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Wages?

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Non-Compete Agreements: Human Capital Investments or Compensated Wages? *

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Abstract

Non-Compete Agreements (NCAs) restrict workers from joining or forming rival companies, which impacts labor market dynamics. Theoretical perspectives on NCAs are varied: they can lead to increased employer investment and higher wages by reducing labor turnover, or they might simply raise wages to compensate for the restriction on workers' post-employment choices. Alternatively, NCAs could reduce workers' outside options, leading to unfavorable terms and lower wages. This paper empirically examines the relationship between NCAs and factors such as firm profit, average wages, and training provisions using a firm-level survey in Japan. Estimation results indicate that firms that use NCAs are more likely to invest in their workers, particularly in off-the-job training. In addition, NCAs are positively associated with firm sales, average wages, and labor productivity. These results support the theory that NCAs encourage firms to invest more in their human capital, leading to higher wages and productivity. Our results also align with previous studies on the Japanese labor markets, highlighting the role of employers in investing in human capital. In general, the study adds evidence to the debate on the fairness and economic impact of NCAs.

Keywords: Non-compete agreement; Human capital investment; Wages.

JEL Codes: J24; J41; K31.

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1 Introduction

1.1 Overview: What we did

Non-compete agreements (NCAs), which restrict workers from joining or forming a rival company, are one of the most important mechanisms that tie employees to their employers. As shown in Garmaise (2011) and Marx (2011), it was already known that executives and high-skilled tech workers were often restricted from moving to competing companies. However, during a labor dispute in 2014 it became apparent that a sandwich chain in Boston was imposing NCAs even on workers earning near the minimum wage ¹. Since Starr et al. (2018) highlighted that nearly 40 percent of the American workforce is currently or has previously been subject to NCAs at work, a debate has emerged over the fairness of such contracts.

The discussion is informed by empirical research because theories suggest that NCAs have mutually contradictory effects. First, because NCAs suppress labor turnover, employers are more likely to invest in their workers, leading to higher wages. Second, although NCAs restrict workers' choices after separation from their employer, this restriction is compensated by an increase in wages from the former employer. Third, NCAs reduce workers' outside options, forcing them to accept unfavorable terms of employment. These theoretical conjectures can be initially explored by observing wages and human capital investments. In the first scenario, both wages and human capital investment would increase. In the second scenario, only wages would increase. In the third scenario, wages would decline.

In order to provide further evidence to support existing literature on the subject, we examine the situation using a firm-level survey conducted in Japan in 2023. In particular, we examine the statistical relationship between the utilization of NCAs and key performance indicators, including firm profitability, average wages, and the provision of training by firms. Our findings indicate that firms utilizing NCAs are more inclined to invest in their workforce, with this correlation being more pronounced for off-the-job training than for on-the-job training. Additionally, the evidence suggests that the deployment of NCAs is positively associated with firm sales, average wages, and labor productivity. These findings are consistent with the first scenario and align with the characteristics of labor markets identified in previous research, emphasizing the pivotal role of firms' human capital investments.

¹“Jimmy John’s Makes Low-Wage Workers Sign ‘Oppressive’ Noncompete Agreements” (Huffpost, on 13th Oct. 2014: https://www.huffpost.com/entry/jimmy-johns-non-compete_n_5978180?1413230622). This report was followed by other journals; “When the Guy Making Your Sandwich Has a Noncompete Clause” (New York Times, on 14th Oct. 2014: <https://www.nytimes.com/2014/10/15/upshot/when-the-guy-making-your-sandwich-has-a-noncompete-clause.html>); “Does Jimmy John’s Non-Compete Clause For Sandwich Makers Have Legal Legs?” (Forbes, on 15th Oct. 2014: <https://www.forbes.com/sites/clareoconnor/2014/10/15/does-jimmy-johns-non-compete-clause-for-sandwich-makers-have-legal-legs/>)

1.2 A brief review of background: Why we did

Recently, the monopolistic power in labor markets has garnered increasing attention from both researchers and policymakers. This shift is driven by concerns that expanded economic inequality may contribute to political instability and social unrest. Empirical studies, particularly those examining minimum wage impacts, have provided evidence that challenges the classical competitive market model. For example, research has shown that minimum wage increases do not always lead to job losses, suggesting that employers possess significant wage-setting power.

In addition, actual labor markets are shaped by institutions indicating bilateral monopoly or employer monopolistic power. Collective bargaining, for instance, can significantly influence wage levels and working conditions, highlighting the imbalance in negotiating power between employers and employees. NCAs are another example of the indication of employer monopolistic power. Because NCAs literally restrict employee mobility, they often limit employees' bargaining power, leading to potentially lower economic outcomes and reduced welfare for workers. However, NCAs can also have pro-market effects by incentivizing employers to invest in general skill training for their employees. This investment can enhance productivity and increase social surplus.

In traditional economic models, it is assumed that workers will accumulate general human capital on their own. Therefore, young workers sometimes face liquidity constraints that prevent them from funding their own training. In actual labor markets, employers often manage training opportunities when introducing new technology within the firm. In other words, employers may finance the accumulation of general human capital for their workers. An employer's investment in the general human capital of a worker is only made on the assumption that the worker will not change jobs. This suggests that the monopsonistic power of employers can sometimes positively impact social welfare.

Determining which aspect —restrictive or pro-market— dominates the labor market requires empirical investigation. NCAs provide an excellent case study for examining the complex effects of employer monopolistic power on worker outcomes and overall social welfare.

There have been two primary methods for empirically investigating the effects of NCAs. One approach is using household surveys that ask workers whether they are (or were) subject to NCAs. The other approach involves asking employers if they use NCAs on their workers. Although a household survey would undoubtedly provide valuable insight into the impact of NCAs on welfare, it is not without its own inherent limitations. As workers often lack precise knowledge about NCAs, household surveys may include a significant share of “Do not know” responses. The interpretation of these responses can affect the analysis of the

estimated results. Additionally, household surveys typically lack firm-side information, such as productivity and profits.

In contrast, business surveys provide information on the incidence of NCAs and can be easily linked to labor productivity and other business metrics. Employers generally have an accurate grasp of the contract terms, making the incidence of NCAs at the establishment or firm level more precise than in household surveys. Although there is a concern about manipulation of reports by companies, unlike in some states in the United States where NCAs are illegal, in Japan, NCAs are not inherently illegal. This reduces the likelihood of employers manipulating their responses regarding the use of NCAs in the case of our survey.

