



***TRAINING THE NATION'S ELITE
NATIONAL - PRIVATE SECTOR DIFFERENCES IN
JAPANESE UNIVERSITY EDUCATION***

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Training the Nation's Elite

National - Private Sector Differences in Japanese University Education

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ABSTRACT

National and private universities in Japan differ in several ways, but perhaps the most notable distinction is that national universities are generally viewed as providing higher quality of education in comparison to private universities. This view is rooted in the history and the foundations under which national universities were founded in Japan – an institution to educate the nation's elite and a recruiting ground for government ministries.

Do such national-private sector distinctions impact the occupational outcomes of Japanese university graduates? If so, in what ways? Using a 1995 cross-sectional survey of Japanese workers, this paper examines in detail, the employment distribution and the rate of return to Japanese university graduates with respect to national-private sector differences. In order to examine quality differences between and among national and private universities, I construct the quality variable proxied by the mean scores of the entrance examinations of the universities attended by the survey respondents.

My main findings show that: (i) Earnings are an increasing function of university quality; (ii) On average, the quality of national universities are higher; (iii) National university graduates are more likely to be employed in the government sector; and (iv) Because of (i) and (ii) coupled by the lower tuition, national university graduates have a higher internal rate of return (IRR) to their education.

My findings lend support to the 'elite' perspective proposed by Becker (1993), under which higher ability individuals (in this case national university graduates) have more to gain from university education than lower ability individuals.

1 Introduction

The evolution of Japanese university education dates back to the Meiji period (1868 to 1912) under which a majority of Imperial universities were founded. Imperial universities played a crucial role in the Meiji Restoration as an institution to train the nation's elites, and a recruiting ground for the central government ministries. Thus began the heritage in which the nation's best and brightest were funnelled from one elite institution to the other – from the Imperial universities to the government ministries.

In the postwar period, authorities of the American Occupation imposed measures which were aimed to break up the channelling of elites and the hierarchical structure of prestige which ensued the university system. As a result, Imperial universities were henceforth to be renamed national universities, and the educational curriculum was revamped to cater to the masses and not to a selected group of elites. These measures, coupled by the growing demand for university education in the postwar period led to the massive expansion of the university system, a majority of which were private universities.

How successful were these measures in dismantling the prestige differentiation between national and private universities? Studies which examine such differences are relatively few and focus mostly on differences at the university level. We know for example that on average, university resources are better endowed among national universities with respect to such indicators as student-

teacher ratios and faculty salaries (James and Benjamin 1988; Narita 1978). What we don't know is how national-private distinctions affect individuals, or the graduates of these institutions. Do quality differences between national and private universities still persist? Are national university graduates still more likely to be employed in the government sector? And, as a crucial criterion for investment motives, Do national university graduates have higher returns to their education? These are the questions that motivate my current research. By pursuing these questions in detail using individual-level data, we can examine the extent to which the traditional aspects of university education still remain or do not remain in contemporary Japanese society.

The paper is organized as follows. In Section 2, I outline the historical background of national and private universities, with a particular focus on the expansion of private universities in the postwar period. I also highlight some of the distinctive features of national versus private universities which persist today. Section 3 introduces the theoretical framework of human capital investments as proposed by Becker (1993). Two alternatives are proposed which follow directly from the Becker framework: An egalitarian perspective which posits that the returns from university education will be equalized for national and private university graduates after accounting for their costs and benefits, and an elite approach which maintains that abler persons have more to gain from their university education than less able persons. Section 4 outlines the data and methods, and discusses the main findings and results of the statistical analysis. Section 5 concludes.

