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A CROSS-SECTIONAL ANALYSIS OF THE DETERMINANTS OF ENROLLMENT IN HIGHER EDUCATION IN JAPAN*

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Abstract

This paper analyzes the determinants of the ratios of enrollment of males and females in universities and junior colleges by using cross-sectional data. We examine socioeconomic as well as purely economic factors such as (1) availability of investment funds, (2) proximity of institutions, (3) the father's educational background, (4) the mother's educational background, (5) the occupations of the parents, (6) the mother's participation in the labor force, (7) whether the subjects live in or near large cities, and (8) the ratio of effective labor demand to effective supply. We also examine the strength of the signaling hypothesis by using a variable for self-employment. We have found among other things that the effects of all the factors except (1) and (5) are dependent systematically on the sex of the decision-maker and the type of institution, i.e., university or junior college. It has been shown that the signaling hypothesis is not supported.

I. *Introduction*

The expenditure for higher education accounts for a large portion of the family budget, and it will have a substantial effect on future job opportunities and earnings. Thus whether or not to spend money for higher education is an important question for all families. Moreover, it is an important question for society as well, since educated people are necessary for economic growth, and the determination of who should receive additional education has an important effect on income distribution within that society.

The decision as to the expenditure for (higher) education has been modeled by those who consider it a form of human capital investment. According to their basic theory, the decision is made on the basis of the cost and benefit of the investment (see e.g. Becker (1975)). The cost is comprised primarily of direct outlays such as tuition and fees, and of forgone earnings. On the other hand, the benefit is made up primarily of the stream of additional earnings due to the education. A slightly more sophisticated theory takes into account the availability of investment funds to a family. Therefore, people tend to invest in higher

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education if the cost is lower, the benefit larger, and/or the availability of funds higher.

This theory of human capital appears persuasive, but there seem to be a number of other factors that affect the decision to seek higher education. What is especially unsatisfactory with this theory is that it does not take socioeconomic factors into account. For example, the educational backgrounds and occupations of parents seem to have a significant influence on the decision.

Furthermore, human capital theory is not the only hypothesis in use today which seeks to explain how people make the decision to invest in education. Another very famous theory is the signaling hypothesis proposed originally by Spence (1974). According to this theory, people go to college in order to transmit in the labor market the information that they are more productive than those who do not. Thus if one wants to investigate what factors actually determine enrollment in higher education in the real world, one must consider several variables in addition to simply the rate of return for the investment in higher education and the availability of investment funds. (In the following, enrollment refers to enrollment in a university or junior college.)

The purpose of this paper is to examine in detail several factors that seem to affect the enrollment decision by using cross-sectional data. Our focus will be on the enrollment decisions of males in universities, females in universities, and females in junior colleges. (Few Japanese males go to junior college.) We will consider some socioeconomic factors that the simple human capital theory does not take into account. We will also consider the strength of the signaling factor in the investment decision regarding higher education. In addition, we will compare the relative importance of the factors among the three types of decisions. Most of these will become analyzable by the use of cross-sectional data available for each prefecture in Japan.

The above purpose will also reveal the factors that bring about differentials in the ratios of enrollment among prefectures. That investigation of these differentials is an important matter can be understood by the fact that the differentials amount to more than 200% in all cases.

The structure of the paper is as follows. In Section II we will look into the facts regarding the differentials in the ratios of enrollment. This is equivalent to observing the dependent variables of our regression analyses. After observing these facts, we will also survey in that section several important studies on the determinants of enrollment. In Section III we will consider the independent variables of our regression analyses and discuss the data for these variables. In Section IV we will undertake hypothesis testing by specifying the regression model and by using the data considered in Section III. Section V will summarize the entire discussion.

II. *Facts and Previous Studies*

We observe in detail in this section the real differentials in the ratios of enrollment among prefectures. We will see that these differentials are quite large.

In this paper we would like to discuss three types of ratios regarding enrollment, i.e., the ratio of enrollment of males in universities (four-year institutions), the ratio of enrollment of females in universities, and the ratio of enrollment of females in junior colleges.

The first ratio in a particular year is defined as the number of males who were enrolled in universities in that year divided by the number of males who graduated from junior high schools (compulsory education) three years before. The other two ratios are defined similarly. These definitions are similar to the one most commonly employed, e.g., by the Ministry of Education.

These ratios are calculated from the data in the *Basic School Survey* compiled by the Ministry of Education. Note, however, that a slightly minor reservation should be kept in mind. The survey does not have data for the number of new students from each prefecture who are enrolled. What the survey actually contains is data for the number of new students from high schools located in each prefecture. There are small differences between the two, especially in prefectures which contain, or are close to large cities, but these differences are probably negligible. For a reason that will be presented later in the paper, we will focus our analysis on the enrollment ratios for the year 1981. Thus the data for the calculation of the enrollment ratios are those for the years 1981 and 1978.

Let us now look into the differentials in the ratios. Figure 1 shows the enrollment ratios of males in universities. The names of the prefectures on the horizontal axis are arranged from those with low ratios to those with high ratios. The ratios vary from a value slightly higher than 20% to that slightly lower than 55%. The top three prefectures in terms of the ratio are Tokyo, Hiroshima, and Kanagawa with the ratios 54.3%, 49.8%, and 47.4 %, respectively. The bottom three are Aomori, Okinawa, and Iwate with 21.4%, 21.9%, and 24.4%, respectively.

Figure 2 also shows the ratios of enrollment of females in universities. The ratios vary from a value slightly higher than 5% to that slightly higher than 20%. The top three prefectures in this case are Tokyo, Okayama, and Kagawa with 21.2%, 17.9%, and 17.5 %, respectively. The bottom three are Hokkaido, Okinawa, and Kagoshima with 5.5%, 5.6%, and 6.1%, respectively.

Figure 3 shows the ratios of enrollment of females in junior colleges. The ratios vary from the value slightly higher than 10% to that slightly higher than 30%. The top three are Nara, Hiroshima, and Hyogo with 30.5%, 28.6%, and 28.0%, respectively. The bottom three are Aomori, Yamagata, and Iwate with 10.2%, 10.9%, and 12.4%, respectively.

These observations imply first of all that the differentials are more than double in each of the three cases. They imply further that the differentials in the ratio of enrollment in universities between males and females are quite large. The number of males who enrolled in universities is more than double that of the female counterparts. The ratio of male enrollment in universities in Tokyo is about ten times as large as that of female enrollment in universities in Hokkaido. The differentials between the sexes partly reflect the fact that more than half of females who sought higher education enrolled in junior colleges.

