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"Cohort Size Effects on Promotion and Pay: Evidence from personnel data"
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Cohort Size Effects on Promotion and Pay

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Unemployment among young people has posed a major problem to several countries. The International Labour Organization (ILO) estimates worldwide unemployment for 15-24 year olds at 12.6% for 2013, with the rate remaining above 12% through 2018. As regular full-time positions are in short supply during the economic downturn, there has been an increased proportion of non-permanent workers. Professor Kawaguchi and his co-authors have investigated how tough economic times impact the way Japanese large companies treat those who are fortunate enough to have secured regular employment with them.

In this study, the authors have carried out an econometric analysis on detailed personnel data from two large Japanese manufacturers, for the purpose of testing the relevance of tournament theory as it applies to groups of employees concurrently entering the company as new college graduates (cohorts). Results indicate that individuals in smaller entering groups enjoy relatively better chances of promotion. While conventional wisdom holds that traditional Japanese employment customs are weakening, the authors suggest that the evidence that each cohort participates in its own separate tournament indicates that some economically justifiable practices remain in place.

—Please tell us how you became involved in this line of research and the particular issues which you are trying to address.

The worldwide financial crisis of 2008 drove up unemployment among the young to levels that, despite some differences in severity from country to country, drew international concern. A young person's failure to find a job can have long-term consequences; once you get derailed, it can be difficult to get back on track. Japan, of course, has been in a long-term slump, dating back to the collapse of the bubble economy. Professor Yuji Genda and his colleagues at the University of Tokyo have been conducting research into unemployment among the young since the mid-1990s—beginning shortly after the bubble ended—and have demonstrated that, when economic conditions are ailing, higher percentages of new workers find themselves in non-permanent employment. This is knowledge that we have already acquired from prior work. So then, what about the young people who have managed to obtain a permanent position at a big firm anyway—how are they treated after they are hired? We assumed that the number of new entry workers is low in the fragile economy—that is, the cohort size is small. Does the small cohort size affect the young employees' opportunities for promotion? This question drew our attention, and we looked into it.

Who competes in the promotion contest?

—In your paper, you point out that the purpose of the paper also includes elucidating the promotion mechanisms in Japanese firms…

Within labor economics, tournament theory is one way of conceptualizing how companies decide on whom to promote. According to the theory, you have a series of contests, where the losers drop out until only a winning group—the prize winners—remains. Since each contest is won by the superior player, this is indeed a method for evaluating relative merit. This approach also has one clear advantage: it filters out external factors such as

the state of the economy, which, when bad, can impede everyone's performance. One problem with the theory, however, is that it is not clear exactly who is competing with whom within the company. For this reason, there has not been much econometric analysis of theory as it directly relates to firms; instead, the analysis itself has typically been based on sports scenarios and other situations where the contestants are very clear, and the outcomes have been often invoked to examine business management.

Obviously, however, an analysis that applies to sports does not necessary apply to business. We therefore wanted to use actual company data to test directly the theory. We were still left with the problem of identifying the contestants in the competition. Our hypothesis was that the employees who entered at the same time would become the competitors; within a cohort, comparisons among competitors seem to be a reasonable way to approach the issue in practice, since it eliminates performance differences that might result from more or less experience, or more or less time in on-the-job learning. Our paper presents an econometric analysis of detailed company data, toward the goal of validating our hypotheses.

—Was there any prior research that you were looking at?

The 2010 study by Kwon, Milgrom, and Hwang stimulated our research. Using personnel data from American and Swedish companies, their paper analyzed how economic conditions at hiring time affected future promotions. The results suggested that employees who entered during good times were promoted more quickly. One can think of a reason for this—compared to sluggish

Figure 1: Size of entry cohort of Manufacturing Company A (white-collar workers)