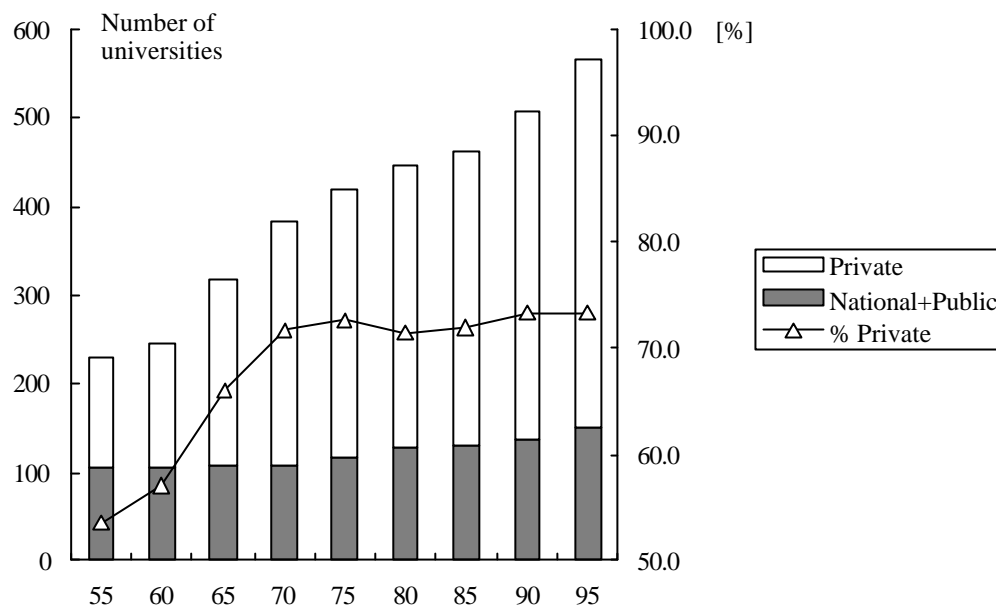
2 Background

Expansion of the University System in the Postwar Period

In order to meet the growing demand for university education in the postwar era, the Japanese government made efforts to improve its access to the general public by expanding the number of universities, from 201 in 1950 to 565 in 1995 (Figure 1). This expansion also reflected in part the concerns of the authorities of the American Occupation, who sought to reduce the prestige differentiation of universities (notably the Imperial Universities) in order to modify the differential recruitment practices which took place between employers and selected universities (James and Benjamin 1988).

The expansion of the university system was achieved mainly through increasing the number of private (as opposed to national¹) universities. The Japanese government granted charters for 170 new private universities between 1950 and 1971 (Bowman 1981), and the number of private universities has increased at a faster rate than national universities. The proportion of private universities was 54 percent in 1955 but has risen to 73 percent in 1995. The proportion of students enrolled in private institutions is roughly equivalent to these figures, rising from 60 percent in 1955 to 73 percent in 1995.

¹ References concerning national universities will hitherto include public universities unless otherwise noted.



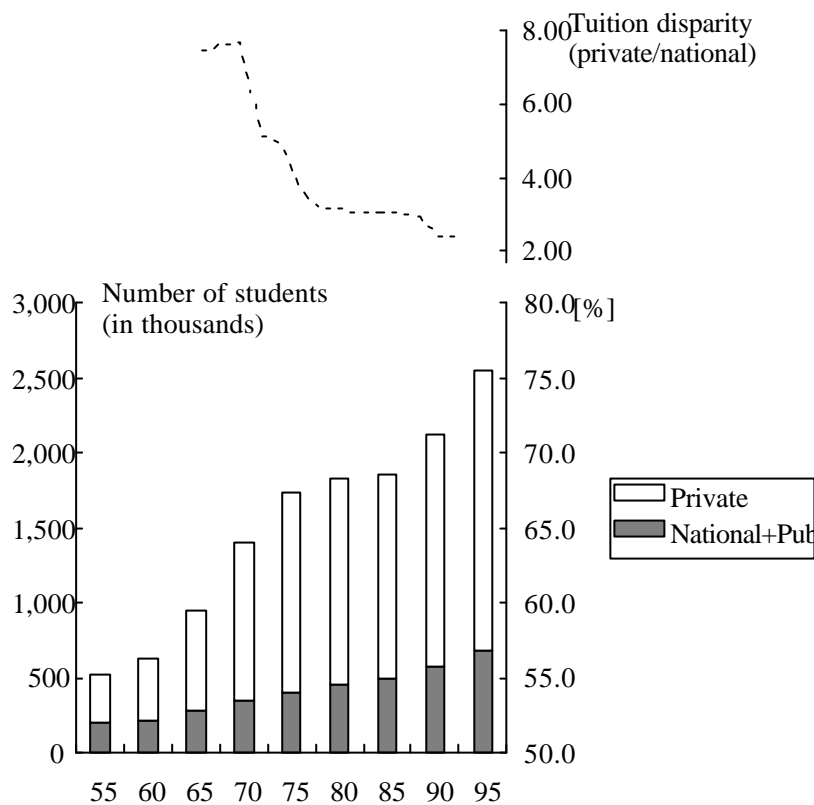
[SOURCE: Ministry of Education]

Figure 1 Expansion of the university system in the postwar period

Expansion of private universities

The postwar expansion marks a crucial turning point in the history of university education in Japan. The shift from national to private universities was not only quantitative but qualitative as well. The long-standing tradition that national universities offered a better quality of education at lower tuition was significantly dismantled during the postwar expansion. The following historical account draws from studies by Nagai (1971) and Ogura and Iwai (1991), and describes the process through which private universities improved their relative position.

The expansion of private universities in the latter half of the 1960s was not sufficient to meet the surging demand for university education among the first generation of baby-boomers. Many private universities were therefore forced to accept up to twice as many students as their enrollment capacity. At the same time, private universities faced financial problems which were prompted by the sudden expansion. However, any attempt to raise tuition was met with violent disapproval by students. Tuition at private universities was already high relative to national universities. The tuition disparity - the ratio of tuition at private versus national universities - was about 7.0 in the 1960s (see Figure 2), and the students protested that the massive expansion of private universities had precipitated a serious decline in the quality of their education. Financial problems were further exacerbated by the Oil Shock of 1973, after which the government finally intervened by initiating a Freeze-in Policy (*touketsu seisaku*) in 1976 with the following agenda: (i) subsidize private universities to restructure their financial base, (ii) restrict the expansion of private universities in large metropolitan areas, and (iii) ban the practice of accepting students over the enrollment capacity (*mizumashi nyugaku*). These measures were put into effect for the following ten years with the intention of controlling the supply and quality of university education.