This paper will analyze how each of these enrollment ratios is determined. This will be equivalent to showing why such differentials exist among prefectures. The significance of discussing each of the three types of ratios separately rather than collectively can be seen in the following facts. Figure 4 shows the ratios of enrollment of males in universities, but it is different from Figure 1 in that the order of prefectures here is the same as that for Figure 2. Though Figure 4 implies that there is a positive correlation between the ratios of males and females, it is not extremely large. So it is worthwhile to analyze the two separately. Similarly Figure 5 shows the ratios of enrollment of females in junior colleges with the order

FIGURE 1. THE RATIOS OF ENROLLMENT OF MALES IN UNIVERSITIES

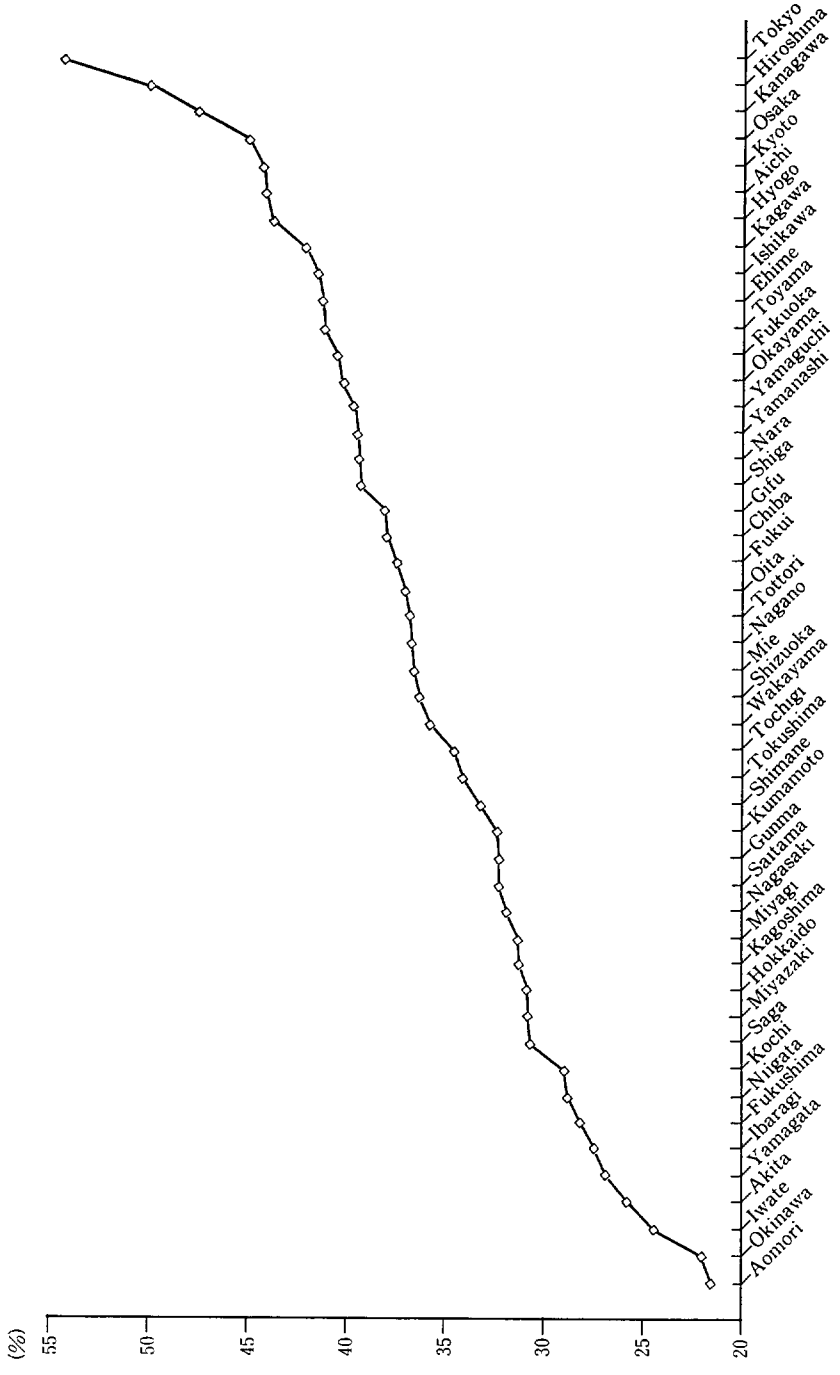


FIGURE 2. THE RATIOS OF ENROLLMENT OF FEMALES IN UNIVERSITIES

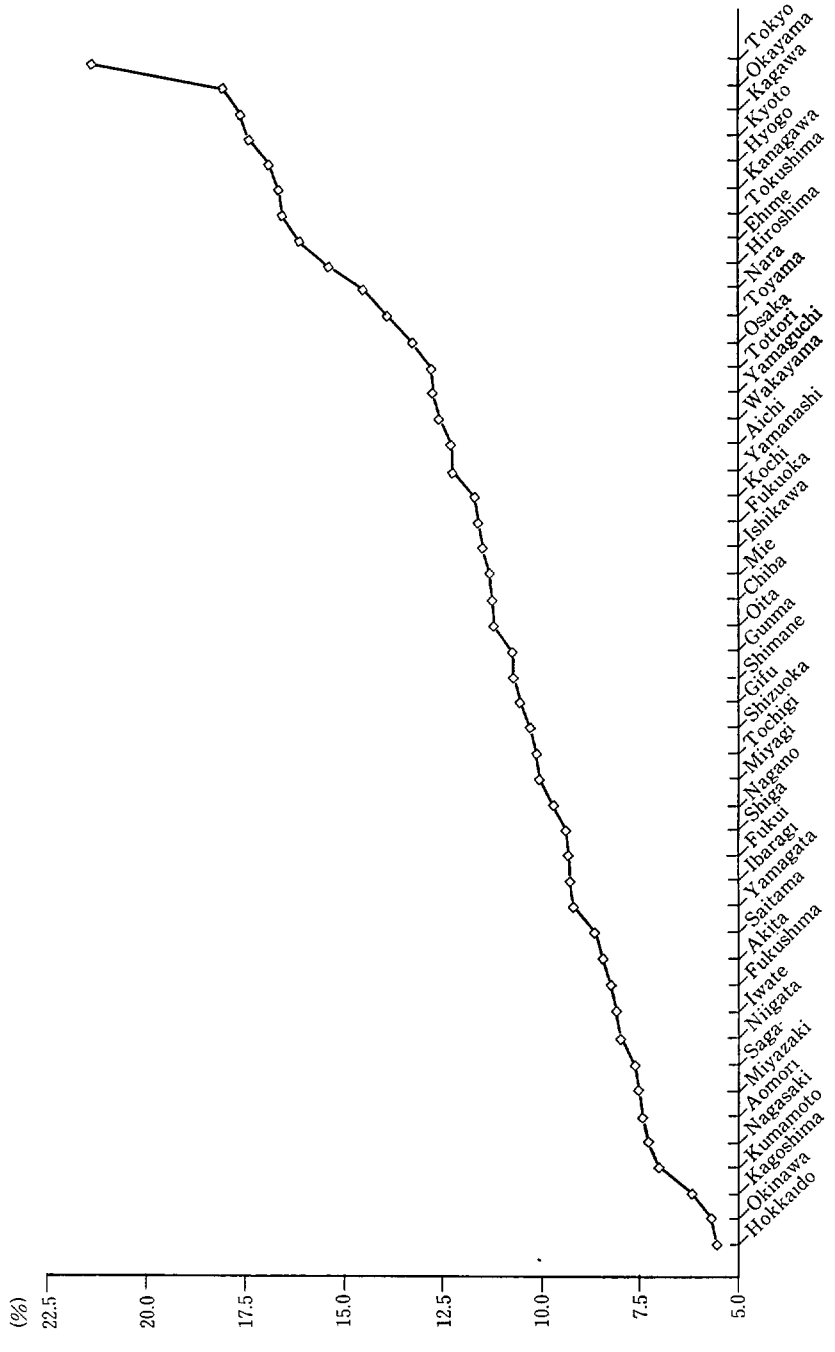


FIGURE 3. THE RATIOS OF ENROLLMENT OF FEMALES IN JUNIOR COLLEGES

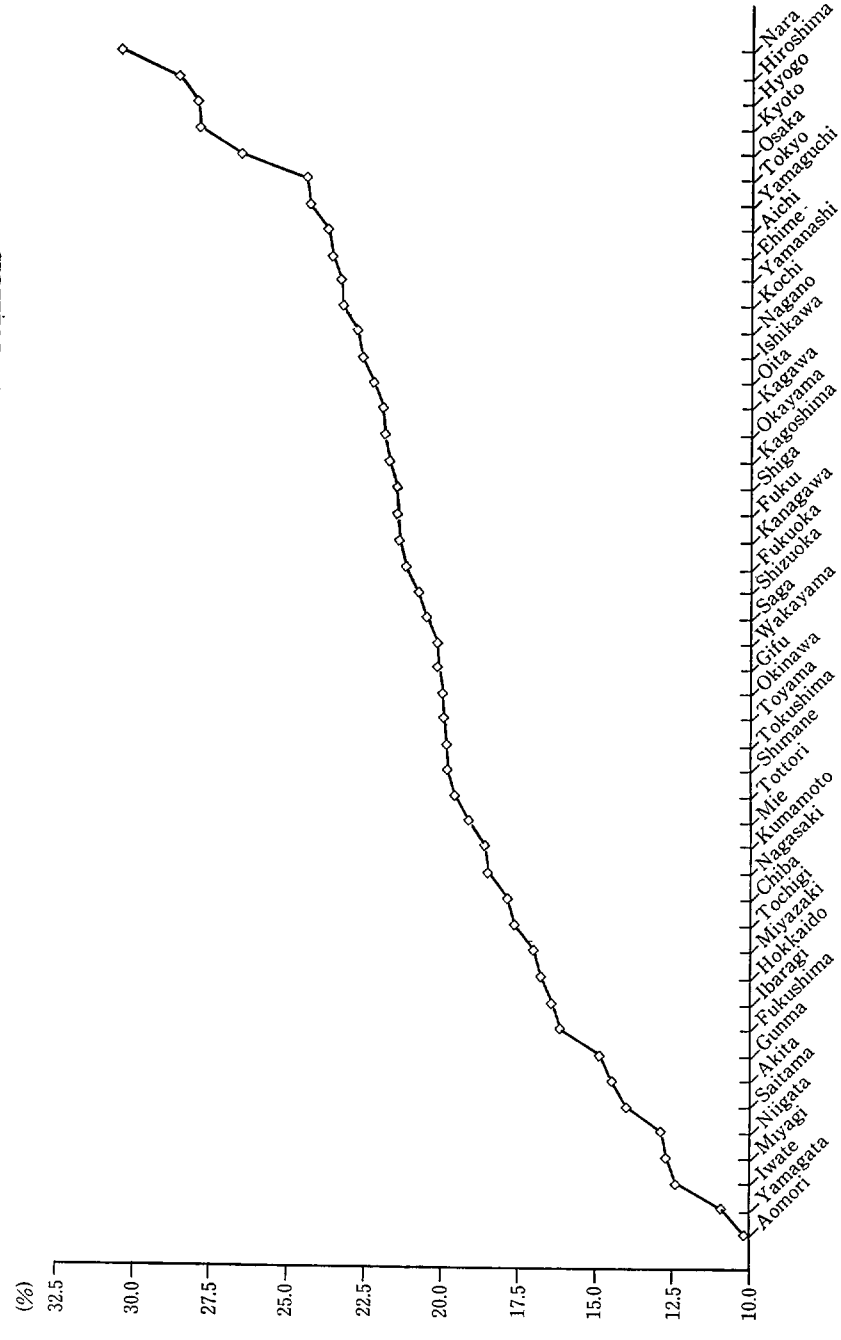


FIGURE 4. THE RELATIONSHIP BETWEEN THE RATIOS OF ENROLLMENT OF MALES IN UNIVERSITIES AND THE RATIOS OF ENROLLMENT OF FEMALES IN UNIVERSITIES