The disadvantage of business surveys in the context of NCAs is that a firm may utilize a variety of labor contracts, some of which include NCAs while others do not. This can prevent a firm-level survey from capturing the precise incidence of NCAs. However, due to the specific legal circumstances in Japan, this risk is minimized in our survey. Japanese labor contracts legally depend on collectively determined “Work Rules” (*Shugyo Kisoku*), meaning that the labor contracts are determined, at smallest, at occupational level and that individual contracts between employers and an employee are exceptional. In fact, a report by the *181st Working Conditions Subcommittee* (Document No. 4) indicates that among professional occupations, where NCAs would typically apply, only 8.4% of contracts are individualized. In addition, most individualized terms only relate to wages, working hours, and leave. Thus, the firm-level survey is supposed to provide relatively precise information on NCAs in Japan.

This research focuses on the firm-side mechanisms of NCAs by conducting a firm-level ad hoc survey. One unique approach of our survey is to ask the incidence of NCAs and training provision in each occupation, enabling us to compare the association between NCAs and training among occupations within the same firm.

2 Institution and More Specific Literature on NCAs

2.1 Legal framework

2.1.1 Basic standing point of labor law

Imposing contractual restrictions on workers’ behaviors has been ubiquitous, often leading to social conflicts. Since the early twentieth century, nation-states have regulated anti-competitive labor contracts by legislating fair labor standards. However, the restriction of workers’ behavior by contracts remains common, typically in the form of NCAs.

2.1.2 Labor law and anti-monopoly

Why have anti-competitive labor contracts survived? One reason is the mutual inviolability of anti-monopoly law and labor law in every country. Labor law tends to rely on developing collective bargaining schemes to regulate labor contracts, which creates a de facto exemption from anti-monopoly law ².

More specifically, in Japan, the existence of an employment contract sharply defines the coverage of labor law; if there is an employment contract between two parties, labor law governs their contractual relationship regardless of its contents. Moreover, within the realm of labor law, because it has allowed de facto anti-competitive contracts to some extent, anti-monopoly law has failed to eliminate them ³. A typical example is the fact that the severance payment in Japan is defined as the benefit. It is not an obligation on the part of the employer, but allows the employer discretion in granting and taking it. Or, Japanese labor law has recognized the scheduled damage against workers ⁴.

2.1.3 Recent change in the relation between labor law and anti-trust

Recently, competition authorities such as the Fair Trade Commission have been increasingly active in intervening in the labor market on both sides of the Pacific Ocean ⁵.

For example, in the U.S., the government of the State of California revised the regulation on NCAs, effective January 1, 2024 ⁶. The new regulation deems even a fairly limited non-compete obligation to be illegal. It also places restrictions on contracts signed outside of California. In 2023, the U.S. Federal Trade Commission (FTC) provided a series of reports proposing a nationwide ban on non-competes ⁷. With the support of the National Labor Relations Board (NLRB) ⁸ and Department of Justice (DOJ) ⁹, the FTC issued a final rule

²However, there is no explicit provision in either Japan or the U.S.

³In the U.S., we do not have any clue.

⁴In a case of claim for repayment of study abroad expenses, it has become the norm to recognize a financial contract (between the same entities) in parallel with an employment contract, to interpret the burden of study abroad expenses as being due to a financial contract (with a special agreement to waive claims on the condition of a certain level of service after returning home), and to recognize a claim for repayment.

⁵See Kambayashi et al. (2023) for a discussion of competition authorities' activities. This section summarizes the legislative and other activities related to NCAs.

⁶Assembly Bill 1076 and Senate Bill 699. This revision is in response to the state Supreme Court decision in *Edwards v. Arthur Andersen LLP* on August 7, 2008.

⁷On 23 Apr. 2024. <https://www.ftc.gov/news-events/news/press-releases/2024/04/ftc-announces-rule-banning-noncompetes>, and on 4 Jan. 2023. <https://www.ftc.gov/legal-library/browse/federal-register-notice/non-compete-clause-rulemaking>.

⁸On May 30, 2023, the NLRB pointed out that the non-compete clause could be problematic under the National Labor Relations Act (NLRA) if left unchecked.

⁹19 Apr., 2023, Summarizing a strand of researches; namely, Balasubramanian et al. (2022), Starr et al. (2019), Starr et al. (2018), Starr et al. (2021), Balasubramanian et al. (2024), Colvin and Shierholz (2019),

on April 23, 2024.

3 NCA in Japan

3.1 Legally binding of NCA during and after employment in Japan

According to the Article 3.4 of the Labour Contract Act in Japan, both of workers and employers must comply with the labour contract and exercise their rights and fulfil their obligations faithfully and in accordance with *good faith*. More concretely, case law recognises the obligation not to compete during employment, even in the absence of explicit work rules or written covenants. Therefore, while employed, it is possible to be a breach of the labour contract to engage in business activities for oneself or for third parties during working hours, whether or not in a competitive relationship. In addition, even in the worker's free time, any act that causes disadvantage to the employer by making the employer's customers the worker's own customers is possible to be a breach of the non-competition obligation (Okamoto (2021), p.8).

Recently, flexible work arrangements such as part-time and dual employment have been expected to stimulate the development of new technologies, open innovation and entrepreneurship. While many companies prohibit side/dual employment during employment, the government believed that the legal gray area of side/dual employment during employment was hindering the spread of such work styles. To address this, in 2018, the Ministry of Health, Labour and Welfare (MHLW) established the guidelines on the promotion of side and dual work. The guidelines state that “companies that prohibit or uniformly permit side or dual work are required, based on the wishes of the workers, to consider the direction of allowing side/dual employment outside working hours in principle”.

Along with the guidelines, MHLW also revised the Model Work Rule. The new Model Work Rule removed the provision in the Worker Compliance Guidelines that “workers shall not engage in work for other companies without permission”. In addition, the new provision added to the Model Work Rule that describes points to be noted regarding side or dual employment, specifically, the obligation to maintain confidentiality, and addressing concerns about how to ensure non-compete agreements. The Guidelines and the Model Work Rule are not legally binding. However, many obedient Japanese companies rely heavily on the Model Work Rule when revising their own work rules.