[SOURCE: Ministry of Education]

Figure 2 Expansion of university enrolment in the postwar period

Despite the decline in the number of students graduating from high school following the baby-boom generation, the demand for university education continued to grow during the years of the Freeze-in Policy (1976 to 1986). This trend allowed private universities to gradually raise tuition and recover their financial standing, while at the same time improve their quality of education. Meanwhile, Japan's economic performance suffered as a result of the Second Oil Shock and the exchange rate crisis in the 1980s. Instead of relaxing the subsidy to private universities, the Japanese government responded by raising the tuition charged by

national universities. Since tuition at national universities rose at a faster rate relative to private universities, the tuition disparity between private and national universities narrowed to 3.0 by the end of the 1980s, and eventually to a low of 2.3 in 1994.

In sum, the Freeze-in Policy initiated in 1976 allowed private universities to stabilize their financial base and improve the quality of education. Enrollment in private universities grew as the tuition disparity narrowed in favor of private universities. The relative decline in tuition accompanied by improvement in university quality boosted the overall reputation of private universities. Although James and Benjamin (1988) maintain that national universities have historically upheld a higher reputation and are believed to offer a higher quality of education, Ogura and Iwai (1991) suggest that quality among private universities in recent years is comparable to, if not better than that of national universities².

National versus Private University Differences in Contemporary Japan

Although the postwar expansion of private universities has in many ways obscured the traditional distinctions between national and private universities, some differences still remain and should be highlighted. First, as mentioned above, tuition at private universities remains more than twice as high because they receive smaller government subsidies than national universities and must rely more heavily on

² According to James and Benjamin (1988), national universities have a higher expenditure per student, more floor space per student and offer higher salaries for their faculty. See also Narita (1978) for a thorough comparison of national versus private universities. Ogura and Iwai's

tuition fees. The burden of real costs falls on the students. In specialized departments (or faculties) such as engineering or medicine, students must compensate for expensive facilities and special training. Tuition among these departments can be significantly higher among private universities, while national universities charge a flat-rate tuition across all departments.

Second, national university applicants must go through a two-round examination process versus one-round only for private university applicants. In the first-round, students are tested on basic subject areas (e.g. Japanese, English and mathematics), while the second-round is more specific to the student's desired area of specialization. This results in their having to take a larger number of examinations over a broader range of categories. As characterized by the expression, *examination hell*, all university applicants in Japan must pass the examinations specific to the university that they apply to, but in this respect, national university applicants must undergo a *tougher hell* by virtue of having to take more examinations.

Third, national university applicants may only apply to one national university in a given year, while private university applicants may apply to as many universities as they desire. This one-shot constraint suggests that it is riskier to apply to national universities. On the other hand, applying to private universities is less risky, to the extent that these applicants may diversify their risk by applying to a

description of 'better quality' is not clear in terms of what the authors are referring to.

wider range of universities in accordance with their expected probability of acceptance.

And fourth, national universities are still generally viewed as providing *better* education in comparison to private universities. *Better* education here refers to such factors as student-teacher ratio, educational expenditures per student, faculty salaries, and so forth³. This argument is often extended in reference to the quality of the students as well, i.e. national universities attract ‘smarter’ students than private universities.

As a final point, the view that national university students are generally smarter than their private university counterparts is partially rooted in the history and the foundations under which national universities were founded in Japan – an institution to educate the nation's elite and a recruiting ground for government ministries (James and Benjamin 1988). The educational curriculum was structured in accordance with the demands of government ministries who sought new recruits from these elite institutions. Hence, national universities provided a crucial point of departure where elites were trained in one elite institution (i.e. national universities) to be transferred to another (i.e. the government ministries). Remnants of this particular aspect of Japanese history still remain very much intact today. A majority of the bureaucrats in the central ministries are dominated by national university in particular, by graduates of Tokyo University. In 1983, Tokyo University graduates alone accounted for 62.3 percent of high ranking officials in all ministries; this

³ See previous footnote.

proportion was 88.6 percent in the Ministry of Finance, considered to be the most prestigious ministry (Rohlen 1983).

Whether or not government sector jobs are more prestigious or not than private sector jobs is a matter of debate and is beyond the scope of this paper. In general, employment in the central government ministries are perceived to be high status, but government sector jobs may also include regional public offices staffed by public officials, in which case the status distinction becomes less clear. What differentiates government sector employment from the private sector is that the seniority effect is more pronounced. Employees of government agencies start their careers with lower initial salaries, but the returns to seniority (or tenure) are larger (Yamaguchi 1983). Moreover, the salary of government workers may rise regardless of performance, as Yamaguchi (1983) explains:

The salary of a civil servant increases even if he is not promoted. An employee who is promoted to a position in a higher grade, of course, receives a higher salary, but one who is not promoted also receives a pay increase within his salary grade. This “periodic pay increase” allows us to say that the seniority wage system is strong in the civil service and that the linkage between job and salary is weak. (1983: 298)

The earnings trajectory among government workers is therefore typically steeper in comparison to their private sector counterparts⁴.