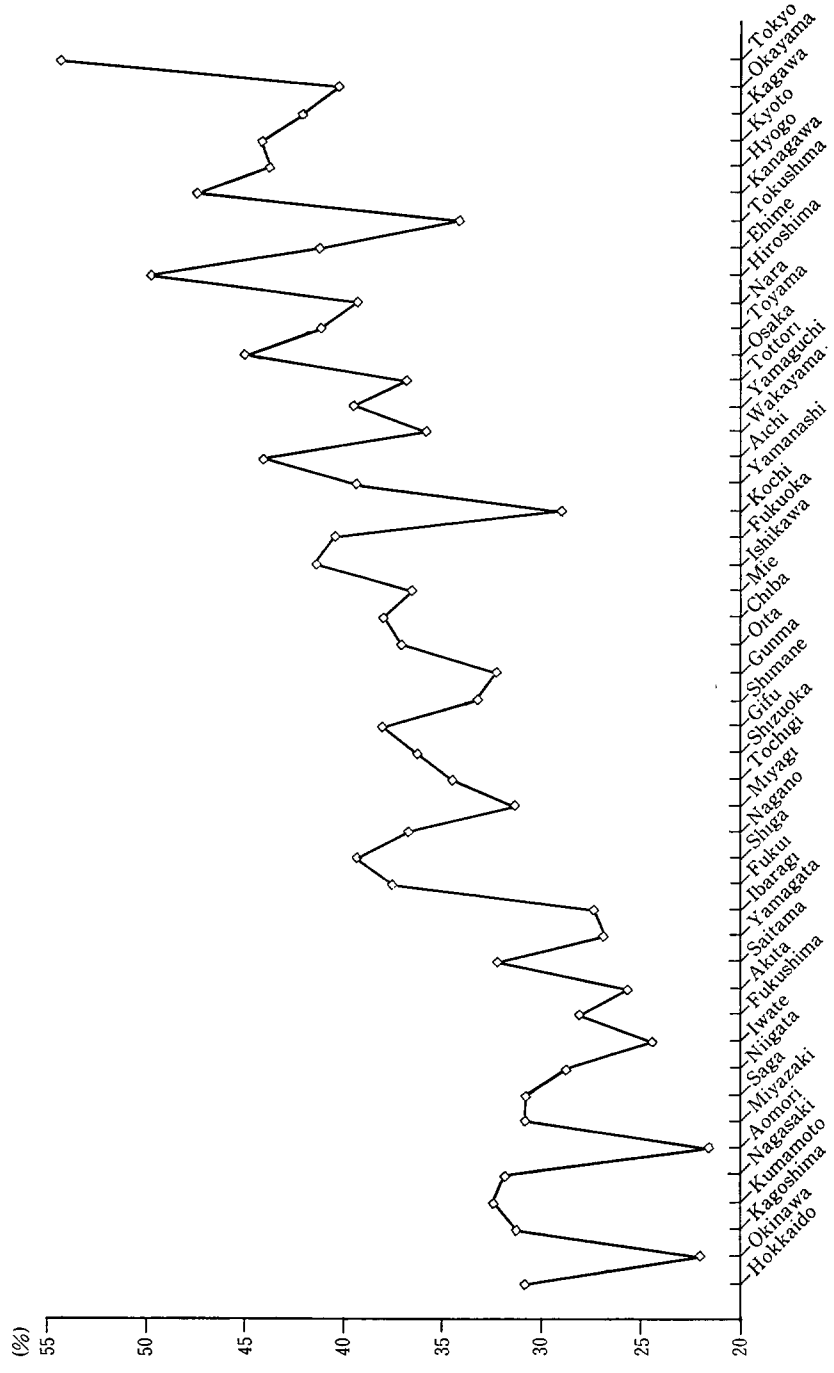
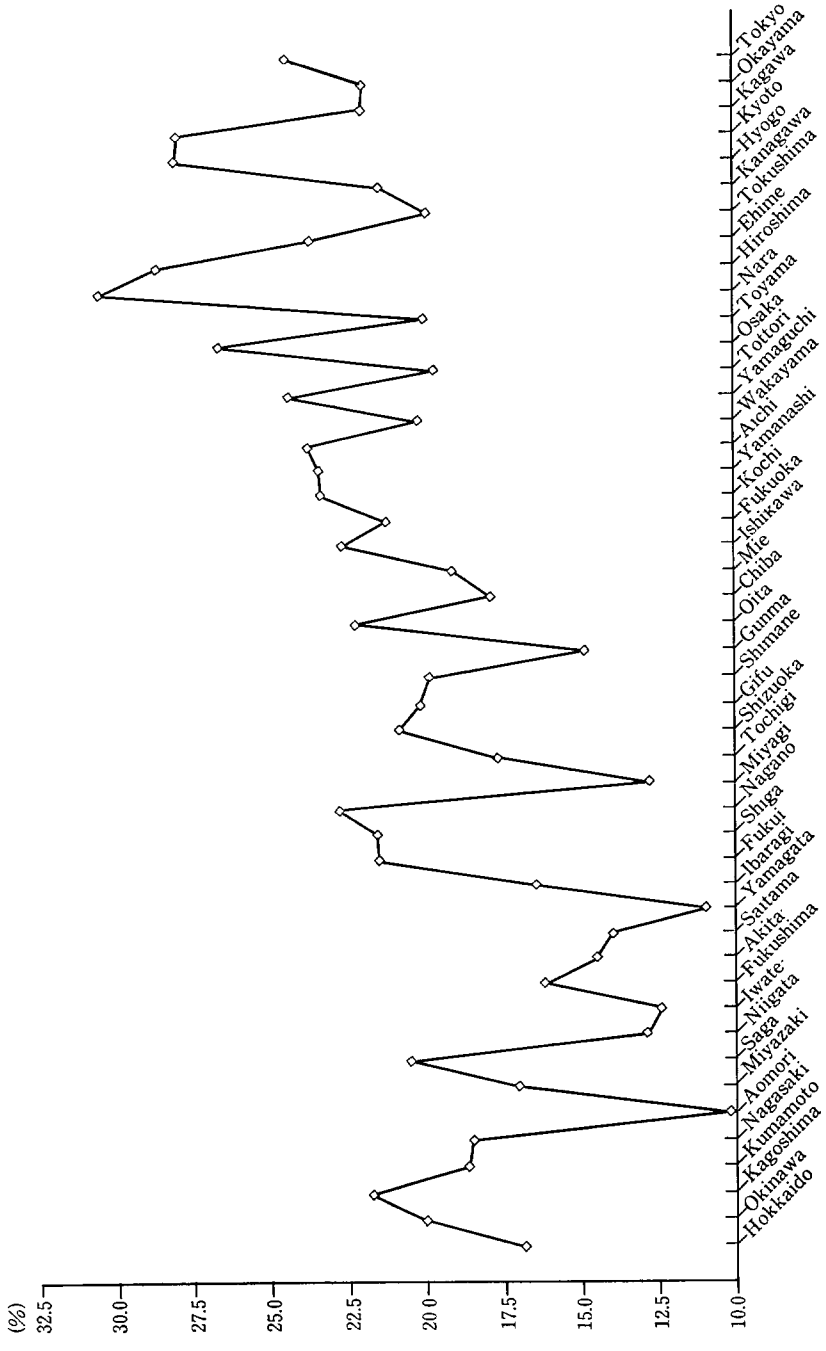


FIGURE 5. THE RELATIONSHIP BETWEEN THE RATIOS OF ENROLLMENT OF FEMALES IN JUNIOR COLLEGES AND THE RATIOS OF ENROLLMENT OF FEMALES IN UNIVERSITIES



of prefectures on the horizontal axis being the same as that for Figure 2. Here the correlation between the two types of ratios for females is not so large that it is clearly desirable to analyze them separately.

A number of attempts have been made to investigate the factors that determine the enrollment in higher education. Most of these attempts are based on the theory of human capital, so they basically consider that the cost and benefit are the prime determinants. Here we would like to review briefly what these earlier studies have found. For this purpose it is useful to classify the studies according to whether they are cross-sectional or time-series analyses. Because there are usually differences in the availability of data in these two types of analyses, they often test different types of hypotheses. Of course, there can also be cases in which they test the same types of hypotheses.

Notable cross-sectional analyses have been undertaken by Radner and Miller (1970), Corazzini, Dugan, and Grabowski (1972), Hopkins (1974), Kohn, Manski, and Mundel (1976), and Bishop (1977). What they showed is essentially that cost factors such as tuition, forgone earnings, and the distance of the school from the student's home have negative effects on enrollment, while expected future additional earnings due to enrollment and family income have positive effects. Some of these studies showed that the educational background of the father or family head (a socioeconomic factor) has a positive effect. Of course, there are some varieties among these studies. Some treat groups with different family incomes separately to show that the effects of other variables depend on family income levels. Some analyze the factors which affect the choice between private and state institutions. Others consider the effects of public policies on enrollment.

Time-series analyses were undertaken by Campbell and Siegel (1963), Galper and Dunn (1969), Lehr and Newton (1978), Mattila (1982), Pissarides (1982), Fujino (1986), and Arai (1990). As in the case of cross-sectional analyses these studies take into account the effects of family incomes and tuition costs. Some consider in addition the effects of the rate of growth of the size of the army, the size of discharges from the army, demonstration effects, and the differentials in the probability of promotion due to educational background. Some of these latter effects are difficult to identify in cross-sectional analyses.

As we have already seen, this paper utilizes cross-sectional data in terms of prefectures to discuss the determinants of enrollment. Micro-data might be desirable for conducting this type of cross-sectional analysis, but no such data are available.

