Non-compete Agreements: Human Capital Investments or Compensated Wages?

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ABSTRACT

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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.

JEL Classification:	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 among the most important mechanisms tying employees to their employers. Research by Garmaise (2011) and Marx (2011) established that executives and high-skilled tech workers were frequently bound by NCAs. However, a 2014 labor dispute revealed that even low-wage workers at a sandwich chain in Boston were subjected to NCAs, sparking widespread criticism[1].

With nearly 40% of American workers currently or previously subject to NCAs, as highlighted by Starr et al. (2018), concerns over the fairness of these agreements have gained prominence. While NCAs can discourage job changes, they may also incentivize employers to invest in employee training by reducing turnover. Such investments could be essential for productivity growth. Since NCAs can have both restrictive and beneficial effects, understanding their net impact requires empirical research, including analyses of worker mobility, wage growth, and long-term productivity trends.

In this paper, we propose three hypotheses on NCAs that can be tested empirically. The first hypothesis is the "Human capital hypothesis": To prevent workers from leaving their jobs, employers invest more in their workers, leading to higher wages. According to the classical model of (Becker, 1994), general human capital is typically financed by employees, as it is transferable across employers, making it inefficient for companies to bear these costs. However, prior research indicates that companies may bear the costs of general human capital under specific circumstances ((Acemoglu and Pischke, 1999; Dustmann and Schönberg, 2009; Autor, 2001; Booth and Snower, eds, 1996; Fudenberg and Rayo, 2019)). The second hypothesis is the "Compensating wage hypothesis": Although NCAs restrict workers' choices after separation, this restriction is offset by increased wages from their current employer (Garmaise, 2011). The third hypothesis is the "Worker exploitation hypothesis": NCAs reduce workers' outside options, forcing them to accept unfavorable terms of employment (Berry et al., 2019).

These theoretical conjectures can be examined empirically by observing wages and human capital investments. Under the "Human capital hypothesis," both wages and human capital investment would increase. Under the "Compensating wage hypothesis," only wages would increase. Under the "Worker exploitation hypothesis," wages would decline.

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[1]Reports include Huffpost (Oct. 13, 2014): *Jimmy John's Makes Low-Wage Workers Sign 'Oppressive' Noncompete Agreements* (https://www.huffpost.com/entry/jimmy-johns-non-compete_n_5978180?1413230622=.) and others.

In order to examine the validity of these three hypotheses, it is critically important that both wages and human capital investment are precisely observed. However, previous research on NCAs has often relied on worker surveys, which have two major drawbacks. First, it is difficult to analyze the effects of NCA on human capital investment because the workers' survey do not have access to company-level information such as productivity and profits. Second, workers often lack accurate knowledge of NCAs, with a significant share of respondents answering "do not know." For instance, a survey by the Cabinet Office of Japan (COJ) found that 35.7% of workers were uncertain about their NCA status(COJ, 2019). Starr (2019) attempted to address this issue using imputation methods, but results varied depending on the assumptions used.

To overcome these limitations, we conducted a firm-level survey in Japan in 2023. The survey covered topics such as NCAs implementation by company and occupation, investment in human resources (OJT, Off-JT, support for self-development), and employee turnover rates. Firm-level surveys offer the advantage of more accurate information about contract terms, as employers are better informed about these agreements. Additionally, since NCAs are not illegal in Japan, employers are unlikely to manipulate their responses regarding their use.

We merged the survey data with a panel dataset including key performance indicators (e.g., sales, profits, and wages) at the firm level. This approach enabled us to analyze the impact of NCAs on wages and human capital investment simultaneously, addressing an unresolved issue in existing research. Our findings are consistent with the "Human capital hypothesis," emphasizing the pivotal role of firms' investments in human capital as a potential benefit of NCAs."

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 (Manning, 2021b). 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 (Manning, 2021a). 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 (Dobbelaere et al., 2024). 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(Azar and Marinescu, 2024). 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 encouraging 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. Young workers sometimes face liquidity constraints that prevent them from funding their own training. However, in real labor markets, employers often provide 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 workers' general human capital is only based 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.

Two primary methods for empirically investigating the effects of NCAs have been used. 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. In addition, company surveys can collect detailed information on the period of time and target areas that are bound by NCA, as well as information on other labor management policies. Although there is a concern about the manipulation of reports by companies, NCAs are not inherently illegal in Japan, unlike in some states in the United States where NCAs are 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 with individual workers, some of which include NCAs. 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 the smallest, at the 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) of the Labor Policy Council, which is supervised by the Ministry of Health, Labor and Welfare, indicates that among professional occupations, where NCAs would typically apply, only 8.4% of contracts are individualized. In addition, most of the individual conditions are limited to those related to wages, working hours, and leave. Thus, the firm-level survey from Japan is supposed to provide relatively precise information on NCAs.

This research focuses not only on wages but also on human capital investment and its effects of NCAs by conducting a firm-level survey. One unique approach of our survey is that, while it is a firm-level survey, it asks about 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 Literature on NCAs

2.1 Labor law and anti-monopoly

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.

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-trust law [2].

More specifically, in Japan, the existence of an employment contract sharply defines the scope of labor law. Once an employment contract exists between two parties, labor law governs their contractual relationship, irrespective of its specific context. Furthermore,

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[2]However, neither Japan nor the U.S. has explicit provisions regarding mutual exemptions between labor law and antitrust law.

within the framework of labor law, agreements between employers and employees that have *de facto* anti-competitive effects are often permitted to some extent. As a result, antitrust law has not fully eliminated such arrangements. A typical example is severance payment: unlike salary or wages, which are clearly defined and obligatory, severance payments are usually considered gratuitous benefits provided at the employer's discretion based on company policies, financial circumstances, or other factors. This allows employers to use severance payments as a form of leverage or "hostage." Similarly, Japanese labor law has recognized that certain pre-determined damages against workers can be lawful under specific conditions [3]. These contractual arrangements between employers and employees might not be permissible if assessed solely from the perspective of anti-competitive policy.

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 [4]. For example, in the U.S., the government of the State of California revised the regulation on NCAs, effective January 1, 2024 [5]. 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 [6]. With the support of the National Labor Relations Board (NLRB) [7] and Department of Justice (DOJ) [8] , the FTC issued a final rule on April 23, 2024.

2.2   Legal framework on NCA in Japan

According to the Article 3.4 of the Labour Contract Act in Japan, both of workers and employers must comply with the labor contract and exercise their rights and fulfill their

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[3]In 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.

[4]See **?** for a discussion of competition authorities' activities. This section summarizes the legislative and other activities related to NCAs.

[5]Assembly 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.

[6]On 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-notices/non-compete-clause-rulemaking.

[7]On 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.

[8]19 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), **?**, Lavetti et al. (2020), Johnson and Lipsitz (2022), Marx (2011). DOJ explained that they have been long interested in labor markets.

obligations faithfully and in accordance with *good faith*. More concretely, case law recognizes 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 labor contract to engage in business activities for oneself or for third parties during working hours, whether or not there is a conflict of interest. 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 uniformly prohibit 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, provisions have also been added to address concerns about how to ensure confidentiality and non-compete obligations. 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 guidelines and Model Work Rule are notes on dual employment, not post-employment cases. However, it is recommended that the Model Work Rule describe confidentiality and non-competition obligations. Courts are likely to recognize a non-compete obligation during employment even if it is not stipulated in employment rules or a written agreement, but are less likely to recognize a breach of the non-compete obligation after the end of 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.

