018)

	N	Mean	Median	SD	Min	Max
Key and control variables						
ln(wage)	21,382	0.842	0.829	0.322	-0.333	2.053
ln(wage) male	21,292	0.902	0.887	0.319	-0.286	2.315
ln(wage) female	20,176	0.610	0.599	0.319	-0.571	2.406
ln(wage) prim edu	4,152	0.807	0.818	0.382	-0.370	3.797
ln(wage) second edu	19,936	0.812	0.800	0.340	-0.367	2.452
ln(wage) tert edu	20,606	0.885	0.871	0.325	-0.394	2.121
ln(rent) (VA/h)	21,382	0.903	0.845	0.645	-4.249	5.501
sh_female	21,382	0.218	0.177	0.163	0.000	1.000
av_ age	21,382	39.677	39.821	4.272	18.000	65.714
sh_edu_senihigh	21,382	0.458	0.466	0.268	0.000	1.000
sh_edu_junicoll	21,382	0.133	0.097	0.137	0.000	1.000
sh_edu_univ	21,382	0.388	0.346	0.260	0.000	1.000
av_tenure	21,382	14.828	15.052	4.989	0.000	36.056
sh_overtime_h	21,382	0.070	0.063	0.050	0.000	0.388
sh_exper_over_10y	21,382	0.102	0.000	0.161	0.000	1.000
ln(alt_wage)	21,382	0.839	0.831	0.246	-0.279	2.029
Instruments for rents						
hhi	21,382	0.043	0.024	0.052	0.003	0.626
Top 5 market %	21,382	0.307	0.264	0.180	0.071	0.920
iprrec_emp	21,382	0.062	0.000	0.635	0.000	27.732
Firms' heterogenity						
ln(tang_k_emp_r)	17,534	1.480	1.283	1.683	-7.975	6.847
sh_nonreg	21,382	0.174	0.053	0.249	0.000	0.986
lnemp	21,382	6.331	6.137	1.407	3.912	11.801
firm age	21,382	49.162	49.000	25.621	0.000	89.000
sh_manager	21,382	0.279	0.252	0.200	0.000	1.000
ln(intan_k_emp_r)	21,382	1.038	0.183	3.223	-0.034	119.995
ln(soft_emp_r)	21,382	0.133	0.003	1.109	0.000	119.953
ln(adv_emp_r)	21,382	0.318	0.037	1.526	0.000	63.442
ln(rdint_emp_r)	21,382	0.588	0.000	2.359	-0.143	67.855
ln(tang_IT_emp_r)	21,382	0.000	0.033	0.924	0.000	106.516
ln(inf_cost_emp_r)	21,382	0.066	0.203	0.692	-3.506	23.827
export	21,382	0.264	0.000	0.441	0.000	1.000
fdi	21,382	0.107	0.000	0.309	0.000	1.000
sh_mng_univ	19,082	0.478	0.497	0.313	0.000	1.000
av_mng_age	19,082	46.096	46.400	4.774	20.000	66.000
av_mng_tenure	19,082	21.186	22.000	6.416	0.000	43.000

Wage rate: log of hourly wage rate of regular employees (000 yen)
Rent (labour productivity): log of valued added per hour of regular work (000 yen)
Intangible capital: log of intengible capital investment per employee (million yen)
All monetary values are in 2011 Yen

Source: own elaborations from MHLW's BSWS and METI's BSJBSA data

BSJBSA data are also used to construct variables to be employed as valid instruments for rents (see section 4): (i) domestic and overseas receipts from intellectual property rights (patent, utility models, design rights, copyrights, software) per employee (iprrec_emp); (ii) market concentration (alternatively, as the market share of the five largest company in each industry year – 'top 5 market %', or as the an industry/year Herfindahl index computed on sales – 'hhi'). Lastly, we use

BSJBSA information to identify the variables that describe firms' heterogeneity. The first set of attributes includes: firm size; firm age; share of the workforce with university education, share of workforce employed in managerial occupations, a dummy variable for exporting companies (export), and a dummy variable for companies having productive investments abroad (FDI). A second group of employers' characteristics is related to investments in intangible capital per worker (total and its components, i.e. expenditures in advertisement (advert_emp_r), R&D (R&D_emp_r) and software (soft_emp_r); and in additional digitalisation technologies (tangible IT capital – 'tang_IT_emp_r'); information processing and communication costs – 'inf_cost_emp_r').

Table 1 outlines some descriptive statistics of the variables used in our analysis. All monetary values are in real terms (Yen, 2011). Wages have been deflated using the CPI index from OECD; value added and all other firm level variables have been deflated using industry gross output deflators (from Japan Industrial Productivity – JIP - database).

The average firm level wage of regular workers amounts to 2,320 Yen; the gender gap is above 25% and the college premium is around 10%. On average, 22% the company regular employment is composed of female employees and 39% of college workers; the average employees' age and tenure are 39.7 years-old and 14.8 years, respectively. As for other firms' characteristics, the average size is around 562 employees and the share on non-regular workers approaches 18%. About 26% of firms export part of their output and 11% own foreign affiliates. The intensity of intangible investment (and its components) shows a high variability across firms; investments in digital technologies exhibit a similarly high variability.

4. Empirical model

4.1 Baseline model

Our baseline empirical specification is consistent with the bargaining power-driven models developed in literature (Blanchflower et al., 1996; Estevão and Tevlin, 2003) and specifically relies on the theoretical model developed in Fukao et al. (2023), where by differentiating the quasi-rent function with respect to wages, one obtains a rent-sharing equation in which the pie to be divided between workers and the employer is identified in the value added per employee and is a function of labour hired and productivity. The size of the rent-sharing parameter, i.e., the link between value added and wages, describes the extent to which workers are able to appropriate rents and depends directly on the workers' bargaining power. This conceptual framework also allows for the existence of different types of labour, namely, regular and nonregular employment. It means that two groups of workers shape an important duality in the labour market and in the bargaining process. Fukao et al.'s (2023) extended theoretical model formally shows that factors associated to specific contexts, such as technological progress, intangible capital intensity, high total factor productivity that shapes the internationalisation of firms and changes in the share of nonregular workers, alter the extent to which regular workers are able to appropriate rents.