The above guidelines and Model Work Rule are notes on secondary and dual employ-

Johnson et al. (2023), Lavetti et al. (2020), Johnson and Lipsitz (2022), Marx (2011). DOJ explained that they have been long interested in labor markets.

ment, not post-employment cases. However, it is recommended that the Model Work Rule describe confidentiality and non-competition obligations. Courts are likely to recognise a non-compete obligation during employment even if it is not stipulated in employment rules or a written agreement, but are less likely to recognise a breach of the non-compete obligation after separation from employment. If the employer wishes to continue the non-competition obligation after the employee's departure from employment, a separate agreement (work rules, contract or covenant) must be concluded (Okamoto (2021), p.28). For this reason, especially since 2018, many companies have clearly stated confidentiality and non-competition obligations in their employment regulations.

3.2 Current status of NCA in Japan

To ascertain the precise circumstances pertaining to NCAs, a household survey was conducted by the Cabinet Office of Japan. Cabinet (2019) reported that 13.0% of all employees stated that they have a non-compete agreement, 9.9% stated that they may have a non-compete agreement and 35.7% stated that they were unsure. Interestingly, the figure who replies that they definitely have NCAs is not much different from those in the United States. According to the results of a similar 2014 survey in the United States, 15.2% of respondents answered 'Yes' to the question of whether a non-competition obligation exists for employers (Starr et al. (2020)). A survey of freelancers conducted by the FTC found that 13% of freelancers who left their previous job were made to agree not to do business with or work for competitors of their previous employer, or had their subsequent employment or business hindered due to unclear confidentiality obligations imposed when they left their previous job (FTC (2018)).

According to our original firm survey conducted in 2023, 13.1% of companies had NCA with their directors, 74.2% did not and 12.7% did not know. On average, firms imposed NCAs on 34% of its employees (Table 2)¹⁰. While there is little difference of having NCA among occupations as well as among industries, large companies tend to have NCA than small-to-medium sized companies.

Of the companies with NCAs, 17.2% were introduced before 2000, 44.8% cumulatively before 2010 and 63.2% cumulatively before 2015. After 2015, 3.6% were introduced in 2016, 3.3% in 2017, 6.1% in 2018, 4.3% in 2019 and 7.1% in 2020, 2.9% in 2021 and 2.2% in 2022. With regard to the content stipulated in NCA, the most common category was the nature

¹⁰The survey asked whether companies had NCAs with their employees for *each* occupation in the company. If all or some of the employees in the occupation had NCA, such occupation of the company in question was counted as having a NCA. The coverage of NCAs in each company is calculated by the number of workers of each occupation as weights.

and scope of work (25.5%), followed by time limits (10.0%) and employee categories (9.4%).

4 Data and empirical model

4.1 Survey design

We combine two distinct data: our original survey and the Basic Survey of Japanese Business Structure and Activities (BSJBSA)¹¹. In order to analyze, we constructed three types of datasets: Cross-section data, Firm-level panel data, and firm-occupation two-way data.

Our original survey was conducted by the authors in January-February 2023. The sample of the survey was selected from the BSJBSA. The questionnaire was sent to 27,510 companies¹², and, among them, 2,698 companies responded to the survey. The response rate was 9.1%. The information on NCA in our analysis comes from this survey data. Since we ask about the year of NCA introduction in the survey, we can use it like panel data, thus allowing for a DD analysis.

Table 1 describes the response bias. The dependent variable is 1 if the sample responded to the survey, 0 otherwise. The higher the number of employees, the larger the sales, the higher the percentage of foreign investment, and the newer the firm, the lower the response probability. There is virtually no bias with respect to parent company ownership and industry.

4.2 Summary statistics in cross-section data

The treatment we are focusing on is NCA. The NCA was asked in two ways in our survey: The question (A) is, specifically, “Please answer which of the 6 following categories of workers or categories of persons concerned the NCA most typically applies to: (1) managerial, (2) professional/technical, (3) clerical, (4) sales and marketing, (5) occupations other than those listed above, (6) client companies and subcontractors, and (7) NCA do not apply to any category”

In the question (B), the firms were asked whether the company’s rules of employment or other regulations provide for NCA for each of the following seven occupations: (1) Manage-

¹¹The BSJBSA is conducted by the Ministry of Economy, Trade and Industry every year. The BSJBSA covers approximately 30,000 companies per year, which have at least 50 employees and capital of at least 30 million yen in the manufacturing, wholesale, retail, and service industries. Corporate attributes such as industry and firm size, and corporate performance such as sales, profit margins, and average wages in our analysis dataset come from BSJBSA.

¹²Of the 29,574 companies surveyed by the BSJBSA, 2,064 companies did not have the variables necessary to send out for the survey.

Table 1: Response bias

VARIABLES	(1) respond	(2) respond	(3) respond
ln(emp)	-0.046*** (0.002)	-0.046*** (0.002)	-0.018*** (0.003)
ln(sales)			-0.024*** (0.003)
foreign investment ratio			-0.001*** (0.000)
year established			-0.000*** (0.000)
parent company ratio			-0.000** (0.000)
Observations	27,510	27,330	27,330
industry FE	NO	YES	YES

Note: The marginal effects of probit estimates are reported. The dependent variable, respond=1 if a firm responded the survey, respond= 0 if a firm were sent the survey but not responded.

rial, (2) professional/technical, (3) clerical, (4) sales and marketing, (5) occupations other than those listed above, (6) new graduates in the above occupations who have been employed for less than three years, (7) client companies and subcontractors. The percentage of workers in each occupation (1)–(5) in a firm are also surveyed. This allows us to calculate the applicable rate of NCA weighted by the percentage of employees by occupation for each company.

Using the answer to those two questions (A) and (B), we developed three indicators for NCA application at a firm level. The first indicator “*DNCA*” is the application of the NCA to the company as a whole. This variable is set to 0 if the answer to the question (A) “NCA do not apply to any category” is “Yes”, and 1 otherwise. The second one is the weighted-NCA using the NCA application status for each type of occupation in (1)–(5) in question (B) above. We represent it “*NCAwgt*”. The third one is the application of the NCA to subcontractors. It is set to 1 if the answer to the question “NCA apply to (7) client companies and subcontractors” in the question (B) is “Yes” and 0 otherwise. Hereafter, it is denoted as “*DNCAcont*”. Table 2 describes the summary statistics of cross-section data in 2023, and it shows that the average of *NCAwgt* is 0.34, *DNCA* is 0.35, and *DNCAcont* is 0.11.

One strand of outcomes we are interested in are related to human resource investment, specifically on-the-job training (OJT), off-the-job training (Off-JT), and self-development.