2.3 Figures of NCA in U.S. and Japan

The U.S. leads the world in research on NCA. Many studies have been conducted on the current situation of the NCA. The percentage of NCA application to U.S. CEOs increased from 64.7% in 1993 to 78.8% in 2010 (Thomas et al., 2015). Prescott et al. (2016) describes that 18% of the U.S. general workers was bound by an NCA in 2014, and 38% agreed to an NCA at some point in their careers. NCAs are more likely to be signed by high-skill, high-wage workers who are involved with trade secrets, but they are also found among low-skill, low-wage workers who are not involved with trade secrets ((Starr, 2021)). According to the 2017 survey, 25% of workers reported being held by the NCA. It was also common among low-wage workers ((Colvin and Shierholz, 2019)). Starr (2021) point out that 10% workers negotiated benefits in exchange for signing an NCA, and 33% were offered an NCA after accepting a job offer .

In Japan, to ascertain the precise circumstances pertaining to NCAs, a household survey was conducted by the Cabinet Office of Japan (COJ). COJ (2019) reported that 13.0% of all employees stated that they have a NCA, 9.9% stated that they may have a NCA 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 Japan Fair Trade Commission (JFTC) 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 (FTCJ (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% were unknown. On average, firms imposed NCAs on 34% of its employees (Table 1) [9]. 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.

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[9]The 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.

With regard to the content stipulated in NCA, the most common category was the nature and scope of work (25.5%), followed by time limits (10.0%) and employee categories (9.4%).

3 Data and empirical model

3.1 Survey design

We combine two distinct data: our original survey and the Basic Survey of Japanese Business Structure and Activities (BSJBSA). The BSJBSA is conducted by the Ministry of Economy, Trade and Industry every year. In order to analyze, we constructed three types of datasets: cross-section data, firm-occupation two-way data, and firm-level panel data.

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.

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 companies[10], and, among them, 2,698 companies responded to the survey. The response rate was 9.1%. Response bias is discussed in the A.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 Difference-in-Difference analysis.

3.2 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) Managerial, (2) professional/technical, (3) clerical, (4) sales and marketing, (5) occupations other

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

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 answers to those two questions (A) and (B), we developed two 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". Table 1 describes the summary statistics of cross-section data in 2023, and it shows that the average of NCAwgt is 0.34, and DNCA is 0.35.

One strand of outcomes we are interested in is 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 [11]. The average turnover rate in surveyed companies, which is the weighted average of workers by occupation, is 4%. Though average turnover rates were continuous variable in the original survey, as you can see in Figure A1, there is 40% of almost zero responses, so the estimation used a discrete variable. "Dturnover" is defined as 0 if there were no employees who left the company in the previous year, and 1 if there were one or more employees who left the company. The percentage of companies that provide Off-JT in at least one occupation ("DOffJT") is 58%. OJT is the percentage of total working hours spent on OJT, by occupation. The average percentage of OJT ("OJT") is 9%. "DOJT" is a discrete variable that takes 0 if the time spent on OJT is zero, and 1 if it is greater than 0. As shown in Figure A2, there is 80% of firms' response almost zero, so a discrete variable is used in the estimations. About 60% companies support self-development for their employees in at least one occupation ("DSelfDevelop"). While there is little difference in OJT and turnover rate between firms with and without NCA, firms with NCA offer much more Off-JT and self-development support than those without.

Another strand of outcomes are firm performance and wages; namely, sales, profits, total payroll, average wages, and labor productivity. Average total sales ("sales") is 6,752 million yen, ROA ("ROA") is 2%, operating income margin ("profitR") is 4%, average total payroll ("payroll") is 776 million yen, average wage per workers ("average_wage") is 4.10 million yen, average labor productivity per worker ("LP") is 7.16 million yen, and average number of employees ("emp") is 217. Average sales, total payroll, and number of employment are

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

higher for firms with NCA than those without NCA, implying that firms with NCA are larger than those without.

The sample size after data cleaning is 2,698. The average foreign ownership ratio ("foreign investment ratio") is 0.92%, and the percentage of shareholding by the parent company ("parent company ratio") is 33%. Among them, 88% are small-to-medium businesses with fewer than 300 employees ("DSME"), and 44% are manufacturing companies ("Dmnfc"). There is not much difference in the percentage of small and medium-sized firms, and manufacturing firms between firms with and without NCA.

Table 1: Summary statistics: Cross-section data

	all		DNCA1		DNCA0	
	mean	sd	mean	sd	mean	sd
DNCA1	0.35	0.48	1.00	0.00	0.00	0.00
NCAwgt1	0.34	0.46	0.76	0.38	0.09	0.27
DTurnover	0.85	0.35	0.87	0.34	0.85	0.36
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
DOJT	0.09	0.29	0.09	0.29	0.09	0.29
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
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
payroll	775.76	1833.42	929.96	2819.78	696.57	990.61
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
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
Dafter2018	0.06	0.25	0.23	0.42	0.00	0.00
Dsecret	0.28	0.45	0.37	0.48	0.23	0.42
Dsidejob	0.13	0.34	0.15	0.36	0.12	0.33
Dperiod	0.10	0.30	0.28	0.45	0.00	0.00
Darea	0.02	0.15	0.07	0.25	0.00	0.00
DSME	0.88	0.33	0.87	0.34	0.88	0.32
Dmnfc	0.44	0.50	0.43	0.50	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.

3.3 Firm-occupation two-way data

In the analysis using firm-occupation two-way data, we use the implementation status of the NCA for each occupation category in question (B) 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, the year of NCA introduction, the ratio of foreign capital, the year of establishment, the parent company shareholding ratio, trade secret management rules, and dual employment policy are measured by the company-level. As shown in Table 2, the NCA implementation weighted average by occupation is 0.36, and the 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%, the percentage of OJT implemented is 47%, and the percentage of support for self-development provided is 53%.

Table 2: Summary statistics: firm-occupation two-way data

	all	
	mean	sd
NCA	0.36	0.48
DTurnover	0.38	0.49
DOffJT	0.45	0.50
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	0.06	0.25
Dsecret	0.27	0.45
Dsidejob	0.14	0.35
Dperiod	0.10	0.30
Darea	0.02	0.15
DSME	0.88	0.33
Dmnfc	0.46	0.50
Observations	11001	

3.4 Firm-level panel data

The firm-level panel data was compiled by merging the survey data described above with the BSJBSA. It is unbalanced panel data. Summary statistics are shown in Table 3. 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, and DNCA is 0.34. 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 worker is 4.20 million yen, average labor productivity per worker is 7.15 million yen, and average number of employees is 200.

Table 3: Summary statistics: Firm-level panel data

| | all | | DNCA1 | | DNCA0 | |
	mean	sd	mean	sd	mean	sd
DNCA1	0.34	0.47	1.00	0.00	0.00	0.00
NCAwgt1	0.34	0.46	0.76	0.39	0.10	0.29
sales	6831.32	15014.30	7503.70	16963.75	6483.20	13885.46
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
payroll	752.83	1253.36	844.88	1694.80	705.16	943.65
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
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
Dafter2018	0.06	0.24	0.23	0.42	0.00	0.00
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
Dperiod	0.09	0.29	0.27	0.45	0.00	0.00
Darea	0.02	0.15	0.07	0.25	0.00	0.00
DSME	0.88	0.32	0.87	0.33	0.89	0.31
Dmnfc	0.47	0.50	0.46	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.