The advantages of using these types of cross-sectional data are as follows. First, there have been no cross-sectional analyses on the determinants of enrollment in Japan. Secondly, use of these data enables us to test the effects of several interesting socioeconomic factors that seem to affect the enrollment decision. These socioeconomic factors are the father's educational background, the mother's educational background, the parents' occupations, the degree of participation of the mother in the labor force, and the proximity to large cities. We will also consider purely economic variables which have conventionally been used, such as family income, proximity to schools, and the demand and supply conditions in the labor market. Thirdly, in a cross-sectional analysis we can attempt to test the signaling hypothesis, a very important hypothesis in vogue today concerning the enrollment decision. The idea for this test was proposed by Wolpin (1977), but he did not undertake a statistical test of the theory.

III. *The Independent Variables and Data*

In this section we will consider the independent variables or the hypotheses to be tested, and the data for the regression analyses that have the characteristics described above. For most of the independent variables we use data from the year 1980. This amounts to assuming that the people we are considering in this paper made enrollment decisions in 1980. This assumption might appear rather simple at first sight, but it is reasonable for the following reasons. First of all, by 1980, most young people in Japan attended senior high school, so the effect of the decisions made by those who participated in the labor force immediately after graduation from junior high school is negligible. Secondly, the relative magnitudes of most of the independent variables among prefectures are expected to be fairly stable within a few years. So even if the enrollment decision was made a few years earlier than 1980, the results will not be greatly affected.

Our first hypothesis to be tested is basic and standard. It is concerned with the availability of investment funds. We expect that a higher degree of availability will lead to higher ratios of enrollment. We use the following two alternative data for this variable.

One is the real prefectural income per capita in thousands of yen in 1980. This is denoted by INPCR. The data for the prefectural incomes per capita are available in the *Annual Report on Prefectural Accounts* compiled by the Economic Planning Agency (1988). We must adjust this data by relative prices among prefectures to compare the real availability of investment funds. Unfortunately such price data are not available for 1980. We therefore substitute the relative prices in 1982 on the basis of the assumption that relative prices will not change greatly over a two-year period. The data are available in the *1982 National Survey of Prices* compiled by the Statistics Bureau, Prime Minister's Office (1982).

The other alternative for the availability of investment funds is calculated from the *Basic Survey on Wage Structure* compiled by the Ministry of Labor (1980). It is the real average annual wage, including bonuses, in thousand yen for male workers from 40 to 54 years of age. This age class has been selected because it is primarily the males in this age class who have children who face the decision of whether or not to enroll. However, there is a reservation regarding the use of this data. Some people work outside the prefectures where they live. Thus, the average annual wage calculated above is not precisely that of the fathers of the students who live in each prefecture. Even so, the correlation is expected to be very high. We again use the above-mentioned data on relative prices. This alternative is denoted by AWR.

The second independent variable is the proximity to schools. We expect that if schools are located nearby, the cost of higher education is less. Furthermore, the existence of institutions might provide demonstration effects to those who live nearby. We can express proximity by the number of institutions in a prefecture per fixed number, say ten thousand, of people who are of enrollment age. Since the proportions of males and females are the same in all prefectures, counting only one sex or both in the above calculation will not cause any biased results. Therefore, for the cases of enrollment of males and females in universities, we use the total number of enrollment-age people of both sexes in the denominator (in ten thousand). For the case of the enrollment of females in junior colleges, we use the

sum of only enrollment-age females in the denominator. This proximity variable is denoted by NOIPC. The data for the number of institutions are available in the *Basic School Survey*. The data for the number of people of enrollment age are abailavle in the *1980 Population Census of Japan* compiled by the Statistics Bureau, Prime Minister's Office (1980).

The third independent variable represents the father's educational background. It is very likely that this variable will affect the child's decision to seek higher education. Some of the studies mentioned in the previous section showed that the father's educational background had a positive effect on the enrollment pattern of the child in the United States. Unfortunately, no studies have been undertaken on this matter in Japan. So it will be of great interest to examine the effect in this country. The latest data for this variable are available in the *1980 Population Census of Japan*. This is the reason we have chosen the year 1981 for the data for the dependent variables.

In order to make the father's educational background an independent variable, we need to transform the distribution of different educational backgrounds into one index. The Census shows the distribution of five types of graduates, a small number of persons who are presently attending schools, and those who have never attended school for each prefecture. Among the five types, we regard the graduates from youth schools (*seinen gakko*), which ceased to exist after World War II, to have completed a course of compulsory education. We can then compute a weighted average of the number of years of the father's education for each prefecture by assigning the following number to each of the groups of people: 9 to the graduates with compulsory education levels, 12 to those from senior high schools (including former middle schools), 14 to those from junior colleges or equivalent institutions, 16 to graduates of universities or graduate schools, and zero to those who have never attended school. (We exclude those who are presently attending schools from this computation.) These numbers do not necessarily imply that these groups have actually been educated for those numbers of years. But for the present purpose, this method of transformation will be appropriate. In this indexation we assume that fathers are distributed uniformly among the age class from 40 to 54. The variable obtained in this way is denoted by YEDFA.

The fourth independent variable is for the mother's educational background. Since none of the above-mentioned studies have considered this effect, this variable is unique to this paper. There is no *a priori* reason why only the father's or family head's educational background will affect the children's enrollment. Therefore, it is of interest to study the effect of this variable. The process of transforming the distribution of different types of graduates into one index for the average years of the mother's education is the same as that adopted above except that the age class taken into consideration covers the range from 40 to 49 in the case of the mother's educational background. The variable obtained in this way is denoted by YEDMO.

The fifth independent variable is also unique to this paper. It is a type of index for the weight of certain occupations of parents that encourage enrollment of children. Our hypothesis here is that those people who are engaged as managers, officials, and professional and technical workers are more likely to send their children to colleges. The data for the percentage of those engaged in these occupations are available in the *1982 Employment Status Survey* compiled by the Statistics Bureau, Prime Minister's Office (1982). There is no data available for the year 1980. The closest available year is 1982. The variable

obtained in this way is denoted by PRMNG.

The sixth independent variable is again unique to this paper. It is the variable for the labor force participation rate of the mothers. Two kinds of effects are conceivable for this variable. The first is that when the rate is higher, mothers are more likely to recognize the benefit of higher education because they can more closely observe those who are actually working. The second is simply that a higher rate leads to higher availability of investment funds. The data for this variable are available in the census data we have previously mentioned. The range of age for mothers is the same as that for YEDMO. The variable obtained in this way is denoted by PARTR.

The seventh independent variable is for a test of the signaling hypothesis. This hypothesis by Spence implies that people invest in education to transmit information about their productivity to their employers. According to this hypothesis, education does not enhance the productivity of workers. Its role is simply to screen people. Wolpin (1977) suggested a method of testing this hypothesis, but he did not undertake a statistical test. He stated that if those who do not have to transmit information regarding their productivity do not invest in higher education, then it simply plays a role of providing signals. Those who do not need to transmit information are people who are going to be self-employed.

We would like to test the signaling hypothesis in this paper on the basis of Wolpin's idea. But a satisfactory test is difficult to conduct, because it is difficult to identify those who are going to be self-employed in the future. Furthermore, even those who plan to be self-employed may have reasons to invest in higher education, even if higher education is simply a screening process. For one reason there is the risk that they will not be able to be self-employed in the future, so they invest in higher education in preparation for this risk. Another is that they may have incentives to transmit information about their abilities to those who trade with them.