Based on the considerations above the baseline specification reads as follows:

$$\ln\left(w_{ijpt}^{R}\right) = \gamma \ln\left(\frac{r_{ijpt}}{n_{ijpt}^{R}}\right) + \boldsymbol{\beta X}_{ijpt} + \lambda_i + \nu_j + \eta_p + \tau_t + \varepsilon_{ijpt} \quad (1)$$

where w is the (ln) average hourly wage of regular workers in firm i (i = 1, …, 2393), industry j (j = 1, …, 68), prefecture p (p =1,…, 47) and year t (t=2004, …, 2018). On the right-hand side of the equation, γ is the rent-sharing parameter that links (ln) average wages to firm-level (ln) rents (r) per regular employee (n^R). $\boldsymbol{X}$ is a vector of covariates including controls for workforce composition or average individual characteristics within firms (e.g., share of female and high-educated workers; average age and tenure) and a measure of alternative wage that a representative worker in a given industry and with given characteristics would receive if dismissed and rehired. $\lambda_i, \nu_j, \eta_p, \tau_t$ are firm, industry, prefecture and time fixed effects and ε is the usual error term. The firm fixed effects (λ_i) control for unobserved heterogeneity, such as specific routines that enterprises follow during bargaining or monopsonistic behavoiur in the labour market, a crucial step to reduce possible

biases in the estimates of rent-sharing (Card et al., 2018). The rent variable is measured by the (*ln*) value added per regular employee. The log-log specification helps attenuate the impact of extreme values and implies that the rent-sharing parameter can be interpreted as elasticity, as in the majority of the reference empirical papers. Standard errors are clustered in all estimations at the most conservative level, that is, the firm level.

4.2 Endogeneity Issues and Instrumental Variable Models

The main identification challenge for our analysis is related to the potential endogeneity of the value added per employee with respect to wages due to possible reverse causality. Our dataset allows us to control for firms' heterogeneity and the effects of specific characteristics on labour productivity; however, the value added, although to a much lesser degree than profits, may still be endogenous if, as is plausible, firms change labour inputs in response to autonomous variations in wages (Estevão and Tevlin, 2003). Following the extensive literature on this specific aspect, we address this issue using instrument variable (IV) methods. Valid instruments in the first stage (i.e., drivers of value added, uncorrelated with wages) should be able to capture shocks on the demand side or on intermediate input markets. The existing empirical literature on rent-sharing for similar firm-level studies has employed, for this purpose, the industry-level import and export prices (Abowd and Lemieux, 1993), firm-level proxies of innovative activities and industry-level measures of market concentration (van Reenen, 1996) and internal lags (Christofides and Oswald, 1992; Blanchflower et al., 1996; Hildreth and Oswald, 1997; Bell et al., 2023). Following this literature and exploiting the richness of the BSJBSA dataset, we constructed a set of potential instrumental variables at that include: (i) an industry-level market concentration, as measured by market share of the largest five firms in the industry (top 5 market %) or, alternatively, the Herfindal index of sales (*hhi*); (ii) the firm-level sum of domestic and overseas receipts from intellectual property rights (patent, utility models, design rights, copyrights, software) per employee (*iprrec_emp*); and (iii) the firm-level lagged first difference of value added per worker (*LD_lnlp_r_reg*).

As we will see in the next section, all these variables pass the usual tests for relevance (under-identification and weak identification tests) and exclusion restrictions (Hansen J test) of instruments as indicated in literature (Baum et al., 2007) and will be used in both baseline equation (1) and in the split sample analysis.

More in detail, the two stage IV FE model (IV FE) reads as follows:

$$\ln\left(w_{ijpt}^{R}\right) = \gamma \ln \frac{\widehat{r_{ijpt}}}{n_{ijpt}^{R}} + \boldsymbol{\beta_1 X}_{1,ijpt} + \lambda_{1,i} + \nu_{1,j} + \eta_{1,p} + \tau_{1,t} + \varepsilon_{1,ijpt} \quad (2)$$

$$\ln\left(\frac{r_{ijpt}}{n_{ijpt}^{R}}\right) = \alpha \Delta \ln\left(\frac{\widehat{r_{ijpt-1}}}{n_{ijpt-1}^{R}}\right) + \delta\, top5_{jt} + \varphi\, iprrec\_emp_{ijpt} + + \boldsymbol{\beta_2 X}_{2,ijpt} + \lambda_{2,i} + \nu_{2,j} + \eta_{2,p} + \tau_{2,t} + \varepsilon_{2,ijpt} \quad (3)$$

where the variable acronyms in equation 2 (second stage) identify the same variables as in the previous equation 1; in equation 3 (first stage), the lagged first difference of value added per hour, the concentration index - $top5$ (or hhi) – and receipts from property rights (*iprrec_emp*) are used as the preferred set of instruments.

4.3 Split sample analysis

Our research idea and conceptual framework require an empirical approach that makes it possible to identify the heterogeneity in the relationship between wages and rents in different regimes defined by a broad set of firms' characteristics. A first group of variables identifies broad firms' attributes: firm's size, age, share of college workers, share of employees in managerial positions, and internationalisation patterns. A second group is related to the presence and intensity of investments in intangibles and digital technologies. We assume that the intensity (high and low) with which these characteristics are found in companies determines specific environments (regimes) that in turn shape behaviour and

nature of companies, including the rent sharing. For example, the higher the size of a firm and the higher the probability that it is a more structured organisation with unions, and this affects the power bargaining of workers through a high rent sharing coefficient. Likewise, the concentration of high-educated workers indicates high-productivity and high-performance companies where probably the lower substitutability between high- and low educated workers raises the bargaining power and rent sharing of the former. Since the variables above, describing the heterogeneity in the relationship between wages and rents, shape different contexts and are not simply intended as moderators of this relationship, we set out a split sample analysis. In other words, we replicate our baseline regression in subsamples obtained by splitting the total sample of companies into those above or below the median value of the variables of interest (of participating or not into internationalisation processes). A correlation matrix between the variables used to describe firms' heterogeneity is reported in the Appendix (Table A1). Apart from some obvious positive associations between firm size and some other attributes (internationalisation, R&D), the relatively low levels of correlation between the variables chosen indicates that they are suitable to describe different structural, organisational and strategical characteristics.

5. Results

The severity of potential endogeneity issues of rents to wages suggests that OLS approaches cannot provide credible estimates of the rent-sharing parameter. All estimates presented in this section relies on the two stage IV FE estimator allowing for multi-way fixed effects, as we always use firm, prefecture, industry and year dummies. The main tests for relevance and exclusion restrictions of instruments (LM statistic for under-identification, F statistic for weak identification and Hansen J statistic for exclusion restrictions) are reported at the bottom of tables, among other diagnostic tests. Standard errors are always clustered at the firm level.