3.5 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, as well as turnover rate, of firm i in occupation o using firm-occupation two-way data. The data allows us to control for both firm and occupation fixed effects. In other words, it addresses unobserved firm heterogeneity such as corporate culture, traditions, and management quality, as well as unobserved occupation heterogeneity in terms of the competitive environment in the labor market, skill levels, and the value of human capital investment.

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

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 the number of employees of firm i in occupation o. Z_i is a vector of foreign capital ratio, year of establishment, and percentage of voting rights held by the parent company. We also control for $firmFE$, $industryFE$, and $occupationFE$ to address the 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; a positive effect through increasing human capital investment, and a negative effect through weakening the 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, (3) firms that have generous/conservative dual employment policy, (4) firms that have NCA with fixed period restriction and without a fixed period, and (5) firms with and without specific target areas in NCA.

As mentioned in section 2, in January 2018, the Ministry of Health, Labour and Welfare (MHLW) established the "Guidelines for the Promotion of Dual Work", and following this, the model employment regulations were revised. Although the model employment regulations are not legally binding, Japanese companies often refer to them when revising their own employment regulations. The guidelines state that, in principle, workers should be allowed

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to engage in side jobs or second jobs outside of working hours, if they so wish[12]. The model employment regulations state that if a worker's employment at a competing company harms the legitimate interests of their own company, the company may prohibit or restrict side jobs or second jobs. Before the guidelines were published, only companies that needed NCA, such as companies with high employee turnover or companies that hold trade secrets, included NCA in their employment regulations. Therefore, prior to 2018, NCAs were likely to be stipulated by firms that were threatened by leaking their business information to competitors via their employees. However, from 2018 onwards, the default settings have changed in accordance with the guidelines of the MHLW. Many companies might have included NCAs, 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 to train 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. (2020) showed that NCAs for physicians decreased the probability of turnover rate and raised 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 have generous dual employment policy 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 have a conservative dual employment policy may have a disadvantage due to the leakage of secrets to competing companies. Therefore, we assume that companies that accept dual employment could be severely affected by the introduction of NCA.

Firms that do not have a set period of time for which employees are bound to NCA in their regulations can expect to have a lower employee turnover rate than those that do specify it. Similarly, companies that do not specify the regions covered by the NCA in their NCA clauses are expected to have a lower turnover rate than those that do. As a result, companies with strong NCA are more likely to increase their investment in human capital for their employees. The effect is expected to be greater in general training than in company-specific training.

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[12]One of the reasons for the stagnation of Japan's economic growth is the rigidity of the labor market, and the government expressed its intention to promote greater worker mobility in order to stimulate economic growth.

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

where $type1$ and $type0$ are the treatment 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.

$$ln(Y)_{it} = \alpha + \beta(NCA \times After)_{it} + \lambda X_{it} \\ + firmFE + (industry \times year)FE + \epsilon_{it} \tag{3}$$

where $ln(Y)_{it}$ is outcomes of firm i in year t. Y_{it} captures 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 the parent company. We control for firm fixed effects to deal with the heterogeneity of firm characteristics that are time-invariant, such as corporate culture and management skills. We also control for interaction terms of industry and year fixed effects, which allows us to address the heterogeneous nature of industries, such as the business cycle and competitive conditions in the labor market in each industry from year to year.

Again, we examine the heterogeneous effects of NCA on firm performance and wages: Some companies invest more intensively in human capital because they impose NCA. As a result of human capital investment, wages and productivity would increase. The model incorporating heterogeneous effects is assumed to be as follows:

$$ln(Y)_{it} = \alpha + \beta0(NCA \times type0 \times After)_{it} + \beta1(NCA \times type1 \times After)_{it} \\ + \lambda X_{it} + firmFE + (industry \times year)FE + \epsilon_{it} \tag{4}$$

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

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4 Results

4.1 Effects of NCA on human capital investment

First, we examine the effects of NCA on human capital investment using the firm-occupation two-way data. The two-way data allows us to estimate the impacts of NCA on human capital investment and turnover rate after controlling for firm fixed effects as well as occupation fixed effects.

Table 4 shows the estimated coefficients after controlling for firm fixed effects, industry fixed effects, and occupation fixed effects as in eq. (1). As shown in Column (1) in Table 4, the estimated coefficient of NCA on job turnover is statistically insignificant. Column (2) displays the effect of NCA on Off-JT. The estimated coefficient 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 the estimated coefficients of NCA on the probability of providing OJT. It is also positive and statistically significant at the 1% level. Column (4) presents the estimated coefficients of NCA on the probability that the firm supports the employee's self-development in time or financially. The coefficient is positive and statistically significant at the 1% level.

Appendix Tables A4–A9 show the effects of NCAs on human capital investment in OLS models, which does not control for firm FE. Our main results are qualitatively consistent with the OLS results.

Our results suggest 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 job turnover does not intuitively explain the positive effect on human capital investment. There are two possible reasons for this: The first reason is that the average turnover rate is only 2.5%, and the variation is too small to measure the effect of the program. The second one is explained by the asymmetry of information between firms and employees regarding the application of the NCA. Firms have accurate information about NCA contracts and make human capital investments with the expectation that the NCA will reduce the turnover rate of workers covered by the NCA. However, as explained in Section sec:review, in general, workers do not know whether or not they are covered by the NCA. Because employees do not have precise information about NCA contracts, NCA does not affect the actual turnover rate.

Again, the estimated coefficient of turnover is statistically insignificant.

Heterogeneous effects of NCA on human capital investment in eq.(2) are shown in Tables 5–9. Table 5 presents the estimates of interaction terms for NCA and post-2018 (Dafter20181) and for NCA and pre-2018 (Dafter20180) on human capital investment in

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Table 4: Effects of NCA on human capital investment

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA	-0.005	0.123***	0.085***	0.060***
	(0.039)	(0.034)	(0.030)	(0.022)
ln(emp)	0.215***	0.044***	0.065***	0.023***
	(0.006)	(0.005)	(0.005)	(0.003)
Observations	7,770	7,789	7,476	7,863
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	YES	YES	YES	YES
Dep mean	0.424	0.498	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 the 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 * $p < 0.1$.

eq. (2). The estimated coefficients for turnover of cross-term for NCA and pre-2018 are statistically insignificant. The same is true with the coefficients for NCA and post-2018. In columns (2)–(4), while the estimated coefficients of the interaction term between NCA and pre-2018 are positive and statistically significant, those of NCA and post-2018 are positive but statistically insignificant. The magnitudes of coefficients of cross terms between NCA and pre-2018 are larger than those of post-2018, especially in Off-JT. This suggests that the NCA has little effect on companies that established NCA regulations after 2018 i.e. the revision of the guideline. Our hypothesis is that those companies have never needed such regulations in particular, and are simply following the Ministry's model employment regulations in a formal way. Whereas, companies that introduced NCA before 2018 may have already had economic reasons to introduce NCA to protect some type of general human capital that might have been confiscated by other firms without any contractual restriction. In particular, the effect of general training, proxied by Off-JT, is greater than that of firm-specific training, proxied by OJT.