We also ask about the turnover rate by occupation ¹³. Average turnover rate in a surveyed companies, which is weighted average of workers by occupation, are 4%. The percentage of firms offering Off-JT in at least one occupation with Off-JT is 58%. OJT is surveyed the percentage of OJT to total working hours by occupation. Average percentage of OJT is 9%. Another strand of outcomes we focus are firm performance and wages, such as sales, profits, labor productivity, total payroll, and average wages. Average total sales is 6,752 million yen, ROA is 2%, ordinary profit margin on sales is 4%, average total payroll is 776 million yen, average wage per workers is 4.10 million yen, average labor productivity per worker is 7.16 million yen, and average number of employees is 217.

The sample size after data cleaning is 2,698. Among them, listed companies are 2%, owner-operated companies (where management is also a major stockholder) are 62%, almost all firms are corporation, 23% firms have trade unions, 88% are small-to-medium businesses with fewer than 300 employees, and 44% are manufacturing companies. Average foreign ownership ratio is 0.92%, and percentage of shareholding by parent company is 33.04%.

There is no difference in turnover rate when comparing firms with NCA in at least one occupation (DNCA1) and firms without NCA in any occupation (DNCA0). Firms with NCA have higher implementation rates of OffJT, OJT, and self-development support than those without NCA. Average sales, total payroll, and number of employment are higher for firms with NCA than those without NCA. There is not much difference in the ratios of listed firms, owner-operated firms, unionized firms, small and medium-sized firms, and manufacturing firms.

4.3 Firm-occupation two-way data

In the analysis using firm-occupation two-way data, we simply use the application of the NCA to each occupation category in the question (A) in each firm-occupation. By occupation, the survey asked firms, whether they have workers applied to NCA, turnover rate, Off-JT, OJT, self development, and number of workers. Meanwhile, by company, responses were collected for the year of NCA introduction, the ratio of foreign capital, year of establishment, parent company shareholding ratio, trade secret management rules, and accepting or sending employees for dual employment. As shown in Table 3, NCA implementation weighted average by occupation is 0.36, and turnover rate is 2%. The percentage of OJT provided with a weighting by occupation is 45%, the percentage of OJT provided as a proportion of total working hours is 7%, and the percentage of support for self-development provided is 53%.

¹³The survey asked whether the company has Off-JT, the percentage of total hours worked in OJT, whether there is support for self-development, and the turnover rate in percentages.

Table 2: Summary statistics: Cross-section data

	all		DNCA1		DNCA0	
	mean	sd	mean	sd	mean	sd
NCAwgt	0.34	0.46	0.76	0.38	0.09	0.27
DNCA	0.35	0.48	1.00	0.00	0.00	0.00
DNCAcont	0.11	0.32	0.21	0.41	0.05	0.23
TurnoverRate	0.04	0.04	0.04	0.04	0.04	0.04
DOffJT	0.58	0.49	0.67	0.47	0.53	0.50
OJT	0.09	0.18	0.10	0.19	0.08	0.18
DSelfDevelop	0.60	0.49	0.67	0.47	0.56	0.50
sales	6751.79	20555.81	7815.00	26686.65	6258.22	16765.86
payroll	775.76	1833.42	929.96	2819.78	696.57	990.61
ROA	0.02	0.09	0.02	0.07	0.02	0.10
profitR	0.04	0.07	0.04	0.07	0.03	0.08
average wage	4.10	1.74	4.15	1.52	4.07	1.84
LP	7.16	5.44	7.13	4.05	7.19	6.10
emp	217.33	870.58	275.30	1428.31	188.25	311.78
average training cost	0.01	0.08	0.01	0.02	0.02	0.10
ln(emp)	4.87	0.76	4.93	0.80	4.84	0.74
foreign investment ratio	0.92	8.88	0.72	7.90	1.01	9.31
year established	1969.29	19.89	1970.08	20.46	1968.87	19.59
parent company ratio	33.04	45.20	32.98	45.17	32.93	45.23
year	2021.00	0.00	2021.00	0.00	2021.00	0.00
Dlisted	0.02	0.13	0.02	0.15	0.02	0.13
Downer	0.62	0.49	0.64	0.48	0.61	0.49
corporation	1.00	0.00	1.00	0.00	1.00	0.00
union	0.23	0.42	0.22	0.41	0.23	0.42
DSME	0.88	0.33	0.87	0.34	0.88	0.32
Dmnfc	0.44	0.50	0.43	0.49	0.45	0.50
Observations	2698		918		1721	

Note: The columns “all” are summaries for all samples, the columns “DNCA1” are for firms with DNCA=1, and the columns “DNCA0” are for firms with DNCA=0.

4.4 Firm-level panel data

The firm-level panel data was compiled by merging survey data described above with the BSJBSA. It is unbalanced panel data. Summary statistics is shown in Table 4. The data covers from 1994 to 2021. The data set we use in this analysis contains 51,353 firm-year observations, of which 17,517 of the sample have NCA and 33,836 have no NCA. Many variables in the firm-level panel data, such as NCA, sales, and employment, show similar values in the cross-section data.

The average of NCAwgt is 0.34, DNCA is 0.34, and DNCAcont is 0.11, and average turnover rate is 4%. Average total sales is 6,831 million yen, ROA is 2%, ordinary profit margin on sales is 3%, average total payroll is 753 million yen, average wage per workers

Table 3: Summary statistics: firm-occupation two-way data

	all	
	mean	sd
NCA	0.36	0.48
TurnoverRate	0.02	0.05
DOffJT	0.45	0.50
OJT	0.07	0.18
DOJT	0.47	0.50
DSelfDevelop	0.53	0.50
ln(emp)	2.97	1.26
foreign investment ratio	0.95	9.10
year established	1969.03	20.04
parent company ratio	33.53	45.33
Dafter2018	0.22	0.41
Dsecret	0.27	0.45
Dsidejob	0.14	0.35
Dmnfc	0.46	0.50
Observations	11001	

is 4.20 million yen, average labor productivity per worker is 7.15 million yen, and average number of employees is 200.

4.5 Empirical model

As mentioned in the section 1.1, there are three hypotheses regarding the effects of NCAs on wages and human capital investment. First, NCA could raise firm performance and wages through increased human capital investment. Second, NCA may lead to higher wages as compensation, but it will not boost productivity. Third, NCA may suppress workers' wages by enhancing firms' bargaining power. Since all of these hypotheses are theoretically possible, we will settle the issue empirically.