⁴ Koh (1989) also explains that the seniority effect is stronger among civil servants although his discussion is more central to promotion and not compensation. Yamaguchi (1992) shows that the steepness of the salary schedule among government employees leads to interfirm job separation rates which are higher in the early years of the career and lower in later years

3 Theoretical framework

How do national-private sector differences affect the outcomes of Japanese university graduates? In order to conceptualize the costs and benefits associated with university education in a unifying framework, I borrow from Becker's theory of investments in human capital (Becker 1993). According to this framework, marginal costs and benefits associated with human capital investments – in this case university education – can be depicted as a relationship illustrated in Figure 3.

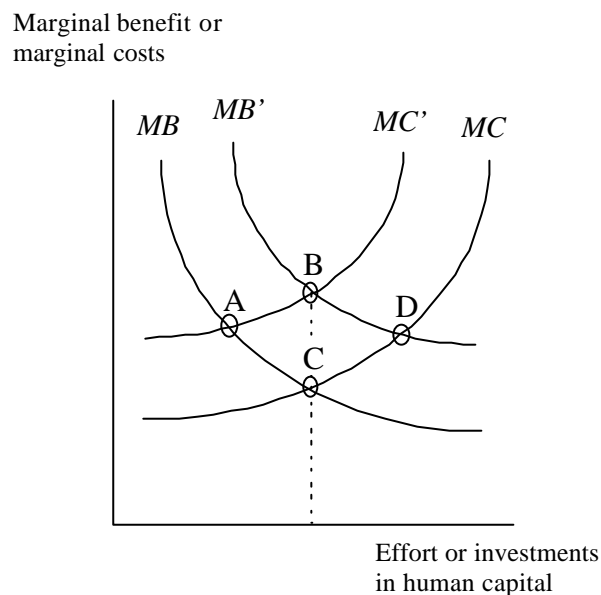


Figure 3 Marginal costs and benefits from investments in human capital

The marginal benefit curves (MB and MB') are downward sloping to account for the diminishing returns from human capital investments. MB' which lies above MB means that individuals along this curve enjoy higher benefits for the same level of

investment. On the other hand, the marginal cost curves (MC and MC') are upward sloping to account for increasing costs. For the same level of investment, individuals along the curve MC' have higher costs than those along the curve MC . The area which is formed along the left-side of the intersections of the curves represents the surplus obtained from investments in human capital. In Becker's terminology, an outcome represented by points B and C would be an egalitarian view, in which costs and benefits from human capital investments are positively correlated. Individuals along the curve MC' may face higher costs, but they also enjoy higher returns resulting in equilibrium condition B, while those along the curve MC may face lower costs, but their returns will be lower as well (point C). As shown in Figure 3, surplus obtained from equilibrium conditions B and C are approximately the same under the egalitarian view.

On the other hand, the greatest inequality positions are generated by points A and D, which can also be observed from the surplus regions created by these points in Figure 3. This represents a condition in which costs and benefits are negatively correlated; those who face higher costs have lower returns and vice versa. Becker describes this as the elite view, partly because it represents a condition in which the abler (or smarter) persons have more to gain.

With respect to investments in university education, private university students will therefore be positioned along the curve MC' while national university students will be positioned along MC , because the former must pay higher tuition, i.e. for the same level of investment in university education, the per-unit cost (one-

year of university education) is more expensive for private university students, *ceteris paribus*. In order for private university students to equalize their returns, their benefits must be higher than national university graduates, i.e. their benefits must be positioned along the curve MB' , and national university graduates along the curve MB . Otherwise, private university students will be made worse off from their investments in university education.

Costs and benefits associated with university education can be monetary or non-monetary. The latter is difficult to capture given the non-quantifiable nature of non-monetary benefits (and likewise costs), and such data are rarely available. Given the relative ease of quantification and analysis, I therefore proceed by assessing the monetary costs and benefits associated with university education.

A frequently used measure in cost-benefit analysis is the internal rate of return (IRR), defined formally as the discount rate which equates the sum of discounted costs to the sum of discounted benefits. The internal rate of return estimation is based on the fundamental principles of cost-benefit analysis. The IRR is essentially an indicator of investment outcomes where the sign of the IRR tells us whether the investment was beneficial or not. A negative IRR means that the cost of the investment outweighs its return and is therefore deemed a 'bad' investment.

The IRR to university education is derived by equating the net present value of the costs and benefits over the lifetime. This is done by first calculating the total annual cost of university education by summing its direct costs (d) and indirect costs, where the latter are estimated by the earnings of high school graduates (Y_h)

who have been in the labor force for s years. The total annual cost of university education in year s of university is therefore expressed as $(Y_h + d)_s$. The annual benefit from university education in any given year of work experience (x) is the difference in earnings between university and high school graduates of the same age⁵ expressed as $(Y - Y_h)_x$.