With these reservations in mind, we consider two candidates for the variable that expresses the size of the group who plan to be self-employed. One is the weight of individual proprietors in the prefectural income, which is denoted by INPR. The other is the portion of self-employed workers among all working persons in each prefecture, which is denoted by SEMP. Both are in terms of per cent. The data for the former can be obtained in the *Annual Report on Prefectural Accounts* mentioned previously, while the data for the latter is contained in the *1982 Employment Status Survey* also previously mentioned.

The rationale for using these data is that if the present weight or portion is large, the future portion of self-employed workers is expected to be also large, because the economic environments will encourage self-employment and children of self-employed workers are more likely to be self-employed. Though INPR does not imply the number of self-employed people, it has an advantage of representing the importance of self-employment in each prefecture: even if the numebr of self-employed workers are large, the future number cannot be expected to be also large, when the present income per self-employed worker is not large. According to the signaling hypothesis, both INPR and SEMP are expected to have negative effects on the enrollment decision.

The eighth independent variable is a dummy variable which takes on a value of one if the prefecture contains a very large city and zero if otherwise. Here a very large city refers to one of the following cities; Tokyo, Osaka, Nagoya, Kyoto, Yokohama, Kobe, Kitakyushu, Kawasaki, Fukuoka, and Hiroshima. All of these cities, with the exception

of Tokyo, are special cities chosen by a government ordinance (*seirei shitei toshi*). This independent variable is denoted by LCDUM.

This dummy variable is introduced to show the advantages to those who live in or near large cities in obtaining admission to universities or colleges. The advantages include a variety of services they can enjoy in order to prepare for the entrance examinations. For example, several famous preparatory schools offer lectures and practice examinations for particular institutions. This specialized instruction allows the students to score higher on entrance examinations than those students who only attend regular high schools. Furthermore, these preparatory schools provide their students with high quality information regarding entrance examinations, partly because they collect data from the large number of students who attend, or who take their examinations. Famous preparatory schools tend to be located in large cities and they assist students there to achieve passing scores in entrance examinations. Sapporo is also a large city, as designated by the government ordinance, but the author has excluded it from the above list because it is not very large as compared with the area and/or population of Hokkaido as a whole.

The ninth independent variable is concerned with the degree of tightness of the labor market when the enrollment decision is made. Some of the previous studies have shown that when the labor market is tight, people are more likely to secure employment rather than to seek higher education. We use here the ratio of effective labor demand to effective supply for both sexes to measure the degree of tightness of the labor market.

The data are available in the *Annual Report on Labor Markets*. There are a variety of dates (by month or year) for which the data for the ratios are available. In this paper we have chosen the fiscal year 1979 for our computations, i.e., we use the annual average of the ratio of that year for each prefecture. One reason is that, fortunately, the degree of correlation between the ratios of adjacent months or years is very high. Another reason is that if we assume that the decision to enroll is made about one year before graduation from senior high school, the ratios in 1979 seem more appropriate than those in 1980. The author actually applied the average ratios both in 1979 and 1980 to some of the specifications discussed below, and found that those in 1979 are more supportive of the hypothesis we are going to test. The independent variable defined in this way is denoted by DSMF.

IV. *Testing the Hypotheses*

We are now in a position to test the several hypotheses we have considered so far. Before proceeding to the tests, we would like to specify the regression model. We will try several specifications based on different combinations of variables and/or data.

First we specify the use of the data for the variable for the availability of investment funds. We will use either INPCR or AWR in one regression equation. Secondly, we similarly specify the use of the variables for the parents' educational backgrounds. It might be interesting to introduce both YEDFA and YEDMO in the same regression equation to see which effect is the stronger. But the author has found from a number of experiments that we cannot test both effects at the same time, because there is high collinearity between the two variables. So in the following, we will use either of the two variables in one regression equation. Since INPR and SEMP are two similar candidates to test the signaling

TABLE 1. THE DETERMINANTS OF THE RATIO OF ENROLLMENT OF MALES IN UNIVERSITIES

	CONST.	INPCR	AWR	NOIPC	YEDFA	YEDMO	PRMNG	PARTR	INPR	SEMP	LCDUM	DSMF	SER	R^2	$\bar{R}^2$	F
(1)	−46.79	0.01075		0.1541	2.457		1.526	26.85	−0.1924		3.587	2.824	3.82	0.760	0.710	15.08
		(1.88)		(0.23)	(0.60)		(1.79)	(2.46)	(−0.96)		(1.46)	(1.18)				
(2)	−93.78	0.01567		−0.3400	4.629		1.687	25.96		0.5962	3.922	3.024	3.70	0.775	0.728	16.37
		(2.54)		(−0.50)	(1.21)		(2.04)	(2.47)		(1.86)	(1.66)	(1.34)				
(3)	−94.53	0.008600		0.1087		7.913	1.066	26.61	−0.1264		3.399	2.676	3.52	0.797	0.755	18.68
		(1.85)		(0.18)		(2.71)	(1.62)	(2.81)	(−0.70)		(1.51)	(1.23)				
(4)	−115.2	0.01355		−0.3033		7.839	1.426	24.52		0.4438	3.699	3.045	3.44	0.806	0.765	19.74
		(2.46)		(−0.49)		(2.79)	(2.19)	(2.61)		(1.49)	(1.69)	(1.51)				
(5)	−88.97		0.007827	−0.07338	3.922		1.421	48.82	−0.09095		3.553	0.6039	3.67	0.779	0.733	16.75
			(2.66)	(−0.11)	(1.13)		(1.78)	(4.03)	(−0.47)		(1.57)	(0.23)				
(6)	−130.3		0.009247	−0.4352	6.126		1.432	52.22		0.4615	4.040	0.3726	3.56	0.792	0.748	18.10
			(3.18)	(−0.67)	(1.79)		(1.86)	(4.54)		(1.62)	(1.83)	(0.15)				
(7)	−115.7		0.006595	−0.1092		7.593	1.191	44.02	−0.06790		3.572	1.116	3.42	0.808	0.768	20.00
			(2.40)	(−0.18)		(2.69)	(1.85)	(3.87)	(−0.38)		(1.72)	(0.48)				
(8)	−132.3		0.007888	−0.3911		7.695	1.421	46.24		0.2784	4.083	1.265	3.38	0.813	0.774	20.67
			(2.78)	(−0.64)		(2.80)	(2.23)	(4.17)		(1.09)	(1.97)	(0.56)				
(9)	−72.95	0.007951		0.7076	7.338			22.53	−0.2101		3.416	1.358	3.93	0.740	0.694	15.88
		(1.41)		(1.17)	(2.32)			(2.06)	(−1.02)		(1.36)	(0.59)				
(10)	−96.88	0.008389		0.5478		10.04		18.50	−0.1897		3.265	1.646	3.59	0.783	0.744	20.13
		(1.77)		(0.99)		(3.76)		(2.25)	(−1.06)		(1.42)	(0.78)				
(11)	−106.2		0.006996	0.4730	7.932			41.56	−0.1212		3.104	−0.8096	3.77	0.761	0.718	17.70
			(2.34)	(0.81)	(2.91)			(3.54)	(−0.61)		(1.34)	(−0.32)				
(12)	−116.9		0.006070	0.3964		10.06		33.72	−0.1441		3.514	0.1971	3.53	0.791	0.753	21.05
			(2.15)	(0.72)		(3.91)		(3.29)	(−0.81)		(1.64)	(0.08)				

hypothesis, we will again use either in one regression equation.