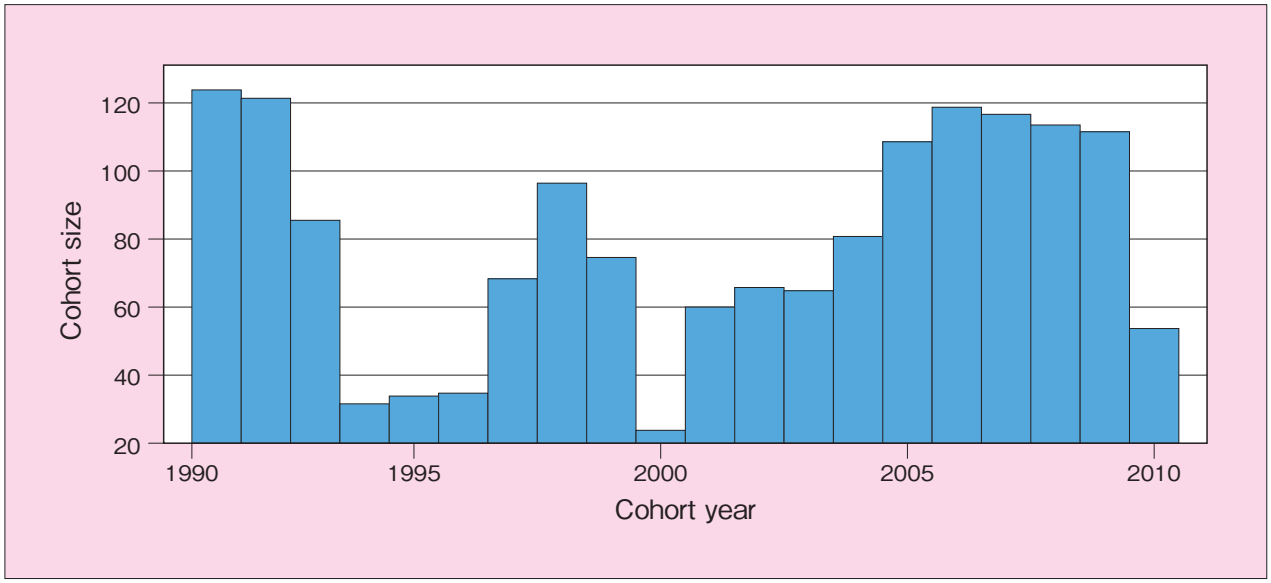
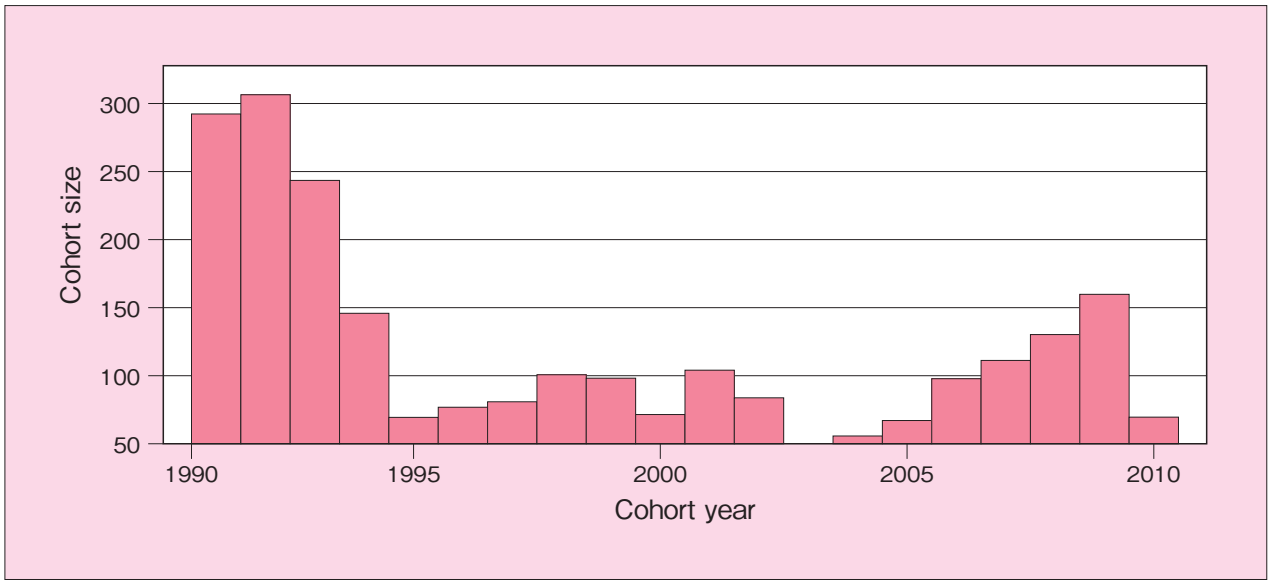


Figure 2: Size of entry cohort of Manufacturing Company B (white-collar workers)



economic times, there appears to be an increase in the number of challenging and desirable jobs within a company at good times, which could possibly bring future success. But we were skeptical of this reasoning. These results applied to the United States and Sweden, but did not seem to mesh with the circumstances of Japanese firms. In the United States and Sweden, for example, there are open and fluid labor markets for different types of work, and it is fairly easy to move from one company to another. In Japan, however, there is a tendency to stay and develop one's career within a firm. Thus, there seems to be a fundamental difference in the characteristics of the organization between the two. In the case of a Japanese firm, the availability of managerial positions—and of desirable jobs—would presumably be relatively less affected by external business circumstances and other external factors. If this is true, then what variables in particular would in fact affect the promotion rates? Our idea, as mentioned earlier, was that the cohort size—the number of new hires entering together—would have a large effect. So we set out to look at that.

Access to detailed personnel data

—In your paper, you indicated that you were able to access data that are usually off-limits. What data did you use?