First, we estimate the effects of NCA on human capital investment of firm i in occupation o using firm-occupation two-way data. The data allows us to control for firm and occupation fixed effects, and hence deal with unobserved firm heterogeneity such as corporate culture, traditions and management quality, as well as unobserved occupation heterogeneity such as skill level and value of human capital investment.

$$\begin{aligned}
 Y_{io} = & \alpha + \beta(NCA)_{io} + \lambda X_{io} \\
 & + firmFE + industryFE + occupationFE + \epsilon_{io}
 \end{aligned}
 \tag{1}$$

Table 4: Summary statistics: Firm-level panel data

	all		DNCA1		DNCA0	
	mean	sd	mean	sd	mean	sd
NCAwgt	0.34	0.46	0.76	0.39	0.10	0.29
DNCA	0.34	0.47	1.00	0.00	0.00	0.00
DNCAcont	0.11	0.31	0.21	0.41	0.06	0.23
NCAwgt_after	0.13	0.32	0.34	0.46	0.00	0.02
DNCA_after	0.13	0.34	0.38	0.49	0.00	0.00
DNCAcont_after	0.03	0.18	0.10	0.30	0.00	0.02
sales	6831.32	15014.30	7503.70	16963.75	6483.20	13885.46
payroll	752.83	1253.36	844.88	1694.80	705.16	943.65
ROA	0.02	0.09	0.02	0.12	0.02	0.07
profitR	0.03	0.09	0.03	0.13	0.03	0.06
average wage	4.20	1.56	4.25	1.47	4.18	1.61
LP	7.15	5.12	7.13	3.68	7.16	5.74
emp	200.08	538.75	228.70	753.81	185.26	381.72
average training cost	0.02	0.20	0.02	0.33	0.02	0.05
ln(emp)	4.89	0.71	4.93	0.75	4.87	0.69
foreign investment ratio	0.64	7.15	0.58	7.11	0.68	7.17
year established	1962.26	79.15	1962.58	82.09	1962.10	77.58
parent company ratio	23.62	40.42	23.32	40.05	23.78	40.61
year	2009.84	7.79	2009.90	7.79	2009.81	7.79
Dafter2018	0.23	0.42	0.23	0.42	0.34	0.48
Dsecret	0.28	0.45	0.38	0.49	0.22	0.42
Dsidejob	0.13	0.34	0.14	0.35	0.13	0.33
Dmnfc	0.47	0.50	0.45	0.50	0.48	0.50
Observations	51353		17517		33836	

Note: The columns “all” are summaries for all samples, the columns “DNCA1” are for firms with DNCA=1, and the columns “DNCA0” are for firms with DNCA=0.

where Y_{io} is outcomes, human capital investment: specifically on-the-job training (OJT), off-the-job training (Off-JT), self-development support, and turnover. $(NCA)_{io}$ takes 1 if NCA is applied to workers of firm i in occupation o , 0 otherwise. X_{io} is a vector of control variables that includes number of employees of firm i in occupation o , foreign capital ratio, year of establishment and percentage of voting rights owned by the parent company. We also control for $firmFE$, $industryFE$, and $occupationFE$ to address heterogeneous unobserved nature of firm, industry, and occupation.

Next, we assume that the effect of NCA is greater in certain types of firms that require more stringent NCA. NCA has contradicting effects on wages in theory; positive effect through increasing human capital investment, and negative effect through weakening bargaining power of workers. The two hypotheses could cancel out the effect of NCA. Therefore, we test the effects of NCA by dividing the sample into two groups, one for which the effect on human capital investment is likely to be large and the other for which the effect on human

capital is subtle. Specifically, the sample is divided by the following criterion: (1) post-2018 and earlier, (2) firms with and without confidentiality provisions, and (3) firms that accept dual employment and those that do not.

As mentioned in the previous section, in January 2018, the Ministry of Health, Labour and Welfare (MHLW) established the “Guidelines for the Promotion of Dual Work”. The guidelines state that, in principle, workers should be allowed to engage in side jobs or second jobs outside of working hours, if they so wish. Along with the guidelines, “Model Work Rule” was presented, and it recommended imposing confidentiality and NCAs. Prior to publishing the guidelines, only the limited number of firms that recognized the importance of NCA, for example, those with high employee turnover or holding trade secrets, would have stipulated NCA in their Employment Regulations. Therefore, prior to 2018, NCAs were likely to be stipulated by firms that feel the threaten by leaking their business information to competitors via their employees. However, after 2018, in accordance with MHLW guidelines, many companies might have included NCA, even if they have little need for NCAs may have begun to prescribe NCAs.

Firms with a general “trade secret management policy” may have more turnovers or more significant business-related confidential matters such as know-how than those without such a policy. Those firms might hesitate from training workers in technical skills without NCA to avoid leaking their important business information. Such firms may experience changes in firm performance as a result of the introduction of NCA. Lavetti et al. (2019) showed that NCAs for physicians decreased the probability of turnover rate and raise earnings. They suggest that the effect comes from the NCA’s deterrence of patient poaching, which has enabled practices to allocate clients to new physicians through in-house referrals.

Firms that allow dual employment are likely to be operating with generic knowledge and skills, or are unlikely to suffer any disadvantage from confidential information being known to competitors. In contrast, companies that do NOT accept dual employment may have a disadvantage due to the leakage of secrets to competing companies. Therefore, we assume that companies which accept dual employment could be severely affected by the introduction of NCA.

$$\begin{aligned}
 Y_{io} = & \alpha + \beta(NCA \times type1)_{io} + \beta(NCA \times type0)_{io} + \lambda X_{io} \\
 & + firmFE + industryFE + occupationFE + \epsilon_{io}
 \end{aligned}
 \tag{2}$$

where *type1* and *type0* are the treated and control groups.

Next, to examine the effects of NCAs on firm performance and wages, we estimate a baseline model using firm-level panel data. We control for firm fixed effects to rule out

unobserved firm heterogeneity, such as firm culture, traditions, and management quality.

$$\begin{aligned} \ln(Y)_{it} = & \alpha + \beta(NCA \times After)_{it} + \gamma(NCA)_{it} + \lambda X_{it} \\ & + firmFE + (industry \times year)FE + \epsilon_{it} \end{aligned} \quad (3)$$

where $\ln(Y)_{it}$ is outcomes of firm i in year t . Y_{it} capture firm sales, ROA, profit ratio, total amount of payroll, average wage per worker, and labor productivity per worker. $(NCA)_{it}$ takes 1 if NCA is applied by the time of the survey, 0 otherwise. $After$ is 1 after the year of introduction of NCA, 0 otherwise. X_{it} is a vector of control variables that includes firm size in employment, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We control for firm fixed effects and interaction terms of industry and year fixed effects to deal with heterogeneous nature of each firm and business cycle in each industry.