Total costs and benefits are then discounted to the year in which the university graduate enters the labor market, specifically at $x = 0$ in order to derive the *IRR* as the discount rate which sets the costs equal to the benefits:

$$\sum_{x=0}^n (Y - Y_h)_x (1 + IRR)^{-x} = \sum_{x=-s}^{-1} (Y_h + d)_x (1 + IRR)^{-x} \quad (1)$$

where n is the year of work experience in which individuals retire⁶.

With respect to national-private differences, the *IRR* will be estimated to account for the differences in direct costs (= tuition) as well as the benefits which will be measured by annual earnings.

⁵ Earnings comparisons can be made with respect to work experience (x), but one must be careful to account for the fact that the expected working life of university graduates (n) must be shortened by s years if we assume that both high school and university graduates retire at the same age. Therefore, if the work experience of university graduates is specified to be x , then the corresponding work experience for high school graduates becomes $x + s$.

⁶ From equation (1), it is clear that *IRR* will vary depending on the value of n , while the costs associated with university are sunk costs incurred over s years and independent of n . However, some individuals may choose to work longer than others (i.e. choose different values of n) so that they can recoup the benefits over a longer time span, thereby offsetting the proportion of benefits over costs. Individuals choose to retire at different ages for various reasons, but it is difficult to account for such

4 Analysis and Results

Data and methods

The dataset used for the analysis is the 1995 Social Stratification and Mobility National Survey⁷ (hereafter SSM) which consists of men and women between the ages of 20 and 69 residing in Japan in 1995. SSM is particularly suited for the purpose of my research because it reports the name of the university for respondents who attended university. University quality will be measured by the mean scores on entrance examinations administered by each university as reported by *Obunsha* (see Appendix for description of coding procedure)⁸.

My estimations are limited in the following ways. First, my analysis is restricted to men. Given the intermittent career mobility patterns of Japanese women, it is difficult to obtain reliable rate of return estimations for women. An accurate analysis of women's returns to university education would require that they be analyzed separately. However, the sample size of female university graduates who were full time regular workers at the time of the SSM survey is 39, thereby making it difficult to conduct statistical analysis. Second, my analysis is restricted to full-time employees. Part-time workers, temporary workers and the self-employed are not considered. Third, the rate of return estimations for university graduates include four year university graduates only. Respondents who reported

individual variations in *IRR* estimations. For this reason, it is conventional to assume that n remains fixed for all individuals.

⁷ I am grateful to the SSM Committee for granting me permission to use the 1995 SSM data.

⁸ I am grateful to Mr. Hisashi Arai of *Obunsha* for allowing me access to past issues of their publications.

having graduated with a Masters or Doctorate degrees were not considered because it is impossible to distinguish if these individuals paid for their own graduate education or not. Given the large number of corporately sponsored graduate students in Japan (i.e. employees who are sponsored by their firms to obtain post-baccalaureate degrees within or outside of Japan), I have chosen to disregard these individuals from my rate of return estimations. The resulting sample size after accounting for the above conditions is 184.

The direct costs associated with university and *ronin* used in the estimations are reported in Table 1. Tuition and part-time earnings of university students were obtained from the 1995 Ministry of Education statistics. The annual direct cost of university education was estimated as tuition minus part-time earnings. Following previous techniques by Cohn and others (Cohn and Hughes 1994; Cooper and Cohn 1997) indirect costs of university education were estimated from the earnings of high school graduates in the SSM survey. Details of the estimation procedures are outlined in the Appendix.

Table 1 Tuition and part-time earnings in annual terms [UNIT: yen]

Tuition	
National universities	497,000
Private universities	1,095,300
Part-time earnings	
National university students	349,200
Private university students	412,200

(see text for full description)

Results

We begin by examining some of the basic features of national-private sector differences (Table 2). We first find that on average national universities attract a ‘smarter’ student body - smarter with respect to their innate ability as measured by grade point average [GPA] in ninth grade) and their performance on the university entrance examinations. We also find that probability of employment into the government sector is higher among national university graduates. All differences of means are significant at the $p = 0.001$ level. These results confirm that the historical perceptions of national-private sector differences are still very much in place in contemporary Japanese society. A simple logistic regression model was tested using age to predict the probability of enrolment in national universities. The results were insignificant suggesting that this probability has not changed over time.

Table 2 National-private sector differences

	Mean	S.D.
GPA in ninth grade		
National	4.59	0.64
Private	3.82	0.93
University quality		
National	56.63	4.95
Private	50.57	6.22
Probability of employment in government sector		
National	0.43	0.50
Private	0.14	0.34

All differences of means significant at $p = 0.001$ level

We proceed by examining various forms of the Mincerian earnings functions to estimate the returns from university education (Table 3). Model 1 includes the

variables experience and experience-squared only and will be used afterwards to estimate the ‘unadjusted’ rate of return to university education. In Model 2, we confirm the significant impact of university quality. The positive rewards obtained from university quality confirms the incentive structure underlying *examination hell*. Students are driven to frenetic levels of preparation for the university examinations because they expect that they will ultimately be rewarded from their investments in getting into the higher quality schools.