Table 6 presents the heterogeneous effects of NCA for firms with confidentiality provisions (Dsecret1) and without it (Dsecret0) . There appears to be no correlation between NCA and the firm's employee turnover rate, regardless of imposing a confidentiality clause as shown in column (1) in Table 6. According to columns (2)–(4), the estimated coefficients of NCA on human resource investment in firms with confidentiality provisions are positive and statistically significant at the 1% or 5% level. The estimated coefficients of NCA on human capital investment in firms without confidentiality clauses are also positive and partially

Table 5: Heterogeneous effects of NCA on human capital investment by year

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA1_Dafter20180	-0.022	0.137***	0.086**	0.057**
	(0.049)	(0.041)	(0.035)	(0.027)
NCA1_Dafter20181	0.090	0.041	0.054	0.060
	(0.080)	(0.072)	(0.078)	(0.046)
Observations	7,095	7,082	6,877	7,176
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	YES	YES	YES	YES
control	YES	YES	YES	YES
Dep mean	0.422	0.496	0.540	0.555

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 the 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 * $p < 0.1$.

statistically significant. However the size of coefficients and statistical significance are, on the whole, slightly smaller than those of companies with confidentiality clauses.

Table 6: Heterogeneous effects of NCA on human capital investment with/without Confidentiality Provisions

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA1_Dsecret0	0.021	0.099**	0.061*	0.043*
	(0.048)	(0.039)	(0.032)	(0.025)
NCA1_Dsecret1	-0.070	0.183***	0.146**	0.104**
	(0.062)	(0.066)	(0.067)	(0.042)
Observations	7,752	7,776	7,468	7,852
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	YES	YES	YES	YES
control	YES	YES	YES	YES
Dep mean	0.424	0.498	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 the 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 7 shows the heterogeneous effects of NCA on human capital investment of firms

that adopt a generous(Dsidejob1)/conservative(Dsidejob0) dual employment policy. The estimated coefficients of NCA on turnover rate for both groups are not statistically significant, as indicated in column (1). The estimated coefficient of NCA on Off-JT, OJT, and supports for self-development for firms that do not allow their employees to hold dual jobs is positive and statistically significant at the 1% level as shown in Columns (2)–(4). The coefficients of NCA for off-JT and OJT at firms that adopt the dual employment system are positive but are statistically insignificant. The estimated coefficient of NCA on support for self-development for firms that accept employees with dual jobs is negative, although it is not statistically significant. The values of the NCA coefficient on human capital investment for companies with conservative dual employment policies are larger than those for companies with generous dual employment policies. Our results suggest that human capital investment for a firm specific skill, using OJT as an indicator, is at the same level in firms with conservative/generous dual employment policy, while the effect of NCA on human capital investment in general skills, as measured by Off-JT, is greater in firms with conservative dual employment policy than those with generous dual employment policy. As shown in the decision of Hashimoto Transportation Inc. (28, April 1972), firms that do not allow their employees to hold dual jobs often have more business secrets. Our results are consistent that the effects of NCA may be greater in such firms.

Table 7: Heterogeneous effects of NCA on human capital investment for firms with generous/conservative dual employment policy

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA1__Dsidejob0	0.004	0.133***	0.088***	0.073***
	(0.043)	(0.036)	(0.033)	(0.024)
NCA1__Dsidejob1	-0.064	0.062	0.067	-0.025
	(0.081)	(0.087)	(0.073)	(0.044)
Observations	7,728	7,717	7,454	7,837
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	YES	YES	YES	YES
control	YES	YES	YES	YES
Dep mean	0.425	0.498	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 the 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 8 shows heterogeneous effects of NCA on human capital investment depending on

the inclusion of a binding period in NCA. Dperiod1 is specified when the NCA clause stipulates the period of application of NCA restrictions after leaving employment, and Dperiod0 is specified when the period of restriction is not specified. Regardless of whether there are regulations on the period of time bound by NCA, the estimated coefficients of NCA on turnover rate are not statistically significant, as indicated in column (1). The estimated coefficient of NCA on Off-JT, OJT, and supports for self-development for firms that do not specify the period of effective time of NCA is positive and statistically significant at the 1% level as shown in Columns (2)–(4). The coefficient for human capital investment in companies with fixed periods of NCA is rather negative, though not statistically significant. The size of the NCA coefficients for human capital investment in companies with no fixed period of NCA are larger than those for companies with a fixed period of NCA. Our evidence suggests that human capital investment is larger among firms with strong NCA which is written in more favor of firms, especially in general human capital investment, proxied by Off-JT. Companies with strict NCA regulations can invest more in their employees' general human capital without worrying about them leaving. When an NCA with no fixed term is imposed, compared to when the NCA has a fixed validity period, companies form the expectation that the rate of employee turnover will be reduced, leading to an increase in human capital investment.

Table 8: Heterogeneous effects of NCA on human capital investment of NCA period

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA1_Dperiod0	0.005	0.177***	0.098***	0.077***
	(0.045)	(0.040)	(0.038)	(0.026)
NCA1_Dperiod1	-0.043	-0.009	0.049	-0.001
	(0.078)	(0.058)	(0.049)	(0.032)
Observations	7,702	7,728	7,412	7,798
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	YES	YES	YES	YES
control	YES	YES	YES	YES
Dep mean	0.425	0.499	0.539	0.562

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 the 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 9 shows a heterogeneous effect of NCA on human capital investment depending on the inclusion of a specified target area in NCA. When the NCA clause specifies a restricted area for the NCA, Darea1 is used, and when no restricted area is specified, Darea0 is used.

Again, the estimated coefficients of NCA on job turnover are statistically insignificant, as shown in column (1), regardless of whether there are any areas subject to NCA restrictions. The estimated coefficient of NCA on human capital for firms that do not specify the area restricted by NCA is positive and statistically significant at the 1% level as shown in Columns (2)–(4). The coefficients of Off-JT and support for self-investment for companies that have specified regions at NCA are negative, though statistically insignificant. The results of OJT of firms with stipulated regions on NCA are positive and statistically insignificant. The size of the NCA coefficients for human capital investment in companies with no specified area of NCA are larger than those for companies with a specified area of NCA. Similar to the results on NCA with no effective durations shown in Table 8, our estimates suggest that human capital investment is larger for firms with more comprehensive NCA with no area specification for its effects, especially in general human capital investment, proxied by Off-JT and support for self-development. Companies with strict NCA regulations can invest more in their employees' general human capital without worrying about them leaving.

Table 9: Heterogeneous effects of NCA on human capital investment of NCA area

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA1_Darea0	0.007	0.153***	0.093***	0.067***
	(0.041)	(0.035)	(0.033)	(0.021)
NCA1_Darea1	-0.126	-0.117	0.015	-0.036
	(0.121)	(0.082)	(0.077)	(0.070)
Observations	7,702	7,728	7,412	7,798
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	YES	YES	YES	YES
control	YES	YES	YES	YES
Dep mean	0.425	0.499	0.539	0.562

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 the 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 * $p < 0.1$.