Again, we examine the heterogeneous effects of NCA on firm performance and wages: some firms invest human capital more intensively with NCA, while others do not. The model incorporating heterogeneous effects is assumed to be as follows:

$$\begin{aligned} \ln(Y)_{it} = & \alpha + \beta_1(NCA \times type1 \times After)_{it} + \beta_0(NCA \times type0 \times After)_{it} \\ & + \gamma(NCA)_{it} + \lambda X_{it} + firmFE + (industry \times year)FE + \epsilon_{it} \end{aligned} \quad (4)$$

where $type1$ and $type0$ are the same as eq (2).

5 Results

5.1 Effects of NCA on firm performance

Tables 5, 6, and 7 present the estimates controlling for firm fixed effects of equations (3) when we use firm performance, $\ln(\text{sales})$, ROA, profit ratio, $\ln(\text{total payroll})$, $\ln(\text{average wage})$, and $\ln(\text{labor productivity})$, as dependent variables. Independent variables are “DNCA” in Table 5, “NCAwgt” in Table 6, and “DNCAcont” in Table 7.

Columns (4), (5), and (6) in Table 5 show that the estimated coefficients on total payroll, average wage, and labor productivity are positive and statistically significant at the 10% level, suggesting that the introduction of NCA has positive effects on total payroll, average wage, and labor productivity. The estimation results reject the hypothesis that NCA robs bargaining power from employees, but support the hypothesis that NCA provides incentive

to employers for investing human capital. We will explore the relationship on NCA and human capital investment in Section 5.2. The estimated coefficient of NCA on sales are positive and the size of coefficient is about the same as total payroll, average wage and labor productivity as shown in Column (1). Due to the large standard error, the coefficient is not statistically significant. Columns (2)–(3) present that NCA has no impact on ROA and profit ratio.

Using the same model, the estimated coefficients with the independent variable replaced from DNCA to NCAwgt is shown in Table 6. Again, the estimated coefficients on sales, total payroll, average wage, and labor productivity are positive, but not precisely estimated. The results using the alternative indicator for NCA support that the results are not driven by a choice of the NCA variable. The magnitudes of the treatment effects of NCAwgt are similar to those of DNCA. There seems to be no correlation between NCA and sales, ROA, and profit ratio.

Table 7 presents the impacts of NCAcont on firm performance. The estimated coefficients are statistically insignificant, and some coefficients have opposite signs to those of DNCA and NCAwgt. In our survey, we did not ask about the year of NCA introduction, distinguishing between NCA for employees and NCA for subcontractors. It is assumed that respondents are answering the year of NCA introduction for employees. Therefore, we do not consider the results of the NCA estimates for subcontractors to be very reliable.

Table 5: Effects of NCA on firm performance: DNCA

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA_after	0.021 (0.015)	0.000 (0.002)	-0.000 (0.002)	0.020* (0.011)	0.020* (0.011)	0.024* (0.014)
ln(emp)	0.671*** (0.020)	0.003 (0.002)	0.007*** (0.002)	0.790*** (0.014)	-0.210*** (0.014)	-0.232*** (0.016)
foreign investment ratio	0.000 (0.001)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.001)
year established	-0.000** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000** (0.000)	0.000** (0.000)	0.000 (0.000)
parent company ratio	0.000* (0.000)	0.000*** (0.000)	0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000** (0.000)
Observations	50,908	50,707	50,882	50,905	50,905	47,470
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
Dep mean	8.157	0.0188	0.0282	6.247	1.362	1.838

Note: This table shows the results of the estimates of eq.(3). All regressions control for NCA, firm size in employment, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for *firmFE* and (*industry* × *year*)*FE*. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 6: Effects of NCA on firm performance: NCAwgt

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
NCAwgt_after	0.022 (0.019)	0.002 (0.002)	0.003 (0.002)	0.017 (0.014)	0.017 (0.014)	0.022 (0.017)
ln(emp)	0.670*** (0.024)	0.001 (0.002)	0.004** (0.002)	0.797*** (0.016)	-0.203*** (0.016)	-0.225*** (0.019)
foreign investment ratio	0.000 (0.001)	-0.001 (0.000)	0.000 (0.000)	-0.001* (0.000)	-0.001* (0.000)	-0.000 (0.001)
year established	-0.000** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000* (0.000)	0.000 (0.000)
parent company ratio	0.000 (0.000)	0.000*** (0.000)	0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Observations	37,272	37,133	37,251	37,270	37,270	34,699
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
Dep mean	8.141	0.0182	0.0286	6.240	1.367	1.842

Note: This table shows the results of the estimates of eq.(3). All regressions control for NCAwgt, firm size in employment, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for *firmFE* and (*industry* \times *year*)*FE*. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 7: Effects of NCA on firm performance: DNCAcont

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCAcont_after	-0.037 (0.040)	0.004 (0.004)	0.001 (0.005)	-0.024 (0.025)	-0.024 (0.025)	-0.023 (0.033)
ln(emp)	0.671*** (0.022)	0.002 (0.002)	0.006*** (0.002)	0.786*** (0.017)	-0.214*** (0.017)	-0.237*** (0.019)
foreign investment ratio	0.000 (0.001)	-0.001 (0.000)	0.000 (0.000)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
year established	-0.000** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
parent company ratio	0.000 (0.000)	0.000*** (0.000)	0.000** (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000* (0.000)
Observations	39,715	39,558	39,693	39,714	39,714	36,978
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
Dep mean	8.137	0.0181	0.0276	6.215	1.358	1.832

Note: This table shows the results of the estimates of eq.(3). All regressions control for DNCAcont, firm size in employment, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for *firmFE* and (*industry* \times *year*)*FE*. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Tables 8–10 display the heterogeneous effects of NCA on firm performance. DNCA is used as NCA variable for heterogeneity analyses. Table 8 presents the estimates of interaction

terms for NCA and post-2018 and for NCA and pre-2018 on firm performance in eq. (4). The coefficients of interaction terms for NCA and post-2018 on sales, total payroll, average wage, and labor productivity are negative, though statistically insignificant. Negative effects of NCA after 2018 on these firm performance variables are unexpected based on our hypotheses. Whereas, the estimated coefficients of interaction terms for NCA and pre-2018 on total payroll, average wage, and labor productivity are positive and statistically significant at the 5% level. The coefficient of interaction terms for NCA and pre-2018 on sales is also positive, but not statistically significant. The magnitude of coefficients of interaction terms for NCA and pre-2018 on sales, total payroll, average wage, and labor productivity are larger than those in Table 5.