Table 3 The effects of university quality and sector differences on logged earnings

	1	2	3	4
Experience	0.085 ** (0.007)	0.086 ** (0.008)	0.086 ** (0.008)	0.099 ** (0.009)
Experience-squared	-0.001 ** (0.002)	-0.001 ** (0.000)	-0.001 ** (0.000)	-0.001 ** (0.000)
Private university dummy			0.079 (0.064)	0.359 ** (0.112)
Private univ/experience Interaction				-0.015 ** (0.005)
University quality		0.014 ** (0.004)	0.016 ** (0.004)	0.018 ** (0.004)
Constant	14.758 ** (0.065)	13.983 ** (0.218)	13.816 ** (0.256)	13.507 ** (0.271)
R ²	0.538	0.605	0.608	0.627

** $p < .01$.

In Model 3, we include the private university dummy (coded 1 for private university graduates and zero for national university graduates). This coefficient is not significant but becomes highly significant and positive after including its interaction term with work experience in Model 4. These results suggest that in

comparison to national university graduates, private university graduates start off with higher salaries, but their *relative* earnings (i.e. earnings relative to national university graduates) decline as a function of work experience.

We next estimate the internal rate of return (*IRR*) given the coefficients estimated from the OLS regressions. As a required first step, I estimated the experience-earnings profiles for national and private university graduates (Figure 4). The earnings profile for high school graduates are illustrated as a reference category.

Figure 4 confirms the steepness of the earnings profile among national university graduates. The cost region of the graph ($x = -4$ to 0) is smaller among national university graduates accounting for their lower tuition. With respect to earnings, national university graduates earn less during the earlier years of experience but their returns to experience are higher so that they earn more towards the later years of experience.

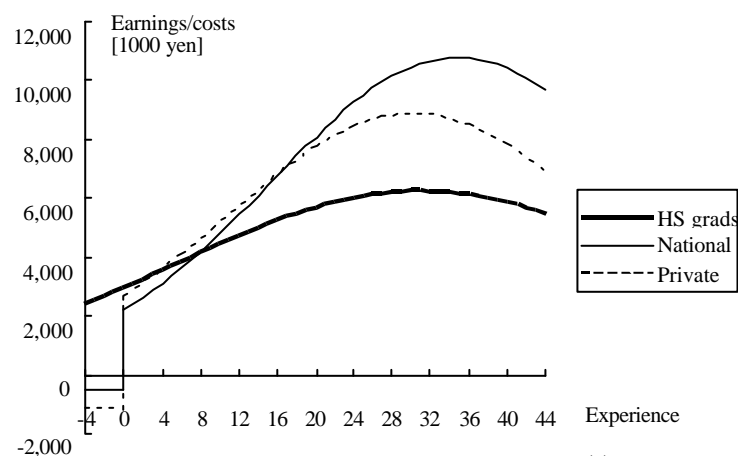


Figure 4 Earnings profiles by university sector

The difference in the shape of the earnings profiles between national and private universities mirrors the distinction between private and government sector jobs. The pattern arises because national university graduates are more likely to be employed in government sector jobs which are characterized by steeper earnings profiles.

Table 4 shows the *IRR* estimates derived from the models reported in Table

3. The unadjusted *IRR* of 6.52 percent was estimated from the baseline model (Model 1).

Table 4 Estimated <i>IRR</i> by university quality and sector [%]					
Unadjusted	By university quality			By university sector	
	Mean <i>Q</i>	Min <i>Q</i>	Max <i>Q</i>	National	Private
6.52	6.47	1.80	12.07	7.01	6.30

The *IRR* as a function of university quality suggest that the payoffs from university quality are substantial. In the lowest quality group, the *IRR* is 1.80 percent. On the other hand, the *IRR* among the highest quality group is 12.07 percent, which is almost twice as high as the unadjusted *IRR*.

And finally, we find that national university graduates have a higher *IRR* than private university graduates. This result reflects a combination of three factors. First, national university graduates pay lower tuition and hence lower costs associated with university education. It follows directly that their *IRR* will be higher, *ceteris paribus*. Second, as previously reported in Table 2, national university graduates attend institutions of higher quality to begin with. Since earnings (or monetary benefits) rise as a function of university quality, the *IRR* will likewise increase with respect to quality. And third, national university graduates

are more likely to be employed in government sector jobs. Although their starting salaries may be lower in comparison to private sector jobs, their returns to experience are higher, resulting in larger benefits over their working life.

In light of these empirical findings, the costs and benefits associated with national versus private university education lend support to the 'elite' view (Figure 5). National university graduates have lower marginal costs (given their lower tuition) *and* enjoy higher benefits, i.e. they have more to gain from their investments in university education. Figure 5 also suggests that private university graduates who invest in their human capital at the same level as that of the national university graduates will have *overinvested* (at least in comparison to the national university graduates). Such a point is obtained at *P* at which point marginal costs are greater than the marginal benefits, thereby resulting in *negative* surplus.