4.2 Effects of NCA on firm performance

Next, we examine the effects of NCA on firm performance using the panel data. Tables 10 – 11 present the estimates controlling for firm fixed effects of equations (3), where we use firm performance, such as ln(sales), ROA, profit ratio, ln(total payroll), ln(averege wage),

and ln(labor productivity) as dependent variables, and "DNCA", which takes 1 if NCA is applied in the company, as independent variables in Table 10. [13]

Columns (4), (5), and (6) in Table 10 show the estimated coefficients on total payroll, average wage, and labor productivity, respectively. They 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. These results are consistent with evidence obtained in 4.1. The results support that NCAs promote human capital investment and lead to an improvement in firm performance. In other words, the hypothesis that NCA deprives employees of their bargaining power is rejected. As shown in Column (1), the estimated coefficient of NCA on sales is positive and the size of the coefficient is about the same as total payroll, average wage, and labor productivity. The coefficient is not statistically significant at the 10% level. Columns (2)–(3) present that NCA has no impact on ROA and profit ratio. The results of the robustness check validation by changing the NCA index are reported in the Appendix A.3.

Table 10: Effects of NCA on firm performance

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_after	0.021	0.000	-0.000	0.020*	0.020*	0.024*
	(0.015)	(0.002)	(0.002)	(0.011)	(0.011)	(0.014)
ln(emp)	0.671***	0.003	0.007***	0.789***	-0.211***	-0.233***
	(0.020)	(0.002)	(0.002)	(0.014)	(0.014)	(0.017)
foreign investment ratio	0.000	-0.000	0.000	0.000	0.000	0.000
	(0.001)	(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	50,853	50,652	50,827	50,850	50,850	47,416
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
Dep mean	8.156	0.0188	0.0282	6.247	1.363	1.839

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 the 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 12–16 display the heterogeneous effects of NCA on firm performance. DNCA is used as an NCA variable for heterogeneity analyses. Table 12 presents the estimates of inter-

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[13]Table 11 is the estimation results using balanced panel data. The signs of coefficients and statistical significance are quite similar to those using all samples.

Table 11: Effects of NCA on firm performance (balanced panel data)

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_after	0.021	0.001	0.002	0.029**	0.029**	0.034**
	(0.016)	(0.002)	(0.002)	(0.012)	(0.012)	(0.015)
ln(emp)	0.671***	0.002	0.005***	0.796***	-0.204***	-0.224***
	(0.023)	(0.002)	(0.002)	(0.015)	(0.015)	(0.018)
foreign investment ratio	-0.001	-0.000	0.000	-0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
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	41,072	40,912	41,047	41,069	41,069	38,295
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
Dep mean	8.123	0.0192	0.0284	6.238	1.371	1.845

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 the 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 * $p < 0.1$.

action terms for NCA and post-2018 (Dafter20181) and for NCA and pre-2018 (Dafter20180) 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. The coefficients for NCA and post-2018 on profits are not statistically significant at all. 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 coefficients for NCA and pre-2018 on profits are not statistically significant at all. The magnitude of coefficients of interaction terms for NCA and pre-2018 on sales, total payroll, average wage, and labor productivity are almost the same around 3%, and larger than those in Table 10. After 2018, the default setting for NCA has changed. Prior to 2018, only firms that required the provisions for NCA, for example, those with high turnover rates and/or trade secrets, stipulated NCA in their Employment Regulations. However, after 2018, even firms that did not specifically require provisions for NCA are likely to have stipulated NCA following the Model Employment Regulation. For companies that introduced NCA before 2018, positive effects are seen on wages, labor productivity, and sales, as well as on human capital investment. However, there are

no such effects for companies that introduced NCA after 2018 according to the guidelines.

Table 12: Heterogeneous effects of NCA on firm performance by year

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_Dafter20180_after	0.026	0.000	0.002	0.027**	0.027**	0.035**
	(0.017)	(0.002)	(0.002)	(0.012)	(0.012)	(0.016)
DNCA1_Dafter20181_after	-0.012	0.003	0.003	-0.047	-0.047	-0.045
	(0.024)	(0.004)	(0.004)	(0.030)	(0.030)	(0.032)
Observations	46,078	45,895	46,053	46,076	46,076	42,934
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	8.135	0.0188	0.0283	6.232	1.363	1.840

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 the 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 13 presents differences in the impacts of NCA on firm performance between firms with confidentiality provisions (Dsecret1) and without them (Dsecret0) as estimated by eq. (4). The estimated coefficients of NCA among firms with confidentiality provisions on total payroll, average wage, and labor productivity are positive and statistically significant. The coefficient of NCA for firms with confidentiality clauses on sales is also positive, but it is not even slightly statistically significant. The coefficients for NCA for firms with confidentiality provisions on profits are not statistically significant at all. The estimated coefficients of NCA on sales, total payroll, average wage, and labor productivity among firms that do not have confidentiality provisions are positive but statistically insignificant. The coefficients for NCA for firms without confidentiality clauses on profits are not statistically significant at all. The size of the coefficient for the NCA interaction term for companies without confidentiality clauses is considerably smaller than for companies with confidentiality clauses. The results are consistent with the results that firms with confidentiality provisions invest more in human capital.

Table 14 shows heterogeneous effects of NCA on firm performance that allow their employees to hold dual jobs (Dsidejob1) and those that do not (Dsidejob0), as estimated by eq. (4). The estimated coefficients of NCA on total payroll, average wage, and labor productivity for firms with conservative policies about dual employment on their employees are positive and statistically significant. The estimated coefficients of NCA on sales for firms that do not have a policy of allowing employees to hold multiple jobs is positive, but not

Table 13: Heterogeneous effects of NCA on firm performance with/without Confidentiality Provisions

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_Dsecret0_after	0.017	0.002	-0.001	0.011	0.011	0.009
	(0.017)	(0.002)	(0.003)	(0.015)	(0.015)	(0.018)
DNCA1_Dsecret1_after	0.029	-0.002	0.001	0.032*	0.032*	0.045**
	(0.026)	(0.003)	(0.003)	(0.016)	(0.016)	(0.022)
Observations	50,720	50,519	50,694	50,717	50,717	47,289
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	8.153	0.0188	0.0282	6.246	1.363	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 the 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 * $p < 0.1$.

statistically significant. The estimated coefficients of NCA on profits for firms that do not accept dual jobs are statistically insignificant. The estimated coefficients of NCA on total payroll, average wage, and sales for firms with generous dual employment policies are positive but statistically insignificant. The estimated coefficients of NCA on labor productivity and ROA for firms that allow their employees to have dual employment are negative but not 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 with conservative policies engaging dual employment for their employees see an improvement in wages, labor productivity, and sales after introducing NCA, while those with lenient policies on dual employment show relatively negative effects on profit and labor productivity. This suggests that the effect of NCA is greater for companies that could be disadvantaged by leaking confidential information to competitors.