As discussed above, after presenting the results for the total sample (Table 2), our empirical strategy relies on showing how different contexts affect the magnitude of rent sharing. For this reason, we apply a split sample analysis where the baseline regression is replicated over subsamples of companies grouped according to their salient characteristics. To improve their readability, Tables 3 to 8 presented in sections 5.2 and 5.3 only include results for the second stage IV FE estimations; first stage outcomes are available upon request.

5.1. Baseline outcomes

Table 2 shows results for equations 2 (second stage) and 3 (first stage) discussed above and refers to the total (unbalanced) longitudinal sample including 3857 companies and 14 years (2005-2018). The two IV-estimates presented are run with two different sets of internal and external instruments that include, in model 1, the lagged first difference of value added per hour worked and a market concentration index (*top 5 market %*). In model 2, we add the metric of revenues from copyright and intellectual property rights (*ipprc_emp*).

Table 2. Baseline results (IV FE estimates, 2005-2018)

	[1]		[2]	
	1st	2nd	1st	2nd
sh_female	0.0138	-0.139***	0.0122	-0.139***
	[0.0294]	[0.0168]	[0.0294]	[0.0168]
av_age	0.000653	0.0287***	0.000172	0.0287***
	[0.00744]	[0.00280]	[0.00742]	[0.00280]
av_age_square	-0.0000117	-0.000269***	-0.0000062	-0.000269***
	[0.0000910]	[0.0000339]	[0.0000908]	[0.0000338]
sh_edu_senihigh	0.000741	0.0932***	0.000128	0.0932***
	[0.0574]	[0.0286]	[0.0574]	[0.0286]
sh_edu_junicoll	-0.00257	0.157***	-0.00174	0.157***
	[0.0604]	[0.0301]	[0.0604]	[0.0301]
sh_edu_univ	0.00224	0.264***	0.00173	0.264***
	[0.0577]	[0.0294]	[0.0576]	[0.0294]
av_tenure	0.00426***	0.00837***	0.00439***	0.00839***
	[0.00143]	[0.000688]	[0.00143]	[0.000685]
sh_overtime_h	0.502***	-0.395***	0.502***	-0.393***
	[0.0897]	[0.0512]	[0.0896]	[0.0506]
sh_exper_over_10y	0.0294	-0.0608***	0.0254	-0.0607***
	[0.0217]	[0.0102]	[0.0217]	[0.0102]
ln(alt_wage)	0.00611	0.0154**	0.00658	0.0154**
	[0.0246]	[0.00640]	[0.0245]	[0.00638]
lntang_capint	0.0284***	-0.00309**	0.0286***	-0.00299**
	[0.00503]	[0.00154]	[0.00502]	[0.00149]
sh_nonreg	1.140***	-0.115***	1.140***	-0.111***
	[0.104]	[0.0401]	[0.104]	[0.0373]
LD_lnhlp_r_reg	0.0806***		0.0801***	
	[0.0112]		[0.0112]	
Top 5% market %	0.214**		0.214**	
	[0.0884]		[0.0883]	
iprrec_emp			0.0259***	
			[0.00798]	
ln(rent) (VA/h)		0.101***		0.0977***
		[0.0319]		[0.0289]
N	17085	17085	17085	17085
R2		0.263		0.264
adj. R2		0.257		0.258
N_hdfe		4		4
df_a		125		125
df_m	14	13	15	13
N_clust	3857	3857	3857	3857
exexog		LD_lnhlp_r_reg cr5		LD_lnhlp_r_reg cr5 iprrec_emp
j		0.904		1.013
jp		0.342		0.603
idstat		56.73		64.54
idp		0.000		0.000
widstat		28.11		22.37
archi2		10.23		11.83
archi2p		0.006		0.008
sstat		11.32		12.75
sstatp		0.00348		0.00521

Standard errors in brackets

Included dummies: firm, prefecture, industry, year. Cluster standard errors at firm level.

* p < 0.1, ** p < 0.05, *** p < 0.01

The diagnostic reported at the bottom of the Table 2 reveals that the two sets of instruments used are always valid and their coefficients in the first stage are in line with the expectations (see 1st stage columns). The lagged shock rents, the industry concentration (*hhi*), the innovative activities captured by gains in licencing out intellectual property rights (*iprrec_emp*) are always positively correlated with rents.

In these baseline specifications, the coefficient of interest (*ln(rent)* – VA/hour) ranges sits around 0.10 and is always significant at the 1% level. The magnitude of the rent-sharing parameter is the same (0.10 percent) that Fukao et al. (2022 and 2023) found in studying rent sharing at the industry level for Japan. The control variables in the second stage show coefficients in line with expectations and reassure about the correct specification of the model. For example, an increasing share of female workers reduces the average wage within firms, whereas increasing average age, tenure and human capital of workers are associated with higher wages, as largely reported in literature for Japan (Kawaguchi and Mori, 2019; Fukao et al., 2022 and 2023).

As a robustness check on the baseline IV models, we replace the instrument measuring market concentration with an alternative one (the industry/year level Herfindal index – *hhi*). Results, presented in Table A2 in the Appendix, are in all regards consistent with the ones presented in Table 2.

5.2. Mapping rent sharing across firms' characteristics

Table 3 presents the first set of results of the split sample analysis, obtained by replicating our baseline regression in subsamples of companies above or below the median value of the variables of interest. The number of observations in each of the two subsample differs because some firms with missing values on lagged variables are excluded.

The first two columns of Table 3 inform us that rent sharing is positive and significant only in large firms (0.11 percent), probably due to the presence and more pervasive role of unions, that translates into a higher bargaining power of workers. This evidence can also be explained by the fact that only large firms possess the organisational capacity to implement monitoring activities and pay schemes needed to implement pay for performance systems that enable rent-sharing. The same explanation can be hypothesised with refence to the result that only older companies implement rent-sharing (0.08 percent), as they are more likely to have accumulated the managerial skills needed to efficiently implement performance-related pay schemes.

Results presented in Table 4 also corroborate this line of interpretation, as positive and significant rent sharing is only observed in firms where we observe high concentration of employees in managerial positions and of high-educated workers. This suggest, on the one side, that a relatively large endowment of management resources and formal knowledge is need for the design, monitoring and measuring activities needed for such payment schemes. On the other side, it also suggests that only companies with a high endowment of highly skilled workforce resort to rent-sharing, probably in the attempt to incentivize effort and productivity of the segment of the workforce with the highest potential. The positive relation between the college share of the workforce and rent-sharing can be explained in view of the imperfect substitutability between college-educated workers and low-educated workers (Kawaguchi and Mori, 2016), that probably guarantees to the former a higher bargaining power.