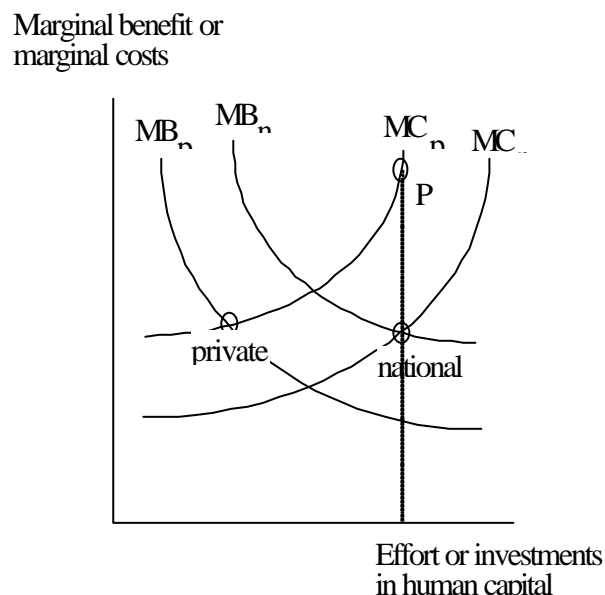


Figure 5 Investments in human capital revisited

Why then, would anybody choose to enroll in private universities? A plausible explanation is that the marginal cost for national university applicants is higher if we account for the preparation involved in getting into these universities, such that the marginal cost curves for national and private university graduates are the same (say MC_p for both graduates in Figure 5). Recall that these applicants must prepare for two rounds of examination where they are tested on a wide range of subjects regardless of intended major. Further, the ‘perceived cost’ of rejection may be significantly higher among national university applicants, since they may apply to only one school within a given year. Nevertheless, such conclusions cannot be drawn without identifying the true form of the cost function. And even if these conditions were true, it would still not be sufficient to equalize the returns between national and private universities, unless the benefits for private university graduates are at the same level obtained as those of national university graduates. Only then do we arrive at an equilibrium condition in which the net benefits (and hence the *IRR*) would be the same for both national and private university graduates.

We may, however, infer that the structural differences between the two sectors of universities function as a selection device. By imposing tougher standards and examination requirements, the national universities effectively weed out many applicants who would rather take the less rigorous route and attract only those who felt sufficiently competent. The result of such sorting is that on average, national universities attract smarter students.

5 Summary and Conclusions

National universities in Japan were originally founded more than a hundred years ago under the objective of training future elites. My research lends support to the position that aspects of this long-standing tradition still remain intact in contemporary Japanese society. Following Becker's framework for investments in human capital, I find that the outcome of national and private university graduates resembles an elite perspective; national university graduates enjoy higher benefits at lower costs. It is an elitist view in the sense that abler persons have more to gain from investments in their human capital.

Despite efforts by the American Occupation to break up the prestige differentiation between national and private universities, and the measures taken by the Ministry of Education to expand the number of private universities, many of the prewar features of national universities still persist. On average, national universities attract smarter students – smarter in the sense that they perform better on university entrance examinations which require more rigorous preparation. National university graduates are also more likely to be employed in the government sector. In this respect, it is likely that national universities still remain a training institution for civil servants, or a preferred recruiting ground from the eyes of the government sector.

Appendix

Coding university quality

Obunsha, a publishing company located in Tokyo, tabulates and publishes results of entrance examinations and the competitiveness scores of Japanese universities on an annual basis. Their annual publication, *Keisetsu Jidai*, is the Japanese equivalent of the *Barron's Guide to American Colleges* and ranks university departments based on results from the examinations administered in the previous year. Test scores are standardized across different universities and range from 30 to 80 (80 being the highest).

The SSM dataset is a cross-sectional survey where the respondents' ages range from twenty to seventy. In terms of the entry year into university, these years range from 1945 to 1992. In the coding process, I used the test scores from the 1966, 1972, 1977, 1982, 1986, 1992 issues of *Keisetsu Jidai* because there were small fluctuations in the scores of the individual schools over time (see Ishida, Spilerman and Su [1997] for a similar coding procedure using *Obunsha* data). I used scores from these respective issues depending upon individuals' entry year. For example, if an individual entered university in 1973, I used the 1972 scores. Because 1966 was the first year in which *Obunsha* began tabulating examination scores, individuals who entered university prior to 1966 were coded using the 1966 scores as an approximation.

Experience-earnings profile for high school graduates

The internal rate of return will be estimated for each male university graduate in the SSM survey by solving for *IRR* in equation (1), where d_i is the direct cost associated with university education specific to individual i , $Y_{i,x}$ is the reported annual earnings of university graduate i with x years of work experience, and $\bar{Y}_{h,x}$ is the estimated mean earnings of high school graduates with experience x which is assumed to be the same for all individuals.