Table 15 shows heterogeneous effects of NCA on firm performance between firms that have introduced NCA with fixed period restriction (Dperiod1) and without it (Dperiod0) as estimated by eq. (4). The estimated coefficients of the interaction term between NCA and firms without fixed period restriction on total payroll, average wage, and labor productivity are positive and statistically significant at the 10% level. The coefficient for the interaction term with NCA in firms that have signed NCA with no limited period is also positive, but it is not statistically significant. The coefficients for the interaction term of NCA for firms with NCA without a limited period on profits are not statistically significant at all. The estimated

Table 14: Heterogeneous effects of NCA on firm performance for firms with generous/conservative dual employment policy

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_Dsidejob0_after	0.021	0.001	0.002	0.022*	0.022*	0.034**
	(0.016)	(0.002)	(0.003)	(0.012)	(0.012)	(0.015)
DNCA1_Dsidejob1_after	0.030	-0.007	-0.011**	0.012	0.012	-0.044
	(0.044)	(0.005)	(0.004)	(0.030)	(0.030)	(0.042)
Observations	49,823	49,624	49,798	49,820	49,820	46,472
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	8.148	0.0185	0.0281	6.239	1.363	1.839

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 the 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 * $p < 0.1$.

coefficients of NCA on sales, total payroll, average wage, and labor productivity among firms that have fixed period restrictions with NCA are positive but statistically insignificant. The coefficient of the cross terms of NCA for the profits of companies with fixed-term restrictions is negative, but not statistically significant. The size of the coefficient for the NCA interaction term for companies that have introduced NCA without fixed period restriction is slightly larger than for companies with fixed period restriction. The results show that companies with strong NCA provisions improved their labor productivity and sales, and wages also increased, but the increase in wages was lower than the increase in labor productivity, so it is clear that they benefited relatively more from the introduction of NCA.

Table 16 shows the results of estimation of the difference in the impact of NCA on firm performance between companies with specific target areas in NCA (Darea1) and companies without such areas (Darea0) by eq. (4). The estimated coefficients of the interaction term of NCA among firms that have not set designated target regions on total payroll, average wage, and labor productivity are positive and statistically significant at the 10% level. The coefficient for the cross-term with NCA in firms that have signed NCA with no limited area is also positive, but it is not statistically significant. The coefficients for the interaction term of NCA for firms with NCA without a designated target area on profits are not statistically significant at all. The estimated coefficients of interaction terms of NCA on sales, total payroll, average wage, and labor productivity among firms that set designated areas with NCA are positive but statistically insignificant. The coefficient of the cross terms of NCA

Table 15: Heterogeneous effects of NCA on firm performance of NCA period

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_Dperiod0_after	0.019	0.001	0.003	0.022*	0.022*	0.032*
	(0.019)	(0.002)	(0.002)	(0.013)	(0.013)	(0.016)
DNCA1_Dperiod1_after	0.026	-0.002	-0.005	0.016	0.016	0.007
	(0.023)	(0.003)	(0.004)	(0.019)	(0.019)	(0.026)
Observations	50,853	50,652	50,827	50,850	50,850	47,416
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	8.156	0.0188	0.0282	6.247	1.363	1.839

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 the 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 * $p < 0.1$.

for the profits of companies with fixed target areas is statistically insignificant. The sizes of the coefficient for the NCA cross term for firms that have signed NCA with no limited area are not necessarily larger than for firms with fixed area restriction, but standard errors are much smaller, and therefore statistically significant. The results showed that companies with strong NCA regulations improved their labor productivity, sales, and wages, and gained relatively more benefits from introducing NCA.

Table 16: Heterogeneous effects of NCA on firm performance of NCA area

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_Darea0_after	0.021	0.000	0.000	0.020*	0.020*	0.025*
	(0.016)	(0.002)	(0.002)	(0.011)	(0.011)	(0.014)
DNCA1_Darea1_after	0.027	0.001	-0.004	0.022	0.022	0.010
	(0.040)	(0.005)	(0.008)	(0.041)	(0.041)	(0.058)
Observations	50,853	50,652	50,827	50,850	50,850	47,416
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	8.156	0.0188	0.0282	6.247	1.363	1.839

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 the 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 * $p < 0.1$.

5 Conclusion

An NCA 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, NCAs weaken the bargaining power of the employee or service provider vis-à-vis the current employer or client because NCAs limit their other trading opportunities. Second, NCAs raise wages as compensation for not taking a job offer from a firm's competitor 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 NCAs and human capital investment, wages, and firm performance. The results reveal that (1) human capital investment is higher in firms or occupations that impose NCAs, (2) this relationship is stronger for off-the-job training than for on-the-job training, and (3) the introduction of new NCAs is correlated with higher sales, wages, and labor productivity.

We also find heterogeneous effects of NCA: (1) For companies that introduced NCA due to necessity, the effect of increased human capital investment due to the introduction of NCA is significant, and the effect of increased wages and productivity is also significant, (2) In companies that introduced NCA without specific durations or without area restrictions for its effect, human capital investment increases, an expansion of Off-JT. Along with it, both labor productivity and wages increase at a similar magnitude. When NCA is implemented in companies that weakly need to use it, there is a negative effect, though not statistically significant, on profits, wages, and labor productivity. Even in companies that do not need to implement it, NCA has a positive effect, though not statistically significant, on human capital investment.

In the U.S., a new rule to consider non-compete agreements as illegal was passed at the

federal level in April 2024. This is because NCA has a strong coercive and exploitative aspect. But opposition from the U.S. Chamber of Commerce and other influential parties have persisted. The judgments at the district court level are divided. The decline in the bargaining power of workers is not just a problem in the U.S., but a global issue. The OECD has also begun discussions on the use of NCAs in member countries and their evaluation, and a large-scale conference was held in October 2023.

To date, research has been conducted using data from the workers' side, and many of these studies have pointed out the negative impact of the NCA on wages. The extremely weak information collection on the part of the company emphasizes the negative aspects of NCA. The negative aspects of NCA are emphasized due to the extremely limited information collected from companies. This study unveils that NCA stimulates incentives for investment in human capital. The results of this paper suggest that if NCAs were made illegal without exception, the disadvantage of under-investment in human capital might outweigh the advantage of increased bargaining power for employees or service providers in the labor market.

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A Appendix

A.1 Response bias

Table A1 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.

Table A1: Response bias

VARIABLES	(1) respond	(2) respond	(3) respond
ln(emp)	-0.046***	-0.046***	-0.018***
	(0.002)	(0.002)	(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 to the survey, and respond= 0 if a firm was sent the survey but not respond.

A.2 Distribution of job turnover rate and OJT

Figures A1 and A2 represent the distribution of job turnover rate and OJT. Although these two variables are continuous variables in the original survey, as the figures show, the proportion of zero is very high. Over 40% of the samples have a job turnover rate of 0.5% or less. Over 80% of the companies surveyed spend less than 0.5% of total working hours on OJT. For this reason, these two variables are converted from continuous variables to dummy variables, and the estimation is performed by treating them as discrete variables.