The so-called "international rent-sharing" conjecture, according to which exporting firms, or MNEs, share their profits with workers (Helpman et al, 2010), seems to be only partially confirmed for Japan, our results reported in Table 5 say. Indeed, we find that rent-sharing is slightly higher in exporting firms (compared to non-exporting ones), but we do not observe rent-sharing for Japanese companies engaged in outward FDI. This outcome is in line with Tanaka's (2018) evidence, where rent sharing has found not being the driver of the higher wages paid by the internationalised Japanese firms to their employees.

Table 3. Rent-sharing and firms' heterogeneity: firms' size and age (IV FE estimates, 2005-2018)

	Small firm	Large firm	Young_firm	Old_firm
	2nd	2nd	2nd	2nd
sh_female	-0.141***	-0.138***	-0.124***	-0.155***
	[0.0243]	[0.0219]	[0.0242]	[0.0224]
av_age	0.0266***	0.0298***	0.0335***	0.0233***
	[0.00455]	[0.00366]	[0.00406]	[0.00397]
av_age_square	-0.000234***	-0.000283***	-0.000326***	-0.000209***
	[0.0000550]	[0.0000450]	[0.0000496]	[0.0000480]
sh_edu_senihigh	0.0615*	0.106***	0.0634	0.121***
	[0.0369]	[0.0412]	[0.0490]	[0.0331]
sh_edu_junicoll	0.159***	0.150***	0.120**	0.193***
	[0.0410]	[0.0426]	[0.0495]	[0.0369]
sh_edu_univ	0.204***	0.283***	0.225***	0.295***
	[0.0390]	[0.0417]	[0.0499]	[0.0347]
av_tenure	0.00814***	0.00832***	0.00874***	0.00839***
	[0.00115]	[0.000911]	[0.00104]	[0.000945]
sh_overtime_h	-0.315***	-0.436***	-0.279***	-0.466***
	[0.0601]	[0.0706]	[0.0655]	[0.0744]
sh_exper_over_10y	-0.0352**	-0.0716***	-0.0503***	-0.0700***
	[0.0149]	[0.0137]	[0.0161]	[0.0136]
ln(alt_wage)	0.00796	0.0193**	0.0193*	0.0104
	[0.0122]	[0.00805]	[0.0103]	[0.00871]
lntang_capint	-0.00128	-0.00185	-0.00274	-0.00207
	[0.00271]	[0.00177]	[0.00227]	[0.00194]
sh_nonreg	-0.0661	-0.124***	-0.0996	-0.0936**
	[0.0985]	[0.0461]	[0.0658]	[0.0421]
ln(rent) (VA/h)	0.0491	0.107***	0.0826	0.0760**
	[0.0833]	[0.0316]	[0.0514]	[0.0320]
N	5091	11536	7535	9223
R2	0.243	0.273	0.252	0.279
adj. R2	0.222	0.264	0.238	0.268
N_hdfe	4	4	4	4
df_a	125	125	125	125
df_m	13	13	13	13
N_clust	1423	2504	1872	2071
exexog	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp
j	3.293	0.659	4.304	0.154
jp	0.193	0.719	0.116	0.926
idstat	5.613	65.990	23.990	42.670
idp	0.132	0.000	0.000	0.000
widstat	3.00	22.14	8.75	16.50
archi2	3.236	11.350	6.574	5.423
archi2p	0.357	0.010	0.087	0.143
sstat	3.347	12.450	7.495	5.656
sstatp	0.341	0.006	0.058	0.130

Standard errors in brackets

Included dummies: firm, prefecture, industry, year. Cluster standard errors at firm level.

* p < 0.1, ** p < 0.05, *** p < 0.01

Table 4. Rent-sharing and firms' heterogeneity: managers' share and college workers' share (IV FE estimates, 2005-2018)

	Low manager share	High manager share	Low university share	High university share
	2nd	2nd	2nd	2nd
sh_female	-0.119***	-0.126***	-0.184***	-0.112***
	[0.0305]	[0.0221]	[0.0220]	[0.0271]
av_age	0.0347***	0.0266***	0.0257***	0.0365***
	[0.00458]	[0.00435]	[0.00386]	[0.00481]
av_age_square	-0.000360***	-0.000234***	-0.000248***	-0.000337***
	[0.0000565]	[0.0000532]	[0.0000460]	[0.0000593]
sh_edu_senihigh	0.0771	0.106**	0.0759**	0.130**
	[0.0478]	[0.0426]	[0.0354]	[0.0550]
sh_edu_junicoll	0.139***	0.157***	0.117***	0.191***
	[0.0511]	[0.0450]	[0.0382]	[0.0575]
sh_edu_univ	0.228***	0.278***	0.273***	0.265***
	[0.0496]	[0.0439]	[0.0412]	[0.0560]
av_tenure	0.00816***	0.00712***	0.00887***	0.00642***
	[0.00118]	[0.000883]	[0.000908]	[0.00111]
sh_overtime_h	-0.300***	-0.449***	-0.223***	-0.540***
	[0.101]	[0.0580]	[0.0529]	[0.0777]
sh_exper_over_10y	-0.0434***	-0.0392**	-0.0316**	-0.0763***
	[0.0142]	[0.0169]	[0.0124]	[0.0177]
ln(alt_wage)	0.0153	0.0122	0.0198**	0.0141
	[0.0107]	[0.00869]	[0.00879]	[0.0102]
lntang_capint	-0.000788	-0.0034	-0.00265	-0.00395
	[0.00240]	[0.00240]	[0.00195]	[0.00256]
sh_nonreg	-0.0134	-0.243***	-0.0814*	-0.135**
	[0.0520]	[0.0794]	[0.0471]	[0.0640]
ln(rent) (VA/h)	0.0312	0.179***	0.0382	0.143***
	[0.0467]	[0.0583]	[0.0378]	[0.0492]
N	6661	8866	7122	8672
R2	0.206	0.182	0.245	0.205
adj. R2	0.189	0.17	0.23	0.192
N_hdfe	4	4	4	4
df_a	125	124	125	123
df_m	13	13	13	13
N_clust	1924	2318	1946	2137
exexog	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp
j	1.453	0.00425	1.359	0.649
jp	0.484	0.998	0.507	0.723
idstat	20.270	19.330	21.960	31.640
idp	0.000	0.000	0.000	0.000
widstat	8.37	7.40	7.61	11.73
archi2	1.595	10.960	2.866	8.782
archi2p	0.661	0.012	0.413	0.032
sstat	1.658	10.940	2.216	10.880
sstatp	0.646	0.012	0.529	0.012

Standard errors in brackets

Included dummies: firm, prefecture, industry, year. Cluster standard errors at firm level.