With these rules in mind we would like to specify the model more concretely. If we use either INPCR or AWR, either YEDFA or YEDMO, either INPR or SEMP, and all the other independent variables, there are then eight different types of specifications. It is difficult to say *a priori* that some of them are better suited than the others. So we apply these specifications to all the dependent variables.

Let us examine the results of these eight specifications for the case of the enrollment of males in universities. They are in the first eight equations in Table 1. We notice in these equations that INPCR and AWR have positive and significant effects on enrollment, as expected. NOIPC does not have expected effects. YEDFA has positive but rather weak effects as compared with those of YEDMO. PRMNG has positive and rather significant effects, as expected. PARTR also has positive and significant effects. INPR and SEMP have different effects. Though INPR has negative but insignificant effects, SEMP has positive and rather significant effects, the latter results completely conflicting with the signaling hypothesis. LCDUM has positive and fairly significant effects in most specifications, as expected. Finally, DSMF does not have the expected effects.

The weak effects of YEDFA seem to be due to the collinearity with PRMNG, since the larger the weight of managers, officials, and professional and technical workers, the greater the average number of years of education of the fathers usually tend to be. We have therefore tried different specifications by eliminating PRMNG in equations 9 through 12, where use is made only of INPR and not of SEMP because the former had better results for the signaling hypothesis in the above. As expected, equations 9 and 11 show positive and significant effects of YEDFA. Therefore, we can propose that the father's educational background affects the enrollment decision. Also interesting is the comparison between the effects of YEDFA and those of YEDMO, the latter of which can be seen in equations 10 and 12. The t-values for the coefficients of YEDMO are larger than those for the coefficients of YEDFA, and all of SER, R^2, $\bar{R}^2$, and F are better when YEDMO is used. From this observation we may insist that the effect of the mother's educational background is stronger than that of the father's in the decision regarding enrollment.

The effects of the other variables in the last four equations are almost similar to those pointed out above, but there are a few slight differences. The results for the effects of NOIPC are more supportive of our hypothesis this time, though the t-values are still not large enough. Similarly, the results for the effects of INPR are also more supportive, though the significance is again not large enough. The results for the effects of LCDUM and DSMF are sligntly less supportive and more supportive, respectively, of the corresponding hypotheses.

Summing up the above observations, we can conclude that the enrollment of males in universities is significantly dependent upon the availability of investment funds, the educational backgrounds of both father and mother, the parents' occupations, the mother's participation in the labor force, and whether or not the decision maker lives in or near a large city. The proximity to institutions does not seem to have significant effects on the ratios of enrollment. This implies that the Japanese males do not seriously consider the cost of travel and the additional room and board costs that result from enrollment in schools far from home. As far as the variables used in our regression model are concerned, the signaling hypothesis is rather weak. One of the variables has positive and fairly signif-

TABLE 2. THE DETERMINANTS OF THE RATIO OF ENROLLMENT OF FEMALES IN UNIVERSITIES

	CONST.	INPCR	AWR	NOIPC	YEDFA	YEDMO	PRMNG	PARTR	INPR	SEMP	LCDUM	DSMF	SER	R^2	$\bar{R}^2$	F
(1)	−37.71	0.002129		0.2956	1.309		1.226	18.30	0.07296		1.453	1.587	2.68	0.551	0.457	5.83
		(0.53)		(0.64)	(0.45)		(2.05)	(2.39)	(0.52)		(0.84)	(0.94)				
(2)	−52.12	0.005996		0.02886	1.548		1.301	15.61		0.4418	1.398	1.086	2.56	0.591	0.505	6.86
		(1.41)		(0.06)	(0.59)		(2.27)	(2.15)		(1.99)	(0.86)	(0.70)				
(3)	−87.50	−0.0004204		0.2758		7.007	0.7001	18.87	0.1445		1.269	1.359	2.32	0.665	0.595	9.45
		(−0.14)		(0.69)		(3.64)	(1.62)	(3.02)	(1.22)		(0.85)	(0.95)				
(4)	−86.16	0.002898		0.1103		6.110	0.7874	16.08		0.3461	1.133	0.7353	2.27	0.679	0.611	10.03
		(0.80)		(0.27)		(3.29)	(1.83)	(2.59)		(1.76)	(0.78)	(0.55)				
(5)	−51.00		0.004014	0.1343	0.7410		1.311	28.12	0.1208		0.8357	0.006147	2.57	0.589	0.502	6.81
			(1.95)	(0.30)	(0.30)		(2.35)	(3.32)	(0.88)		(0.53)	(0.00)				
(6)	−69.42		0.004789	−0.07722	1.752		1.248	28.28		0.4211	1.165	−0.5345	2.45	0.626	0.547	7.95
			(2.39)	(−0.17)	(0.74)		(2.36)	(3.57)		(2.15)	(0.77)	(−0.31)				
(7)	−93.23		0.002397	0.1775		6.185	0.7595	24.66	0.1775		0.5160	0.04291	2.27	0.680	0.612	10.09
			(1.32)	(0.45)		(3.30)	(1.79)	(3.27)	(1.51)		(0.38)	(0.03)				
(8)	−93.83		0.003229	0.007905		5.577	0.8352	24.17		0.3595	0.8842	−0.4173	2.20	0.697	0.634	10.95
			(1.75)	(0.02)		(3.11)	(2.01)	(3.34)		(2.15)	(0.65)	(−0.28)				
(9)	−58.73	−0.0001171		0.7403	5.231			14.83	0.05868		1.316	0.4093	2.79	0.502	0.412	5.61
		(−0.03)		(1.73)	(2.32)			(1.91)	(0.40)		(0.74)	(0.25)				
(10)	−89.05	−0.0005593		0.5642		8.403		13.54	0.1029		1.181	0.6831	2.36	0.642	0.578	10.01
		(−0.18)		(1.55)		(4.78)		(2.50)	(0.83)		(0.78)	(0.49)				
(11)	−66.91		0.003248	0.6381	4.439			21.42	0.09291		0.4217	−1.297	2.71	0.529	0.445	6.26
			(1.51)	(1.51)	(2.26)			(2.54)	(0.65)		(0.25)	(−0.72)				
(12)	−93.97		0.002062	0.5000		7.758		18.09	0.1289		0.4791	−0.5431	2.33	0.653	0.591	10.48
			(1.11)	(1.38)		(4.57)		(2.68)	(1.10)		(0.34)	(−0.35)				

icant coefficients. Though these might be due to the reasons mentioned before, one possible reason might be that the hypothesis is actually rather unrealistic and the effects of high incomes of self-employed workers on their children's enrollment decisions appeared in the tests. The effect of the tightness of the labor market is also weak. A similar result was obtained in a time-series analysis by Arai (1990).

Next we examine the results for the enrollment of females in universities, which are shown in Table 2. All the specifications are the same as those shown in Table 1. As for the availability of investment funds, AWR has positive and significant effects, but INPCR's effects are much smaller in this case than in the case of males.