A.3 Robustness check using alternative index

We verified how much the results would change by changing the NCA index for robustness checks. Using the same model, the estimated coefficients with the independent variable replaced from DNCA to NCAwgt are shown in Table A2. Again, the estimated coefficients on sales, total payroll, average wage, labor productivity, and sales are positive, but statistically
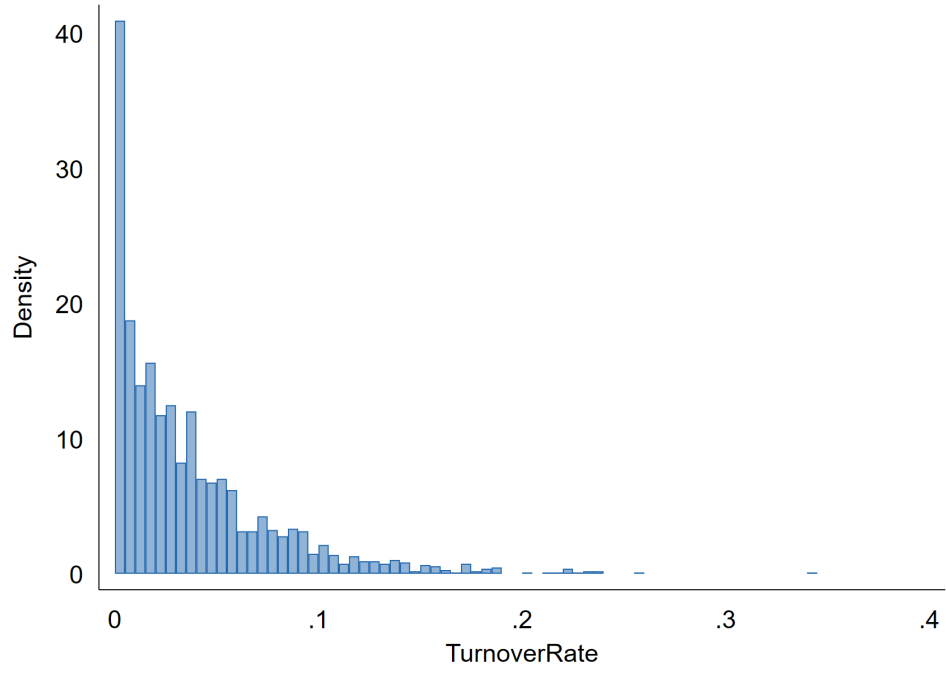
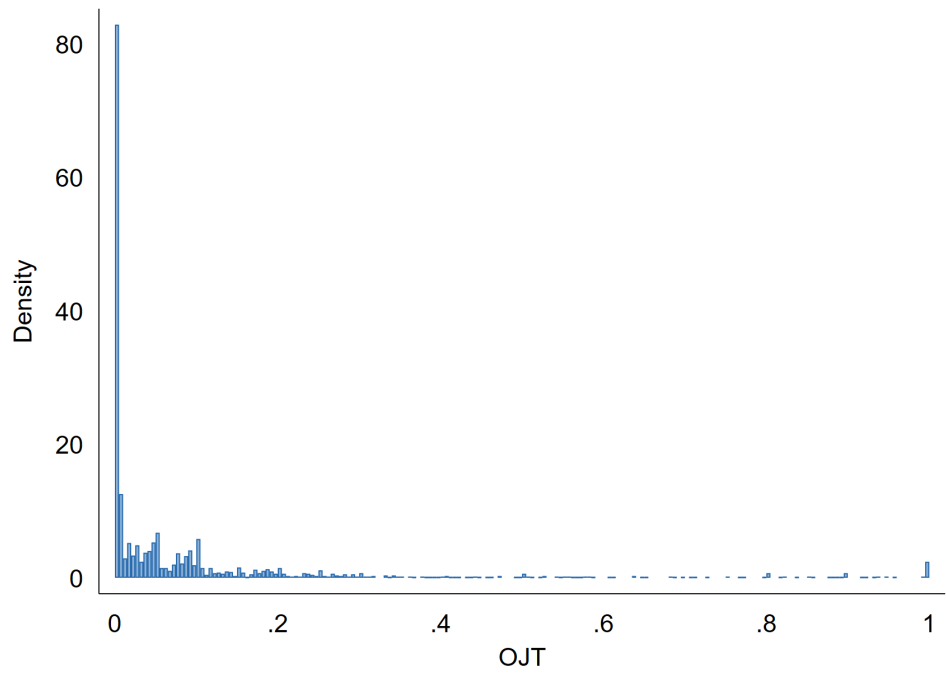Figure A1: Distribution of turnover rate

Figure A2: Distribution of OJT

insignificant even at the 10% level. 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. The results using the alternative indicator for NCA support that they are not driven by a choice of the NCA variable.

Table A2: Effects of NCA on firm performance: NCAwgt

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
NCAwgt1_after	0.023	0.002	0.003	0.019	0.019	0.023
	(0.019)	(0.002)	(0.002)	(0.013)	(0.013)	(0.017)
ln(emp)	0.671***	0.001	0.004**	0.796***	-0.204***	-0.225***
	(0.024)	(0.002)	(0.002)	(0.016)	(0.016)	(0.019)
foreign investment ratio	0.000	-0.001	0.000	-0.001*	-0.001*	-0.000
	(0.001)	(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	37,233	37,094	37,212	37,231	37,231	34,660
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
Dep mean	8.139	0.0181	0.0286	6.239	1.368	1.843

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 the 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 * $p < 0.1$.

A.4 OLS

Appendix Tables A4–A15 show the estimated coefficients of OLS, which do not control for firm FE. OLS estimates are almost the same as those of the model that controls for firm FE. In order to compare the OLS model, which does not control for firm FE, with the main model, which does control for firm FE, the OLS model here only differs from the main model in that it does not control for firm FE. In addition, in the analysis, only the sample used in the main results was used. However, sales are slightly upwardly biased, and wages per worker and total wages paid are slightly downwardly biased. This potentially suggests that NCA is imposed in places where intermediate inputs are large and wages are low.

Table A3: Effects of NCA on firm performance (balanced panel data): NCAwgt

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
NCAwgt1_after	0.024	0.003	0.003	0.022*	0.022*	0.027
	(0.019)	(0.002)	(0.002)	(0.013)	(0.013)	(0.017)
ln(emp)	0.670***	0.002	0.005**	0.802***	-0.198***	-0.215***
	(0.025)	(0.002)	(0.002)	(0.017)	(0.017)	(0.019)
foreign investment ratio	-0.001	-0.001	0.000	-0.001**	-0.001**	-0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
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	34,035	33,902	34,014	34,033	34,033	31,680
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	YES	YES	YES	YES	YES	YES
Dep mean	8.127	0.0187	0.0289	6.235	1.373	1.849

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 the 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 A4: Effects of NCA on human capital investment: OLS

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA	-0.008	0.155***	0.093***	0.144***
	(0.015)	(0.021)	(0.021)	(0.021)
ln(emp)	0.163***	0.064***	0.062***	0.051***
	(0.007)	(0.008)	(0.008)	(0.008)
Observations	7,770	7,789	7,476	7,863
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	NO	NO	NO	NO
Dep mean	0.424	0.498	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 the parent company. We also control for $industryFE$, and $occupationFE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A5: Heterogeneous effects of NCA on human capital investment by year: OLS

	(1)	(2)	(3)	(4)
VARIABLES	DTurnover	DOffJT	DOJT	DSelfDevelop
NCA1_Dafter20180	-0.009	0.151***	0.100***	0.134***
	(0.018)	(0.024)	(0.023)	(0.024)
NCA1_Dafter20181	0.027	0.153***	0.123***	0.149***
	(0.032)	(0.045)	(0.043)	(0.045)
Observations	7,095	7,082	6,877	7,176
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	NO	NO	NO	NO
control	YES	YES	YES	YES
Dep mean	0.422	0.496	0.540	0.555

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 the parent company. We also control for $industryFE$, and $occupationFE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A6: Heterogeneous effects of NCA on human capital investment with/without Confidentiality Provisions: OLS