* p < 0.1, ** p < 0.05, *** p < 0.01

Table 5. Rent-sharing and firms' heterogeneity: exports and (IV FE estimates, 2005-2018)

	No exporting	Exporting	No FDI	FDI
	2nd	2nd	2nd	2nd
sh_female	-0.134***	-0.175***	-0.133***	-0.253***
	[0.0161]	[0.0432]	[0.0174]	[0.0757]
av_age	0.0313***	0.0195***	0.0300***	0.00993
	[0.00312]	[0.00659]	[0.00292]	[0.0128]
av_age_square	-0.000301***	-0.000163**	-0.000291***	0.0000432
	[0.0000383]	[0.0000783]	[0.0000357]	[0.000146]
sh_edu_senihigh	0.0566*	0.224***	0.0895***	0.0551
	[0.0324]	[0.0411]	[0.0311]	[0.115]
sh_edu_junicoll	0.122***	0.247***	0.149***	0.208
	[0.0338]	[0.0466]	[0.0324]	[0.131]
sh_edu_univ	0.195***	0.455***	0.249***	0.299**
	[0.0328]	[0.0428]	[0.0317]	[0.128]
av_tenure	0.00810***	0.00964***	0.00885***	0.00201
	[0.000768]	[0.00155]	[0.000711]	[0.00256]
sh_overtime_h	-0.437***	-0.296***	-0.338***	-0.850***
	[0.0568]	[0.108]	[0.0441]	[0.246]
sh_exper_over_10y	-0.0642***	-0.0372	-0.0590***	-0.034
	[0.0108]	[0.0291]	[0.0108]	[0.0368]
ln(alt_wage)	0.0204***	-0.00254	0.0232***	0.00428
	[0.00736]	[0.0117]	[0.00681]	[0.0199]
lntang_capint	-0.00306*	0.00000504	-0.00327**	0.00248
	[0.00176]	[0.00280]	[0.00154]	[0.00749]
sh_nonreg	-0.105**	-0.167**	-0.128***	-0.0293
	[0.0458]	[0.0721]	[0.0413]	[0.135]
ln(rent) (VA/h)	0.0937**	0.108**	0.109***	0.0454
	[0.0373]	[0.0419]	[0.0318]	[0.114]
N	12088	4755	15043	1840
R2	0.266	0.273	0.261	0.297
adj. R2	0.257	0.253	0.254	0.244
N_hdfe	4	4	4	4
df_a	124	117	125	117
df_m	13	13	13	13
N_clust	2836	1072	3528	426
exexog	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp
j	0.343	1.231	0.33	1.418
jp	0.842	0.540	0.848	0.492
idstat	33.130	33.810	50.300	7.396
idp	0.000	0.000	0.000	0.060
widstat	12.88	11.53	20.16	1.89
archi2	6.225	7.794	12.920	1.646
archi2p	0.101	0.051	0.005	0.649
sstat	6.470	10.210	13.620	1.574
sstatp	0.091	0.017	0.003	0.665

Standard errors in brackets

Included dummies: firm, prefecture, industry, year. Cluster standard errors at firm level.

* p < 0.1, ** p < 0.05, *** p < 0.01

5.3. Rent sharing, intangibles and digitalisation

Table 6 reports a statistically significant rent sharing only in environments with high total intangible investment intensity (0.09 percent) compared to regimes with low intangible investment intensity. If we look at the different types of intangible investments that the data allow to specify, some interesting heterogeneity emerge. Workers appropriate rents only in companies with above median investment intensity in advertising (0.10 percent); however, while the magnitude of rent-sharing in high R&D expenditure-intensive companies is similar and aligned to the average level (0.10 percent), it is even higher in companies with relatively less R&D intensity (0.16 percent).

Table 6. Rent-sharing and intangibles: total intangibles, advertising and R&D (IV FE estimates, 2005-2018)

	Low intangible intensity (soft + adv + rd)	High intangible intensity (soft + adv + rd)	Low advertising intensity	High advertising intensity	Low R&D intensity	High R&D intensity
	2nd	2nd	2nd	2nd	2nd	2nd
sh_female	-0.140***	-0.153***	-0.128***	-0.148***	-0.115***	-0.227***
	[0.0229]	[0.0251]	[0.0218]	[0.0248]	[0.0204]	[0.0316]
av_age	0.0283***	0.0288***	0.0309***	0.0247***	0.0326***	0.0226***
	[0.00424]	[0.00407]	[0.00405]	[0.00409]	[0.00350]	[0.00548]
av_age_square	-0.000265***	-0.000273***	-0.000302***	-0.000216***	-0.000317***	-0.000192***
	[0.0000510]	[0.0000488]	[0.0000486]	[0.0000489]	[0.0000428]	[0.0000638]
sh_edu_senihigh	0.0562	0.110**	0.0351	0.159***	0.0722**	0.0993*
	[0.0385]	[0.0430]	[0.0369]	[0.0383]	[0.0343]	[0.0578]
sh_edu_junicoll	0.118***	0.174***	0.0851**	0.240***	0.146***	0.121**
	[0.0421]	[0.0450]	[0.0403]	[0.0408]	[0.0358]	[0.0601]
sh_edu_univ	0.162***	0.312***	0.151***	0.360***	0.210***	0.326***
	[0.0392]	[0.0438]	[0.0380]	[0.0395]	[0.0352]	[0.0588]
av_tenure	0.00772***	0.00909***	0.00808***	0.00858***	0.00808***	0.00870***
	[0.00107]	[0.000973]	[0.00102]	[0.000995]	[0.000914]	[0.00118]
sh_overtime_h	-0.358***	-0.436***	-0.324***	-0.432***	-0.481***	-0.284***
	[0.0643]	[0.0827]	[0.0601]	[0.0835]	[0.0736]	[0.0705]
sh_exper_over_10y	-0.0569***	-0.0609***	-0.0512***	-0.0589***	-0.0663***	-0.0499**
	[0.0149]	[0.0149]	[0.0158]	[0.0148]	[0.0122]	[0.0201]
ln(alt_wage)	0.0327***	0.00422	0.0325***	0.000566	0.0174*	0.0133
	[0.0113]	[0.00826]	[0.0101]	[0.00845]	[0.00943]	[0.00979]
lntang_capint	-0.00172	-0.00309	-0.00363	-0.00121	-0.0035	-0.00438*
	[0.00235]	[0.00202]	[0.00255]	[0.00193]	[0.00267]	[0.00239]
sh_nonreg	-0.175	-0.0412	-0.162*	-0.0359	-0.191**	-0.117**
	[0.116]	[0.0364]	[0.0979]	[0.0346]	[0.0911]	[0.0482]
ln(rent) (VA/h)	0.0793	0.0934***	0.0753	0.102***	0.160**	0.0940***
	[0.0731]	[0.0310]	[0.0618]	[0.0288]	[0.0749]	[0.0271]
N	6544	9662	7062	9209	10485	6109
R2	0.238	0.29	0.241	0.292	0.207	0.299
adj. R2	0.222	0.279	0.226	0.281	0.197	0.283
N_hdfe	4	4	4	4	4	4
df_a	124	125	124	124	125	120
df_m	13	13	13	13	13	13
N_clust	1746	2251	1857	2181	2575	1369
exexog	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp
j	8.848	0.427	3.745	0.871	4.249	0.193
jp	0.012	0.808	0.154	0.647	0.120	0.908
idstat	13.070	58.360	17.930	52.110	13.990	59.170
idp	0.004	0.000	0.000	0.000	0.003	0.000
widstat	5.91	18.50	6.25	18.03	4.86	21.29
archi2	9.025	11.400	32.390	16.180	12.480	14.050
archi2p	0.029	0.010	0.000	0.001	0.006	0.003
sstat	9.659	9.606	5.200	12.350	9.539	12.860
sstatp	0.022	0.022	0.158	0.006	0.023	0.005