The significance of the effects of NOIPC is again low in the first eight specifications, but it is fairly high in the last four. Even in the first eight specifications, the results are closer to the hypothesis to be tested than those in the corresponding specifications in the case of males. This implies that the variable for proxinity has a stronger effect in the enrollment decision of females in universities.

The effects of YEDFA are much less significant in the specifications within the first eight equations than those we observed in the case of males. In the other specifications, the significance is high enough, but it is not larger than that in the case of males. These results seem to imply (weakly) that the father's educational background has a stronger influence on his son's enrollment decision than is the case with his daughter. The effects of YEDMO are all significant, and as with the above they are more significant in the case of females than in that of males, implying that the mother's educational background has a stronger influence on daughters than on sons.

The effects of PRMNG are similar both in Table 1 and Table 2, and there seems no essential differences. Those of PARTR are also similar, but mostly the significance is slightly higher in the case of males. This might imply (again weakly) that mothers recognize the importance of higher education slightly more for males than for females.

The signaling hypothesis is very weak in the case of Table 2. All the signs of the coefficients of INPR and SEMP are positive, though the t-values of the coefficients of INPR are smaller. We can interpret this in the same fashion as in the case of males.

The coefficients of LCDUM are positive but not significant in the case of Table 2. The tightness of the labor market again does not show significant effects in Table 2. But the results are closer to the corresponding hypothesis than those shown in Table 1. This implies that females are slightly more responsive to this factor than males.

Finally we examine briefly the case of the enrollment of females in junior colleges. The results are shown in Table 3. We would like to emphasize mainly the differences between these and those described above. An interesting difference lies in the effects of NOIPC. They are positive and significant in many specifications in Table 3. This implies that enrollment in junior colleges is fairly responsive to the proximity of these institutions to the homes of the students. Another interesting difference is that the parents' educational backgrounds do not have positive and significant effects. The effects of PARTR are weak in the case of junior colleges as compared with that of universities. The result that the effects of DSMP are relatively closer to those implied by the hypothesis to be tested is also interesting from the point of view of economics. The results concerning DSMF in the last two equations actually show significant effects. Thus the decision to enroll in junior colleges is relatively more responsive to the tightness of the labor market.

TABLE 3. THE DETERMINANTS OF THE RATIO OF ENROLLMENT OF FEMALES IN JUNIOR COLLEGES

	CONST.	INPCR	AWR	NOIPC	YEDFA	YEDMO	PRMNG	PARTR	INPR	SEMP	LCDUM	DSMF	SER	R^2	$\bar{R}^2$	F
(1)	38.64	0.001428		2.733	−3.736		1.378	2.963	−0.2757		2.178	0.3462	3.62	0.491	0.384	4.59
		(0.27)		(2.18)	(−0.97)		(1.79)	(0.28)	(−1.43)		(0.96)	(0.15)				
(2)	−23.15	0.007239		0.9427	−0.8230		1.631	3.675		0.7541	2.649	0.9748	3.46	0.533	0.435	5.43
		(1.26)		(0.72)	(−0.23)		(2.20)	(0.37)		(2.38)	(1.23)	(0.46)				
(3)	−16.90	−0.002597		2.512		2.458	0.7095	7.873	−0.1735		2.227	−0.09174	3.63	0.487	0.379	4.51
		(−0.54)		(1.91)		(0.78)	(1.12)	(0.79)	(−0.90)		(0.98)	(−0.04)				
(4)	−58.58	0.004771		0.6486		3.355	1.194	5.879		0.7676	2.611	0.5320	3.40	0.549	0.455	5.79
		(0.89)		(0.50)		(1.18)	(2.01)	(0.63)		(2.49)	(1.23)	(0.27)				
(5)	23.74		0.005765	2.436	−5.104		1.492	16.05	−0.2098		0.7970	−2.172	3.42	0.545	0.449	5.69
			(2.13)	(2.04)	(−1.59)		(2.09)	(1.43)	(−1.14)		(0.39)	(−0.90)				
(6)	−49.96		0.008108	0.6501	−1.183		1.575	23.51		0.7843	1.639	−2.145	3.14	0.618	0.538	7.68
			(3.22)	(0.56)	(−0.40)		(2.43)	(2.33)		(2.97)	(0.86)	(−0.98)				
(7)	−24.39		0.004427	2.559		0.5439	0.7267	17.32	−0.1193		0.1693	−2.999	3.53	0.515	0.413	5.05
			(1.59)	(2.01)		(0.18)	(1.18)	(1.50)	(−0.63)		(0.08)	(−1.23)				
(8)	−75.86		0.007318	0.4604		1.944	1.226	23.07		0.8380	1.471	−2.449	3.12	0.622	0.542	7.82
			(2.87)	(0.39)		(0.75)	(2.26)	(2.30)		(3.36)	(0.79)	(−1.16)				
(9)	14.04	−0.0008823		3.588	0.7574			−1.320	−0.2998		2.267	−1.170	3.72	0.449	0.350	4.53
		(−0.17)		(3.02)	(0.25)			(−0.13)	(−1.52)		(0.97)	(−0.53)				
(10)	−17.34	−0.002475		2.932		3.770		2.019	−0.2229		2.339	−0.8895	3.65	0.470	0.375	4.94
		(−0.51)		(2.32)		(1.28)		(0.24)	(−1.19)		(1.02)	(−0.41)				
(11)	3.528		0.005157	3.425	−0.8047			8.640	−0.2483		0.5674	−3.966	3.57	0.492	0.401	5.40
			(1.84)	(3.00)	(−0.31)			(0.78)	(−1.30)		(0.26)	(−1.68)				
(12)	−24.76		0.004343	2.986		1.939		11.17	−0.1711		0.3413	−3.745	3.55	0.497	0.407	5.51
			(1.55)	(2.44)		(0.69)		(1.07)	(−0.92)		(0.16)	(−1.58)				

V. *Concluding Remarks*

In this paper we have discussed the determinants of the ratios of enrollment in Japan by using cross-sectional data. We have considered three cases, i.e., males in universities, females in universities, and females in junior colleges. We have examined several socio-economic as well as some purely economic factors.

The major findings of this paper can be summarized as follows. The availability of investment funds measured by one form of income showed positive and significant effects on all three types of enrollment. Proximity has different effects among the three cases. Though the effect of proximity is weak in the case of males, it is much stronger in the cases of females. In the case of females in junior colleges, the effect is significant in the greatest number of specifications.

The father's educational background has positive and significant effects in the cases of male and female enrollment in universities, but not in the case of female enrollment in junior colleges. It has relatively stronger influence on sons than on daughters. The mother's educational background has effects similar to those of the father's, but the mother's is relatively more influential. Furthermore, the mother's educational background has a relatively stronger influence on her daughter than on her son. The parents' occupations also affect the decision to enroll. We have found that managers, officials, and professional and technical workers are more likely to want their children to pursue a higher education. The mother's participation in the labor force also has positive and significant effects in regard to her children attending a university. The effectiveness of this factor in the case of females in junior colleges is rather weak. As far as our tests are concerned, the signaling hypothesis is not powerful.

Living in or near large cities has positive effects on enrollment in the case of males. Finally, the hypothesis that the enrollment decision is affected by the tightness of the labor market is most likely to hold in the case of the enrollment of females in junior colleges.

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