From equation (1), it is clear that we must derive a standardized experience-earnings profile for high school graduates, i.e. \bar{Y}_h must be generated for all values of x between 0 and n . This is done by estimating a Mincerian regression for the sample of high school graduates only (Cohn and Hughes 1994, Cooper and Cohn 1997), that is, a Mincerian equation without the schooling variable:

$$\ln Y_h = \mathbf{a} + \mathbf{b}_1 x + \mathbf{b}_2 x^2 + \mathbf{Xf} + \mathbf{e} \quad (\text{A.1})$$

Ideally, we would like to obtain an earnings profile which is a function of experience only, so that earnings can be estimated while controlling for other characteristics (\mathbf{X}). Following Cooper and Cohn (1997), we first construct the following term by substituting the mean value of all variables in \mathbf{X} :

$$V_h = \hat{\mathbf{a}} + \hat{\mathbf{f}}\mathbf{X} \quad (\text{A.2})$$

where $\hat{\mathbf{a}}$ and $\hat{\mathbf{f}}$ are the coefficients obtained from OLS equation (A.1). Second, V_h is substituted back into equation (A.1) so that earnings becomes a function of experience only:

$$\ln \hat{Y}_h = V_h + \mathbf{b}_1 x + \mathbf{b}_2 x^2 \quad (\text{A.3})$$

The substitution of average characteristics (V_h) into equation (A.3) minimizes the differences in earnings owing to personal attributes.

Table A.1 shows the Mincerian regression coefficients among high school graduates only. \mathbf{I}_c is the Heckman correction term for university entry and was included in the second model to

account for unobserved differences between high school graduates. The maximum likelihood equation for participation is the probit model predicting the probability of university entry and the results are reported in Table A.2. The sample is restricted to male respondents who completed at least a high school education and who are currently working full-time. The variable “father’s occupational prestige missing value dummy” was included to salvage the considerable loss of observations (81 cases or 9.6 percent of the sample) resulting from the missing values for father’s occupational prestige. The coefficients obtained from the self-selection model in Table A.2 and their respective mean values were substituted back into the original Mincerian regression equation (equation [A.1]) such that earnings becomes a function of experience and experience squared only (equation [A.3]). An adjustment was made to account for the predicted value of tenure (t). Since t is a function of experience (x) where $t \leq x$, it is implausible that $\hat{t} > x$ which is likely to occur for small values of x . The following regression equation with no constant term was estimated to predict tenure (\hat{t}) given experience. The earnings profile was then estimated as a function of experience.

$$\hat{t} = .875x - .006x^2$$

(.074) (.002)

Table A.1 Mincerian regression coefficients for high school graduates

Variables	OLS		Self-selection model	
	Coefficient	S.E.	Coefficient	S.E.
Experience	0.045 **	(0.008)	0.047 **	(0.008)
Experience squared	-0.001 **	(0.000)	-0.001 **	(0.000)
Tenure	0.009 **	(0.003)	0.009 **	(0.003)
Ninth grade GPA	0.043 *	(0.020)	0.029	(0.023)
Number of previous employers	-0.065 **	(0.021)	-0.067 **	(0.021)
White-collar dummy	0.156 **	(0.041)	0.149 **	(0.041)
Firm size (vs <1000)				
Over 1000	0.148 **	(0.047)	0.147 **	(0.047)
Government	0.053	(0.065)	0.048	(0.065)
I_c			-0.037	(0.036)
Constant	14.610 **	(0.097)	14.696 **	(0.128)
R ²	0.509		0.510	

* $p < .05$, ** $p < .01$.

Table A.2 Probit coefficients describing determinants of university entry

Variable	Coefficient	S.E.
Ninth grade GPA	0.436 **	(0.054)
High school type (0: vocational, 1: general)	-1.256 **	(0.124)
Father's occ prestige	0.037 **	(0.006)
Father's occ prestige missing value dummy	-0.004	(0.179)
City size at time of graduation from Mandatory education	0.310 **	(0.080)
Sibling size	-0.064	(0.039)
Age	-0.012 *	(0.005)
Constant	-3.318 **	(0.402)
χ^2	377.59	

* $p < .05$, ** $p < .01$.

Figure A.1 shows the result of the standardized experience-earnings profile for high school graduates generated following the procedure just described. The results show that the standardized earnings profile conforms well to actual earnings (mean reported earnings of male SSM high school graduates with x years of work experience); aside from the minor deviations in the beginning years of work experience, actual earnings are found to be well within the lower and upper bounds of the 95 percent confidence intervals.

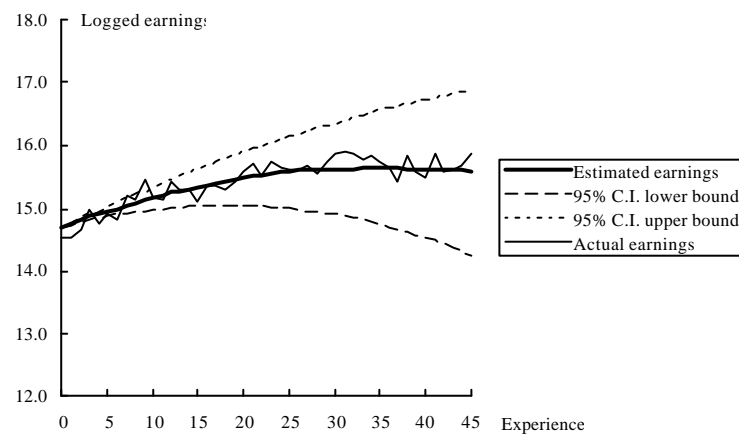


Figure A.1 Standardized experience-earnings profile for high school graduates

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