We used personnel data from two large Japanese manufacturers with many employees in Japan. Both companies granted access to 20 years of detailed data—from 1991 to 2010. We were able to see how many graduates they hired each year, the ratio of both genders, the ages of the new hires, the schools from which they graduated, and their track records over the subsequent years: qualifications, wages, and bonuses.

By looking into trends over 20 years, which is a relatively long period, we were able to take note of some distinct features—such as a rapid drop in the number of new hires that occurred in the mid-1990s (see Figs. 1 and 2).

In general, it is quite difficult to get access to this type of in-depth information. Fortunately, we received a favorable response after approaching the software company that manages the personnel information for these two companies. These two companies also gave us permission to analyze their personnel records for academic purposes. Individual names were removed from the data, of course, along with other information that would make it easy to identify the actual subjects. On our side, we also took considerable care to maintain security. In particular, after placing the data onto RIETI's servers, we never offloaded them while analyzing and arranging the dataset; we accessed and operated on them entirely through RIETI's remote access system, which was set to allow access only to authorized users working from authorized computers. We were well protected against leaks, and this is one of the reasons why we were granted access.

As I mentioned earlier, there are only a few cases—anywhere in the world—where an econometric analysis has been carried out directly on this type of personnel data. And in the few cases that do exist, data were of limited quality—data from failed companies, for example, or data obtained through business consultants

Table 1: Effect of cohort size on work qualifications

Ordered Probit Model with school dummy variables; survey of 1991–2010 college graduates in white-collar employment

Manufacturing Company A	Coefficients
Cohort Size (10 persons)	-0.0342 (0.0033)
Females	-0.511 (0.0432)
Tenure	1.0728 (0.0081)
$(\text{Tenure})^2/100$	-2.771 (0.0392)
Pseudo R^2	0.59
N	85539

Manufacturing Company B	Coefficients
Cohort Size (10 persons)	-0.0019 (0.0008)
Females	-0.818 (0.0118)
Tenure	0.3466 (0.0033)
$(\text{Tenure})^2/100$	-0.6998 (0.0215)
Pseudo R^2	0.27
N	81952

Note: Number in parentheses is standard deviation.

Professor Kawaguchi said that there was correlation between cohort size and promotion opportunities.

associated with the researchers. In this regard, our study is significant in that we were able to obtain and utilize comprehensive information from successful, established, ongoing companies.

Small cohort size generates opportunities for promotion

—What were the results of your analysis?

For both companies, we found that the greater cohort size had a negative effect on one's chances of promotion. This suggests that the individuals within each cohort are competing among themselves for promotion; in other words, the cohort is engaged in its own tournament. The findings also indicate that a small cohort size is advantageous to workers in terms of promotions. Under a stagnant economy, companies hire fewer new graduates, so cohort size falls—improving the prospects of those who get hired, compared to those who do not. An additional factor to consider, however, is that the better promotion rate may in part be attributable to the greater average capability of the people in the smaller cohort. Because tough economic times reduce job opportunities throughout the economy, companies have the chance to recruit relatively more capable applicants; and this may be the reason for the cohort's faster advance. For this reason, we filtered out the effect that university quality has on graduate promotion rates, such that we could better isolate the effect of cohort size itself.

For Company A, the largest cohort size—namely, the greatest number of yearly new hires during the 1991-2010 period we studied—was 124, while the smallest was 24. According to the data, the individuals in the smallest cohort enjoyed approximately twice the chance for promotion to a given level (called "Grade 3" in our study) compared to their counterparts in the largest cohort. Moreover, each decline of one standard deviation (27.7 individuals) in the cohort size corresponded to a four-percentage point jump in the promotion rate. Results for Company B showed the same trends, although they were less pronounced. The data also show that cohort size has a bigger effect on bonuses than on wages. This finding suggests that, within Japanese firms, bonuses have the characteristics of the "tournament prizes" as posited by tournament theory.

—Why do cohorts compete internally?

In Europe and the United States—and certainly in the latter—there is a strong connection between a company's internal labor market and the economy's external labor market, as indicated by the relative frequency with which employees move from company to company. Because capable employees are readily poached by other firms, a company that wishes to retain talent needs to evaluate its employees by capability and offer promotions accordingly. In Japan, however, the labor market is much less fluid. Companies guarantee long-term employment, and workers develop knowledge and skills while traversing their careers internally. Indeed, some researchers have noted that the wage curve for Japanese companies—the curve associating wages with age—has been flattening out in recent years; in any case, the curve is still much steeper than that of American companies.

This is apparently why promotion mechanisms at Japanese companies function differently than those at U.S. companies. In particular, comparative evaluation in Japan tends to focus on people within the same cohort. By comparing within the cohort—namely, by directly comparing those individuals who have worked the same number of years—the company can more easily assess real differences in skills; the comparison, as a result, is more transparent. I would say that this approach is one of the pillars of Japanese employment practice. It is true, of course, that the Japanese economy is caught up in major changes, and that many distinctive Japanese employment practices are fading. Even so, this cohort-based evaluation approach survives, because it remains an efficient way to screen and motivate workers.