Standard errors in brackets
Included dummies: firm, prefecture, industry, year. Cluster standard errors at firm level.
* p < 0.1, ** p < 0.05, *** p < 0.01

The two types of investments share common features. They are both functional to accumulate strategic assets to create and/or consolidate entry barriers and, ultimately, some market power. In the first case (advertisement), by creating or enhancing the value and market potential of brands; in the second case (R&D) to produce innovations that guarantee a

(more or less persistent) advantage over competing companies. They are also both important sources of risks, enhanced by their sunk cost nature. It is therefore to be expected that firms with more intensive recourse to such strategic trajectories demand and try to attract highly skilled human resources with high salaries and try to maximise their effort by linking part of their remuneration to the firm's performance. However, the timing needed to develop the two types of strategic assets and to appropriate the potential gains can differ significantly. In the case of advertising, the success of a campaign materializes in the short run into some economic performance (such as the consolidation or the increase of the market share) and the pay for performance scheme can be more easily designed and linked to it. R&D investments, on the contrary, usually require a much longer time to be developed and to materialize into economic returns; it is therefore likely that high R&D companies attract the high potential human resources needed by means of high wages, without linking or exposing them to short-term productivity (or value added, or profit) shocks. This interpretation is corroborated empirically by the descriptive evidence on average wage levels paid by low/high R&D companies (see Table A3 in the Appendix). Hourly wage in high R&D intensity and high advertisement intensity companies are both above the average level (2,656 yen and 2,450 yen, respectively, compared to the general average level of 2,321 yen) and this is in line with an extensive literature, particularly on innovative firms (Aghion et al., 2019). However, for R&D intensive companies, hourly wages are the highest of all subsamples (with the only exception of FDI firms). This is especially the case for the college-educated workers. On average, tertiary educated employees earn 2,422 yen per hour (see Table 1); R&D-intensive employers pay significantly higher labour remunerations (2,804 yen per hour), also compared to the advertisement-intensive companies (2,540 yen) (see Table A3).

As regards the third type of intangible investments - software, which is the component related to digitalisation - the first two columns of Table 7 reveal that companies with a high intensity of investments in software implement rent-sharing; a similar result is obtained for other investments or expenditures related to digital technologies, tangible IT equipment and information processing and communication costs. This evidence can be explained by two non-mutually exclusive factors. First, the adoption of those types of technologies requires absorptive capacity that can be guaranteed by high-skilled and motivated workforce; in such contexts, resorting to pay-for-performance schemes might be crucial to attract employees with high productivity potential (sorting effect) and to elicit the expected level of effort. Second, the implementation of performance-related systems requires gathering and processing a significant amount of detailed information, to monitor and measure workers' or teams' performance and to fine-tune the incentive schemes. Investments in digital technologies (or the purchase of information processing services on the market) are clearly crucial to enable the management to carry on such tasks.

Table 7. Rent-sharing and digitalisation: software, tangible IT and information processing and communication costs (IV FE estimates, 2005-2018)