Table 9 presents differences in impacts of NCA on firm performance between firms with Confidentiality Provisions and otherwise as estimated by eq. (2). The estimated coefficients of NCA on total payroll, average wage, and labor productivity with Confidentiality Provisions are positive and statistically significant. The coefficient on sales is also positive, although not precisely estimated. The estimated coefficients of NCA on sales, total payroll, average wage, and labor productivity without Confidentiality Provisions are positive, but statistically insignificant. The sizes of coefficients of interaction terms on NCA for firms without Confidentiality Provisions are smaller than those for firms with Confidentiality Provisions. The results support that firms with Confidentiality Provisions possess more private business information, and therefore, they are relatively benefited by having NCA.

Table 10 shows heterogeneous effects of NCA on firm performance of accepting their employees to hold dual jobs, as estimated by eq. (2). The estimated coefficients of NCA on total payroll, average wage, and labor productivity for firms that do not accept employees' side jobs are positive and statistically significant. The estimated coefficients of NCA on profit ratio for firms allowing dual employment are negative and statistically significant at the 5% level. The results show that firms that do not allow their employees to hold multiple jobs will see an improvement in wages and labor productivity due to the NCA. This suggests that the effect of NCA is greater for companies that could be disadvantaged by leaking confidential information to competitors.

5.2 Effects of NCA on human capital investment

Next, we examine the effects of NCA on human capital investment using the firm-occupation two-way data. Tables 11 shows the estimated coefficients after controlling for firm fixed effects, industry fixed effects and occupation fixed effects as in eq. (1). Column (1) shows that the estimated coefficients of NCA on turnover is statistically insignificant. Column

Table 8: Heterogeneous effects of NCA on firm performance by year: DNCA

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA_Dafter20181_after	-0.012 (0.024)	0.003 (0.004)	0.002 (0.004)	-0.049 (0.030)	-0.049 (0.030)	-0.049 (0.032)
DNCA_Dafter20180_after	0.026 (0.016)	-0.000 (0.002)	-0.000 (0.003)	0.030** (0.012)	0.030** (0.012)	0.034** (0.015)
Observations	50,908	50,707	50,882	50,905	50,905	47,470
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
control	YES	YES	YES	YES	YES	YES
Dep mean	8.157	0.0188	0.0282	6.247	1.362	1.838

Note: This table shows the results of the estimates of eq.(4). All regressions control for NCA, firm size in employment, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for $firmFE$ and $(industry \times year)FE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 9: Heterogeneous effects of NCA on firm performance with and without Confidentiality Provisions: DNCA

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA_Dsecret1_after	0.029 (0.025)	-0.002 (0.003)	0.001 (0.003)	0.031* (0.016)	0.031* (0.016)	0.045** (0.022)
DNCA_Dsecret0_after	0.017 (0.017)	0.002 (0.002)	-0.001 (0.003)	0.012 (0.015)	0.012 (0.015)	0.010 (0.018)
Observations	50,908	50,707	50,882	50,905	50,905	47,470
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
control	YES	YES	YES	YES	YES	YES
Dep mean	8.157	0.0188	0.0282	6.247	1.362	1.838

Note: This table shows the results of the estimates of eq.(4). All regressions control for NCA, firm size in employment, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for $firmFE$ and $(industry \times year)FE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

(2) displays that the estimated coefficients of NCA on Off-JT is positive and statistically significant at the 1% level, suggesting that the firms/occupations with NCA are more likely to offer Off-JT. Column (3) shows that the estimated coefficients of NCA on the OJT hours as a percentage of total hours worked is positive and statistically significant at the 10% level. Column (4) shows that the estimated coefficients of NCA on the probability of providing OJT is positive and statistically significant at the 1% level. The magnitude of coefficient of offering OJT is smaller than that of Off-JT. Column (5) presents that the estimated coefficients of

Table 10: Heterogeneous effects of NCA on firm performance of accepting or sending out concurrent workers: DNCA

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA_Dsidejob1_after	0.030 (0.044)	-0.007 (0.005)	-0.011** (0.004)	0.011 (0.030)	0.011 (0.030)	-0.045 (0.041)
DNCA_Dsidejob0_after	0.020 (0.016)	0.001 (0.002)	0.002 (0.003)	0.021* (0.012)	0.021* (0.012)	0.034** (0.015)
Observations	50,908	50,707	50,882	50,905	50,905	47,470
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
control	YES	YES	YES	YES	YES	YES
Dep mean	8.157	0.0188	0.0282	6.247	1.362	1.838

Note: This table shows the results of the estimates of eq.(4). All regressions control for NCA, firm size in employment, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for $firmFE$ and $(industry \times year)FE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

NCA on the probability that the firm supports the employee’s self development in time or financially is positive and statistically significant at the 1% level. Our results suggest that there are no correlation between NCA and turnover rate, that the firms/occupations with NCA invest more in human capital than those without NCA, and that the effects are greater for general skill investment than for firm-specific skill investment. The fact that there is no effect of NCA on turnover rate does not intuitively explain positive effect on human capital investment. We suppose that the reason for this is that the average turnover rate is only 2.5%, and the variation is too small to measure the effect of the program.

Heterogeneous effects of NCA on human capital investment in eq. 2 are shown in Table 12–14. Column (1) in Table 12 indicates that neither NCA introduced after 2018 nor before 2018 affect turnover rate. In columns (2)–(5), while the estimated coefficients of interaction terms of NCA and post-2018 are positive but statistically insignificant, those of NCA and pre-2017 are positive and statistically significant except column (3). The size of coefficients of interaction terms of NCA and pre-2017 are larger than those of post-2018, and standard errors of interaction terms of NCA and pre-2017 are smaller than those of after 2018. This suggests that firms that established provisions for NCAs after 2018 did not specifically require such provisions, but followed the Model Employment Regulations.