Necessity for studying trends for employees who join in mid-career

—Would you get different results if you examined different companies?

Personnel management practices might be different in companies that are heavily oriented toward merit-based appraisals—where they might put less focus on individual

cohorts. Results might also have been different if we studied companies in other types of enterprise—service companies or entertainment companies, for example.

In addition, we need to review studies focusing on companies where many employees enter in mid-career. When an individual with 10 years of experience enters the firm, for example, questions are raised; where do they get positioned in the company, and against whom are they evaluated when considering promotions. Many individuals in this category are involved in quite specialized work; therefore, many of them do not fit the picture of employees who compete within their own cohorts. In the light of this, there must be some other methods of evaluating them, and we need to elucidate them. One of the co-authors of our paper—Hideo Owan, RIETI Faculty Fellow and a professor at the University of Tokyo—is working with others on a RIETI project already underway in this area, entitled "Economic Analysis of Human Resource Allocation Mechanisms within the Firm." We look forward to seeing their findings.

—If the likelihood of promotion is more dependent on cohort size than on differences in capability, does it seem somewhat unfair or not?

In our study, we covered people who had not been working very long at their companies. While the maximum employment length among our samples from the two companies was 20 years, the average for Company A employees was only 6.5 years, and for Company B employees, 7.6 years. This is a point which I particularly want to stress. If we were to look at people who are really building up a career and moving up into top positions, then we would expect to find that they were in competition with people hired somewhere near the same year they joined the firm, but not necessarily in the same cohort.

Importance of Consistent Macroeconomic Management

—What type of political implications do your findings suggest?

When it comes to landing a job in tough economic times, a wide gap opens up between those who are fortunate enough to find something, and those who are not. Our results suggest that the gap is even greater than we might have thought, since the fortunate job finders also enjoy above-average rates of promotion. To put it another way, hard times seem to magnify the unfairness. Companies cannot control the economy. When the external environment worsens—when the economy weakens—they have no choice but to cut down on hiring; and, as a result, it will have a heavy impact on the labor market in the short run. This in turn will bring about an increase in the number of non-permanent workers, with negative long-term consequences for everyone involved. If we want to prevent this type of problem, we need macroeconomic policies that maintain a stable economy. As far as monetary policy is concerned, there are numerous discourses on what the goals should be. Looking to the United States, we see that the Federal Reserve Board monitors both the inflation rate and the unemployment rate when deciding on how to act. The Bank of Japan, in contrast, does not maintain clear goals with respect to labor market indicators. From my point of view, they should be giving these indicators a great deal of weight. In particular, I think policymakers need to devote serious thinking to the employment conditions for young people.

—Please let us know something about your next research topics.

In Japan, where the proportion of turnover is smaller than that in the United States, it is likely that the way a company handles its human resources would have a decisive influence on the firm's performance. Thus, one crucial issue is to identify the standards used to decide on which employees get the important jobs. In this study, we showed that people beginning their careers at two large Japanese manufacturers, when competing for promotion, are largely in competition with the others in their own cohort. So, as a company makes decisions about promotions, where does it place the greatest weight? Presumably, the company must refer to a wide range of information when making these decisions. When considering a person for a promotion, for example, it might assess according to evaluations from superiors or use a numerical performance score which is calculated by using some specific method. Our feeling is that the quality of the school from which one graduated plays a relatively important role in the early years; but that as time goes by and the employee gains experience, the weight shifts more toward on-the-job performance. There has not yet been much research in this area, in part because the relevant data has been difficult to obtain. We think this is the topic that should be addressed next.

Profile

Daiji Kawaguchi has been a professor at the Faculty of Economics, Hitotsubashi University since 2013. He was an assistant professor at the Graduate School of Humanities and Social Sciences, University of Tsukuba from 2003 to 2005, and an assistant professor at the Institute of Social and Economic Research, Osaka University from 2002 to 2003. His recent works are as follows: Hirokatsu Asanno, Takahiro Ito and Daiji Kawaguchi, "Why Has the Fraction of Nonstandard Workers Increased? A Case Study of Japan," *Scottish Journal of Political Economy*, Vol. 60, 2013, 360–389; Daiji Kawaguchi and Yuko Ueno, "Declining Long-Term Employment in Japan," *Journal of the Japanese and International Economies*, Vol. 28, 2013, 19-36; Daiji Kawaguch and Tetsushi Murao, "Who Bears the Cost of the Business Cycle? Labor-Market Institutions and Volatility of the Youth Unemployment Rate," *IZA Journal of Labor Policy*, Vol. 10, Article 10.