	Low software intensity	High software intensity	Low IT investment per employee	High IT investment per employee	Low information cost per employee	High information cost per employee
	2nd	2nd	2nd	2nd	2nd	2nd
sh_female	-0.139***	-0.156***	-0.130***	-0.145***	-0.104***	-0.184***
	[0.0222]	[0.0234]	[0.0184]	[0.0380]	[0.0252]	[0.0220]
av_age	0.0257***	0.0303***	0.0296***	0.0266***	0.0296***	0.0248***
	[0.00411]	[0.00431]	[0.00320]	[0.00673]	[0.00381]	[0.00431]
av_age_square	-0.000236***	-0.000284***	-0.000281***	-0.000243***	-0.000281***	-0.000223***
	[0.0000488]	[0.0000527]	[0.0000387]	[0.0000817]	[0.0000475]	[0.0000507]
sh_edu_senihigh	0.103***	0.0956**	0.0661**	0.103	0.0698*	0.148***
	[0.0371]	[0.0460]	[0.0331]	[0.0653]	[0.0359]	[0.0515]
sh_edu_junicoll	0.184***	0.138***	0.140***	0.138**	0.114***	0.223***
	[0.0403]	[0.0478]	[0.0347]	[0.0683]	[0.0389]	[0.0526]
sh_edu_univ	0.231***	0.288***	0.233***	0.279***	0.195***	0.343***
	[0.0382]	[0.0462]	[0.0342]	[0.0663]	[0.0383]	[0.0523]
av_tenure	0.00830***	0.00847***	0.00815***	0.00821***	0.00825***	0.00850***
	[0.000982]	[0.00105]	[0.000770]	[0.00154]	[0.00110]	[0.000969]
sh_overtime_h	-0.291***	-0.429***	-0.395***	-0.405***	-0.417***	-0.403***
	[0.0614]	[0.0661]	[0.0645]	[0.0847]	[0.0869]	[0.0615]
sh_exper_over_10y	-0.0680***	-0.0568***	-0.0632***	-0.0395*	-0.0661***	-0.0541***
	[0.0155]	[0.0152]	[0.0120]	[0.0210]	[0.0140]	[0.0154]
ln(alt_wage)	0.0171*	0.0148	0.011	0.0191	0.0158*	0.0184*
	[0.00962]	[0.00900]	[0.00776]	[0.0117]	[0.00941]	[0.00953]
lntang_capint	-0.00199	-0.00153	-0.00295	-0.00640**	-0.00214	-0.00392**
	[0.00284]	[0.00194]	[0.00192]	[0.00279]	[0.00244]	[0.00192]
sh_nonreg	-0.148	-0.0652*	-0.129**	-0.0671	-0.0843	-0.123**
	[0.0953]	[0.0382]	[0.0508]	[0.0632]	[0.0799]	[0.0494]
ln(rent) (VA/h)	0.084	0.0784***	0.100***	0.143**	0.0611	0.111***
	[0.0667]	[0.0288]	[0.0381]	[0.0569]	[0.0587]	[0.0370]
N	6718	9092	12310	3884	7279	8889
R2	0.248	0.285	0.254	0.27	0.252	0.279
adj. R2	0.232	0.274	0.246	0.244	0.237	0.268
N_hdfe	4	4	4	4	4	4
df_a	123	124	125	120	125	125
df_m	13	13	13	13	13	13
N_clust	1933	2171	3048	997	1898	2185
exexog	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp	LD_lnhlp_r_reg cr5 iprrec_emp
j	2.644	0.0369	1.833	1.152	1.385	4.057
jp	0.267	0.982	0.400	0.562	0.500	0.132
idstat	16.770	51.960	41.950	15.070	12.560	54.120
idp	0.001	0.000	0.000	0.002	0.006	0.000
widstat	5.80	16.00	15.00	5.01	3.61	22.81
archi2	4.606	7.834	8.255	7.798	1.725	18.370
archi2p	0.203	0.050	0.041	0.050	0.631	0.000
sstat	4.107	8.184	8.676	7.216	1.939	11.970
sstatp	0.250	0.042	0.034	0.065	0.585	0.007

Standard errors in brackets

Included dummies: firm, prefecture, industry, year. Cluster standard errors at firm level.

* p < 0.1, ** p < 0.05, *** p < 0.01

6. Conclusions

This research builds upon recent studies on rent sharing in Japan (Fukao et al., 2022 and 2023) and contributes to the existing knowledge by refining those previous analyses along two directions.

First, it employs finer grained data by combining two different databases (the BSWS and the BSJBSA) and investigates rent sharing at the firm level. This occurs at the expense of reducing the time span of the analysis to the period 2005-2018 (that is, 14 years compared to the longer-term analysis, 1970-2012, reported in Fukao et al., 2022 and 2023). However, our analysis allows to provide evidence for more recent years and, above all, it addresses the concerns on rent sharing estimation bias emerging when the analysis is not properly conducted at the company level, as reported in the recent literature (Card et al., 2018).

Our second contribution lies in exploring rent sharing along different potential heterogeneity sources, including the intensity of innovative investments (in digitalisation) and intangibles.

The results of the empirical analysis conducted on the total sample of companies (baseline estimation), confirm a positive, generalised and statistically significant rent sharing. More in detail, one percent increase in the firm's rent, proxied by the value added per employee, boosts wages of Japanese regular workers by 0.10 percentage points. This value is aligned to the coefficient previously estimated in the detailed industry level/demographic cells analysis of Fukao et al. (2023).

The split sample analysis also confirms results of previous studies, as rent sharing highlights a statistically significant magnitude in companies with high-skilled workforce (high share of college-educated workers) and a high share of employees in managerial occupations. It also adds new evidence on the importance of rent sharing heterogeneity along the dimensions of firm's size, firm's age and internationalisation processes (exporting and multinational firms). Our empirical evidence also suggests that companies endowed more with intangible capital and investing more into digital technologies resort more on rent-sharing. This might indicate, in the first place, a complementarity between (at least some types of) labour and more innovative forms of investments; second, a more intensive use of performance-related pay systems by companies that rely on such types of assets, aimed at attracting highly performing workers and at eliciting the expected level of effort; third, that the presence of specific types of investments (particularly, digital technologies) enables the effective implementation of pay-for-performance schemes, that require high efficiency in workers' monitoring, information collection and processing.

The first policy implication of our analysis relies on the positive and significant rent sharing that has been especially found in companies investing more in digital technologies and advertising. It could signal a sorting effect, according to which these firms try to attract skilled and most talented workers by paying them higher wages through a pay for performance scheme. These sorting effects might be not enough whether intense labour reallocation from declining (low-digitalised) to growing (high-digitalised) firms is hindered by skill mismatches. In these cases, policies and programs to support skill updating and training remain essential to guarantee the job transitions (Kotera and Schmittmann, 2022).

Another important policy implication of our study derives from the evidence that rent sharing is only relevant for regular workers who tend to be employed in high-wage companies. This can be observed combining the evidence of rent-sharing magnitude in subsamples and the average wages in the subsamples (Table A3). Therefore, while rent-sharing has, in principle, a pro-equality effect by increasing the share of value added that accrues to labour (i.e., it enhances the labour share), it is also likely to produce a wage inequality increasing effects, enlarging the remunerations of regular workers employed in high-wage companies compared to those employed in low-wage firms. As the latter employ a higher share of non-regular workers too (see Table A1) rent-sharing is likely to accentuate a dualization between low-wage and high-wage companies in Japan. This calls for labour market policy actions aimed at supporting the remunerations of workers at risk of marginal employment positions. Our study can contribute to better shaping and targeting policy actions, by providing information on the type of employer in which vulnerable workers are employed and on the component of remuneration that needs to be prioritized.