Table 13 presents the heterogeneous effects of NCA for firms with and without confidentiality provisions. There does not appear to be a correlation between NCA and turnover rate in firms with or without confidentiality provisions as shown in column (1) in Table 13. According to columns (2)–(5), the estimated coefficients of NCA on human resource invest-

Table 11: Effects of NCA on human capital investment

VARIABLES	(1) TurnoverRate	(2) DOffJT	(3) OJT	(4) DOJT	(5) DSelfDevelop
NCA	-0.004 (0.005)	0.123*** (0.034)	0.013* (0.008)	0.085*** (0.030)	0.060*** (0.022)
ln(emp)	0.014*** (0.001)	0.044*** (0.005)	0.015*** (0.002)	0.065*** (0.005)	0.023*** (0.003)
Observations	7,770	7,789	7,476	7,476	7,863
industry FE	YES	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES
Dep mean	0.0252	0.498	0.0854	0.539	0.563

Note: This table shows the results of the estimates of eq.(1). All regressions control for firm size in employment by occupation in a firm, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for *firmFE*, *industryFE* and *occupationFE*. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 12: Heterogeneous effects of NCA on human capital investment by year

VARIABLES	(1) TurnoverRate	(2) DOffJT	(3) OJT	(4) DOJT	(5) DSelfDevelop
NCA_Dafter20181	-0.010 (0.011)	0.039 (0.072)	0.007 (0.017)	0.050 (0.076)	0.058 (0.045)
NCA_Dafter20180	-0.003 (0.008)	0.112** (0.053)	0.009 (0.012)	0.070* (0.039)	0.064* (0.035)
Observations	8,909	9,011	8,529	8,529	9,023
industry FE	YES	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES
control	YES	YES	YES	YES	YES
Dep mean	0.0252	0.486	0.0834	0.521	0.558

Note: This table shows the results of the estimates of eq.(2). All regressions control for firm size in employment by occupation in a firm, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for *firmFE*, *industryFE* and *occupationFE*. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

ment in firms with confidentiality provisions are positive and statistically significant at the 1% or 5% level. The estimated coefficients of NCA on human resource investment in firms without confidentiality provisions are also positive but the size of coefficients and statistical significance are a little smaller than those of firms with confidentiality provisions.

Table 14 shows the heterogeneous effects of NCA for firms that allow employees to hold dual jobs, and those that do not. The estimated coefficients of NCA on turnover rate for both firms with and without dual employment are not statistically significant, as indicated in column (1). Column (2) present that the estimated coefficient of NCA for firms accepting

Table 13: Heterogeneous effects of NCA on human capital investment with and without Confidentiality Provisions

VARIABLES	(1) TurnoverRate	(2) DOffJT	(3) OJT	(4) DOJT	(5) DSelfDevelop
NCA_Dsecret1	-0.007 (0.006)	0.183*** (0.066)	0.030*** (0.011)	0.146** (0.067)	0.104** (0.042)
NCA_Dsecret0	-0.003 (0.006)	0.099** (0.039)	0.007 (0.009)	0.061* (0.032)	0.043* (0.025)
Observations	7,770	7,789	7,476	7,476	7,863
industry FE	YES	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES
control	YES	YES	YES	YES	YES
Dep mean	0.0252	0.498	0.0854	0.539	0.563

Note: This table shows the results of the estimates of eq.(2). All regressions control for firm size in employment by occupation in a firm, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for *firmFE*, *industryFE* and *occupationFE*. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

dual workers is positive but statistically insignificant, whereas those that do not allow employees to hold dual jobs is positive and statistically significant at the 1% level. The size of coefficient with dual workers are larger than that without concurrent workers. The results of OJT are positive but the magnitude of the coefficients are twisted, as shown in Columns (3) and (4). Column (5) presents the estimated coefficient of NCA for firms accepting dual employment is negative but statistically insignificant, whereas those that do not accept dual employment is positive and statistically significant at the 1% level. Our results suggest that human capital investment for firm specific skill, using OJT as an indicator, are at the same level in firms with and without dual workers, and that the effect of NCA on human capital investment in general skills, as measured by Off-JT and self-development, is greater in firms that do not allowed employees to hold dual jobs than those that do allow dual employment. Firms that do not allow their employees to hold dual jobs often have more business secrets, and the effects of NCA may be greater in such firms.

6 Conclusion

A NCAs is a contract that imposes a legal obligation on the employee or service provider not to provide labor or services to another competing employer or client during their employment or contract period, or after it ends. We examine the effects of NCAs after retirement/contract termination on wages and human capital investment.

Theoretically, this contract provision is considered to have three distinct effects. First,

Table 14: Heterogeneous effects of NCA on human capital investment of accepting or sending out concurrent workers

VARIABLES	(1) TurnoverRate	(2) DOffJT	(3) OJT	(4) DOJT	(5) DSelfDevelop
NCA_Dsidejob1	0.003 (0.009)	0.061 (0.087)	0.028*** (0.009)	0.067 (0.073)	-0.025 (0.044)
NCA_Dsidejob0	-0.005 (0.005)	0.133*** (0.036)	0.011 (0.009)	0.088*** (0.033)	0.074*** (0.024)
Observations	7,794	7,842	7,490	7,490	7,872
industry FE	YES	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES
control	YES	YES	YES	YES	YES
Dep mean	0.0253	0.498	0.0852	0.538	0.563

Note: This table shows the results of the estimates of eq.(2). All regressions control for firm size in employment by occupation in a firm, foreign capital ratio, year of establishment and percentage of voting rights held by parent company. We also control for *firmFE*, *industryFE* and *occupationFE*. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

NCA's weaken the bargaining power of the employee or service provider vis-à-vis the current employer or client because NCA's limit their other trading opportunities. Second, NCA's raise wage as compensation, but do not improve productivity. Third, because the employee or service provider will not change employers or clients unnecessarily and can expect long-term relationship continuity, the employer or client will feel comfortable investing in general skill that will remain valuable even if the employee or service provider moves to a competitor. Typical examples include the employer's training of the employee and the client's transfer of technology to the subcontractor. If the employee or service provider is likely to move to another competing employer or client, such investments will not be made, as they would simply benefit the competitor. If increasing the competence of one's own or subcontractor's personnel is important to the productivity of the company, then contracts that impose non-compete obligations are not necessarily detrimental to society.

In this paper, we use questionnaire data on firms to examine the relationship between the use of NCA's and human capital investment, wages, and firm performance. The results reveal that (1) human capital investment is higher in firms or occupations that impose NCA's, (2) this relationship is stronger for off-the-job training than for on-the-job training, and (3) the introduction of new NCA's is correlated with higher sales, wages, and labor productivity.

In the U.S., a rule making non-compete agreements illegal was passed at the federal level in April 2024. The stronger coercive and exploitative aspects of NCA's were deemed more likely, but opposition from the U.S. Chamber of Commerce and others has persisted. This paper unveils the effect of NCA on human capital investment. The results of this

paper suggest that if NCAs were made illegal without exception, the disadvantage of underinvestment in human capital might outweigh the advantage of increased bargaining power for employees or service providers in the labor market.

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