	(1)	(2)	(3)	(4)
VARIABLES	DTurnover	DOffJT	DOJT	DSelfDevelop
NCA1_Dsecret0	0.009	0.139***	0.074***	0.115***
	(0.018)	(0.024)	(0.025)	(0.025)
NCA1_Dsecret1	-0.034	0.178***	0.122***	0.188***
	(0.022)	(0.029)	(0.028)	(0.029)
Observations	7,752	7,776	7,468	7,852
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	NO	NO	NO	NO
control	YES	YES	YES	YES
Dep mean	0.424	0.498	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 the parent company. We also control for $industryFE$, and $occupationFE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A7: Heterogeneous effects of NCA on human capital investment for firms with generous/conservative dual employment policy: OLS

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA1_Dsidejob0	-0.016	0.147***	0.076***	0.142***
	(0.016)	(0.022)	(0.022)	(0.023)
NCA1_Dsidejob1	-0.001	0.207***	0.181***	0.144***
	(0.028)	(0.041)	(0.036)	(0.041)
Observations	7,728	7,717	7,454	7,837
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	NO	NO	NO	NO
control	YES	YES	YES	YES
Dep mean	0.425	0.498	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 the parent company. We also control for $industryFE$, and $occupationFE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A8: Heterogeneous effects of NCA on human capital investment of NCA period: OLS

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA1_Dperiod0	-0.019	0.154***	0.102***	0.143***
	(0.018)	(0.023)	(0.023)	(0.024)
NCA1_Dperiod1	0.030	0.154***	0.080**	0.140***
	(0.024)	(0.033)	(0.034)	(0.034)
Observations	7,702	7,728	7,412	7,798
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	NO	NO	NO	NO
control	YES	YES	YES	YES
Dep mean	0.425	0.499	0.539	0.562

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 the parent company. We also control for $industryFE$, and $occupationFE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A9: Heterogeneous effects of NCA on human capital investment of NCA area: OLS

VARIABLES	(1) DTurnover	(2) DOffJT	(3) DOJT	(4) DSelfDevelop
NCA1_Darea0	-0.009	0.157***	0.101***	0.145***
	(0.016)	(0.021)	(0.021)	(0.022)
NCA1_Darea1	0.053	0.091	0.007	0.100
	(0.053)	(0.073)	(0.078)	(0.065)
Observations	7,702	7,728	7,412	7,798
industry FE	YES	YES	YES	YES
occupation FE	YES	YES	YES	YES
firm FE	NO	NO	NO	NO
control	YES	YES	YES	YES
Dep mean	0.425	0.499	0.539	0.562

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 the parent company. We also control for $industryFE$, and $occupationFE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A10: Effects of NCA on firm performance: OLS

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_after	0.074**	0.001	0.003	0.011	0.011	0.025
	(0.029)	(0.001)	(0.002)	(0.014)	(0.014)	(0.018)
ln(emp)	1.002***	0.002***	0.003***	0.964***	-0.036***	-0.009
	(0.016)	(0.001)	(0.001)	(0.009)	(0.009)	(0.011)
foreign investment ratio	0.001	-0.000	0.000	0.001**	0.001**	0.002**
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(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	0.001***	0.000***	0.000***	0.000***	0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	50,853	50,652	50,827	50,850	50,850	47,416
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	NO	NO	NO	NO	NO	NO
Dep mean	8.156	0.0188	0.0282	6.247	1.363	1.839

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 the parent company. We also control for $(industry \times year)FE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A11: Heterogeneous effects of NCA on firm performance by year: OLS

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_Dafter20180_after	0.089***	0.001	0.003	0.015	0.015	0.031
	(0.030)	(0.001)	(0.002)	(0.015)	(0.015)	(0.019)
DNCA1_Dafter20181_after	-0.026	-0.007	-0.001	-0.094**	-0.094**	-0.095*
	(0.066)	(0.005)	(0.005)	(0.039)	(0.039)	(0.050)
Observations	46,078	45,895	46,053	46,076	46,076	42,934
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	NO	NO	NO	NO	NO	NO
control	YES	YES	YES	YES	YES	YES
Dep mean	8.135	0.0188	0.0283	6.232	1.363	1.840

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 the parent company. We also control for $(industry \times year)FE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A12: Heterogeneous effects of NCA on firm performance with/without Confidentiality Provisions: OLS

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_Dsecret0_after	0.052	0.002	0.004	0.005	0.005	0.007
	(0.035)	(0.002)	(0.003)	(0.018)	(0.018)	(0.022)
DNCA1_Dsecret1_after	0.109**	-0.000	0.002	0.018	0.018	0.050*
	(0.046)	(0.002)	(0.003)	(0.021)	(0.021)	(0.028)
Observations	50,720	50,519	50,694	50,717	50,717	47,289
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	NO	NO	NO	NO	NO	NO
control	YES	YES	YES	YES	YES	YES
Dep mean	8.153	0.0188	0.0282	6.246	1.363	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 the parent company. We also control for $(industry \times year)FE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A13: Heterogeneous effects of NCA on firm performance for firms with generous/conservative dual employment policy: OLS

	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
VARIABLES						
DNCA1_Dsidejob0_after	0.058*	0.001	0.002	0.006	0.006	0.017
	(0.031)	(0.001)	(0.002)	(0.015)	(0.015)	(0.019)
DNCA1_Dsidejob1_after	0.127*	0.001	0.006	0.018	0.018	0.052
	(0.066)	(0.004)	(0.006)	(0.035)	(0.035)	(0.041)
Observations	49,823	49,624	49,798	49,820	49,820	46,472
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	NO	NO	NO	NO	NO	NO
control	YES	YES	YES	YES	YES	YES
Dep mean	8.148	0.0185	0.0281	6.239	1.363	1.839

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 the parent company. We also control for $(industry \times year)FE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A14: Heterogeneous effects of NCA on firm performance of NCA period: OLS

	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
VARIABLES						
DNCA1_Dperiod0_after	0.073**	0.000	0.001	0.000	0.000	0.014
	(0.035)	(0.001)	(0.002)	(0.017)	(0.017)	(0.021)
DNCA1_Dperiod1_after	0.078*	0.002	0.006*	0.033	0.033	0.050*
	(0.047)	(0.002)	(0.004)	(0.022)	(0.022)	(0.027)
Observations	50,853	50,652	50,827	50,850	50,850	47,416
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	NO	NO	NO	NO	NO	NO
control	YES	YES	YES	YES	YES	YES
Dep mean	8.156	0.0188	0.0282	6.247	1.363	1.839

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 the parent company. We also control for $(industry \times year)FE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A15: Heterogeneous effects of NCA on firm performance of NCA area: OLS

VARIABLES	(1) ln(sales)	(2) ROA	(3) profitR	(4) lnpayroll	(5) ln(wage)	(6) lnLP
DNCA1_Darea0_after	0.075**	0.000	0.002	0.010	0.010	0.024
	(0.030)	(0.001)	(0.002)	(0.015)	(0.015)	(0.019)
DNCA1_Darea1_after	0.072	0.006*	0.009**	0.013	0.013	0.036
	(0.081)	(0.003)	(0.004)	(0.032)	(0.032)	(0.047)
Observations	50,853	50,652	50,827	50,850	50,850	47,416
industry*year FE	YES	YES	YES	YES	YES	YES
firm FE	NO	NO	NO	NO	NO	NO
control	YES	YES	YES	YES	YES	YES
Dep mean	8.156	0.0188	0.0282	6.247	1.363	1.839

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 the parent company. We also control for $(industry \times year)FE$. Robust cluster standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.