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APPENDIX

Table A1. Correlation matrix between firms' characteristics

	ln(wage)	ln(size)	age	univ share	manager share	export	fdi	ln(intan_k_emp_r)	ln(soft_emp_r)	ln(adv_emp_r)	ln(rdint_emp_r)	ln(tang_IT_emp_r)	ln(inf_cost_emp_r)	sh_non-reg work
ln(size)	0.409	1.000												
age	0.178	0.134	1.000											
univ share	0.465	0.288	0.117	1.000										
manager share	0.183	0.139	0.064	0.234	1.000									
export	0.249	0.236	0.188	0.077	-0.002	1.000								
fdi	0.270	0.287	0.167	0.156	0.033	0.332	1.000							
ln(intan_k_emp_r)	0.302	0.251	0.095	0.208	0.015	0.225	0.163	1.000						
ln(soft_emp_r)	0.115	0.076	0.018	0.093	0.011	0.031	0.053	0.440	1.000					
ln(adv_emp_r)	0.098	0.066	0.026	0.125	0.021	0.017	0.034	0.553	0.062	1.000				
ln(rdint_emp_r)	0.296	0.265	0.105	0.160	0.002	0.282	0.175	0.801	0.091	0.080	1.000			
ln(tang_IT_emp_r)	0.029	0.002	0.001	0.031	0.003	-0.009	0.015	0.047	0.136	0.002	-0.001	1.000		
ln(inf_cost_emp_r)	0.186	0.064	0.020	0.140	0.007	-0.036	0.053	0.176	0.204	0.158	0.042	0.049	1.000	
sh_non-reg work	-0.262	-0.262	-0.239	0.035	0.157	-0.229	-0.114	-0.115	-0.041	-0.001	-0.137	-0.017	-0.075	1.000

Source: own elaborations from BSWS and BSJBSA data

Table A2. Baseline results with alternative set of instruments (IV FE estimates, 2005-2018)

	[1]		[2]	
	1st	2nd	1st	2nd
sh_female	0.0139	-0.139***	0.0122	-0.139***
	[0.0294]	[0.0168]	[0.0294]	[0.0168]
av_age	0.00102	0.0287***	0.000538	0.0287***
	[0.00743]	[0.00280]	[0.00741]	[0.00279]
av_age_square	-0.0000158	-0.000269***	-0.0000103	-0.000269***
	[0.0000908]	[0.0000338]	[0.0000906]	[0.0000338]
sh_edu_senihigh	0.00165	0.0932***	0.00104	0.0932***
	[0.0572]	[0.0286]	[0.0572]	[0.0286]
sh_edu_junicoll	-0.00162	0.157***	-0.000798	0.157***
	[0.0603]	[0.0301]	[0.0602]	[0.0301]
sh_edu_univ	0.00229	0.264***	0.00178	0.264***
	[0.0575]	[0.0294]	[0.0574]	[0.0294]
av_tenure	0.00431***	0.00838***	0.00443***	0.00839***
	[0.00143]	[0.000688]	[0.00143]	[0.000686]
sh_overtime_h	0.503***	-0.394***	0.502***	-0.392***
	[0.0897]	[0.0511]	[0.0896]	[0.0506]
sh_exper_over_10y	0.0288	-0.0608***	0.0248	-0.0607***
	[0.0217]	[0.0102]	[0.0217]	[0.0102]
ln(alt_wage)	0.00634	0.0154**	0.00681	0.0154**
	[0.0246]	[0.00639]	[0.0245]	[0.00637]
lntang_capint	0.0284***	-0.00305**	0.0285***	-0.00295**
	[0.00502]	[0.00154]	[0.00502]	[0.00149]
sh_nonreg	1.139***	-0.113***	1.139***	-0.110***
	[0.104]	[0.0403]	[0.104]	[0.0377]
LD_lnhlp_r_reg	0.0806***		0.0802***	
	[0.0112]		[0.0112]	
hhi	0.446***		0.445***	
	[0.150]		[0.149]	
iprrec_emp			0.0258***	
			[0.00799]	
ln(rent) (VA/h)		0.0997***		0.0965***
		[0.0321]		[0.0291]
N	17085	17085	17085	17085
R2		0.263		0.264
adj. R2		0.257		0.258
N_hdfe		4		4
df_a		125		125
df_m	14	13	15	13
N_clust	3857	3857	3857	3857
exexog		LD_lnhlp_r_reg hhi		LD_lnhlp_r_reg hhi iprrec_emp
j		1.193		1.265
jp		0.275		0.531
idstat		57.53		65.03
idp		0.000		0.000
widstat		28.98		22.98
archi2		10.26		11.88
archi2p		0.0059		0.00782
sstat		11.34		12.78
sstatp		0.00344		0.00514

Standard errors in brackets

Included dummies: firm, prefecture, industry, year. Cluster standard errors at firm level.

* p < 0.1, ** p < 0.05, *** p < 0.01

Table A3. Average firm-level wage by firms' (2005-2018)

	Small firm	Large firm	Young_firm	Old_firm	Low manager share	High manager share	Low university share	High university share	No exporting	Exporting	No FDI	FDI
ln(wage)	0.698	0.918	0.789	0.888	0.789	0.883	0.734	0.939	0.794	0.976	0.812	1.094
ln(wage) male	0.760	0.977	0.848	0.949	0.851	0.942	0.794	1.000	0.857	1.027	0.872	1.150
ln(wage) female	0.476	0.680	0.569	0.646	0.572	0.640	0.518	0.691	0.566	0.728	0.582	0.833
ln(wage) prim edu	0.635	0.897	0.746	0.856	0.751	0.858	0.729	0.915	0.732	0.946	0.772	1.025
ln(wage) second edu	0.676	0.886	0.757	0.859	0.764	0.850	0.722	0.901	0.773	0.918	0.788	1.018
ln(wage) tert edu	0.738	0.959	0.839	0.923	0.835	0.923	0.787	0.967	0.830	1.032	0.853	1.141
	Low intangible intensity (soft + adv + rd)	High intangible intensity (soft + adv + rd)	Low advertising intensity	High advertising intensity	Low R&D intensity	High R&D intensity	Low software intensity	High software intensity	Low IT investment per employee	High IT investment per employee	Low information cost per employee	High information cost per employee
ln(wage)	0.729	0.929	0.777	0.896	0.769	0.977	0.756	0.933	0.817	0.928	0.754	0.920
ln(wage) male	0.788	0.990	0.835	0.958	0.835	1.028	0.819	0.990	0.878	0.984	0.817	0.978
ln(wage) female	0.509	0.687	0.552	0.658	0.545	0.728	0.526	0.699	0.585	0.696	0.532	0.680
ln(wage) prim edu	0.678	0.911	0.735	0.870	0.699	0.943	0.728	0.909	0.788	0.884	0.722	0.895
ln(wage) second edu	0.708	0.895	0.750	0.865	0.751	0.924	0.732	0.899	0.786	0.904	0.723	0.892
ln(wage) tert edu	0.775	0.966	0.826	0.932	0.804	1.031	0.802	0.970	0.861	0.963	0.804	0.954

Wage rate: log of hourly wage rate of regular employees (000 yen, 2011 yen)