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Industry-Specific Human Capital and the Wage Profile: Evidence from Taiwan

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Abstract

Using data from Taiwan's Manpower Utilization Survey (1979-1999), this paper finds evidence that supports the industry-specific human capital effect on wage tenure profiles. We examine data on people who voluntarily or involuntarily change job within or across industries last year. Pre-switching work experience is used as an indirect measure for testing the industry-specific human capital by comparing the effect between stayers and movers. Other things being equal, holding firm tenure constant movers actually incur wage loss, measured by the wage premium of the work experience. However, the greater than average firm tenure effect, especially for movers in the voluntary group, reflects an underlying job-related matching process. It is mainly for this gain from better job match that overcomes the wage loss that stimulates cross-industry job change. We also find that the effect of general work experience declines with education, while the effect of industry-specific human capital increases with education. The experience of Taiwan's labor market confirms the existence of industry-specific human capital, and the rapid voluntary job switching across industries is consistent with the search theory of job match.

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I. Introduction

Since the seminar works by Schultz (1961), Becker (1975), and Mincer (1974),

human capital has been identified as a crucial factor in determining one's productivity

and hence an important factor in production and growth. The accumulation of

human capital can be formed through channels such as formal education,

on-job-training, learning-by-doing, and improvement in health and nutrition.

Among different forms of accumulation, numerous researches have found the

importance of on-the-job training for workers to gain and accumulate new skills,

which in turn show up in the increase of his or her wages. Conventionally,

on-the-job training is classified into two types, general training and firms-specific

training; see, for example, Becker (1975). Empirically, the effect of on-the-job

training is measured by the wage gain with years of work experience. Accordingly,

the worker's total labor market experience can be decomposed into two components,

tenure with the current employer and total prior experience. However, recently

researches by Kim (1992), Kletzer (1993), Neal (1995), Parent (2000), and Weinberg

(2001) find industry-specific skills may constitute an important component of the

typical worker's human capital stock. Using US Displaced Worker Surveys data,

Neal (1995) find that the wage cost of switching industries following displacement is

strongly correlated with predisplacement measures of both work experience and tenure. Weinberg (2001) also finds that the postdisplacement wages of displaced workers are strongly affected by demand in their predisplacement industries. Using data from National Longitudinal Survey of youth (1979-1996) and Panel Study of Income Dynamics (1981-1991), Parent (2000) find that by including total experience in the industry as an additional explanatory variable, the return to seniority is markedly reduced. All these findings suggest that what matters most for the wage profile in terms of human capital is industry-specificity, not firm-specificity. This paper intends to test the hypothesis of the importance of industry-specific human capital in determining the worker's wage profiles using Taiwan labor market data and tries to provide an explanation for the rapid job switch across industry in Taiwan.

This paper is organized as follows. Section II lays out the empirical model and modeling strategy to disentangle the effect of industry-specific human capital under the limited information available from Taiwan's labor market data. Section III describes the data used. Section IV provides the two-stage estimation results. Finally, concluding remarks are followed in Section V.

II. The Empirical Model

The conventional method in testing the industry-specific human capital required

that data on predisplacement industry-specific tenure and predisplacement wage to calculate wage loss due to switching industry, see, e.g. Neal (1995). Neither of the data is available for Taiwan. Huang (2001) uses the probability of staying in the same industry to calculate the expected length of time spent in one's last industry. This method implicitly assumes that workers in the same industry have the same likelihood of switching industry when they change jobs and a person will not reenter an industry her or she worked before and that any interrupted experience in the same industry will not affect one's stock of industry-specific human capital. Under those assumptions, Huang (2001) find little evidence of industry-specific human capital on wage determination in Taiwan.

Incorporating the industry-specific human capital, the traditional wage equation is modified and formulated as:

$$W = \mu(\text{experience}) + \phi(\text{industry tenure}) + \gamma(\text{firm tenure}) + X\beta + \varepsilon \qquad (1)$$

However, due to the lack of data on preswitching industry tenure, the empirical strategy of this paper is to implicitly infer the effect of industry-specific human capital by examining the returns to general experience and firm tenure between stayers and movers who switch job on the postswitching wage. Stayers are workers who remain in the same industry after switching job, while movers are workers who change industry after switching job. If wages of stayers and movers are determined

according to equation (2) and (3):

$$W_s = \alpha(\text{experience}) + \gamma(\text{firm tenure}) + X\beta + \varepsilon_s, \qquad (2)$$

$$W_m = \delta(\text{experience}) + \gamma(\text{firm tenure}) + X\beta + \varepsilon_m, \qquad (3)$$

where subscripts s denotes stayers, m stands for movers and X is a vector of worker's characteristics. As experience includes general experience and industry tenure. If industry-specific human capital does not matter (i.e., $\phi = 0$), α in equation (2) should equal to δ in equation (3). If α is greater than δ, it implies that there exists industry-specific human capital that increases the return of total experience, which includes general experience as well as industry-specific experience. Alternatively, we can run the following regression:

$$W = \lambda(\text{experience}) + \gamma(\text{firm tenure}) + \theta(\text{IND}*\text{experience}) + X\beta + \varepsilon, \qquad (4)$$

where IND is a dummy, 1 for stayers and 0 for movers. θ is expected to be positive in the presence of industry-specific human capital. In sum, for stayers they general experience carries over industry tenure, while for movers the general experience is pure general experience. Empirically, our test of industry-specific human capital is based on equation (4), however, we also treat the stayers and movers as two distinct groups and perform the test according equations (2) and (3).

However, as in our estimation we test two groups of voluntary and involuntary switch job. For the voluntary group, apparently, job switching is a self selection

choice. For this group of estimation, we adopt Heckman's (1979) two stage

estimation method to correct for the likely self-selection bias. The first stage

regression is set up as

$$S = a_0 + a_1 GX + a_2 GX^2 + a_3 ED + a_4 Z + v,$$

where, S is the job preference which is an unobserved latent variable, GX is for

general experience, ED is for education, and Z is a vector for worker's other

characteristics.

III. The Data

The dada that used in this paper is from Taiwan's Manpower Utilization Surveys

for the period 1979-1999. All the figures that used in the paper are in NT dollars

with 1996 as the base year. General experience is calculated as age - years of

schooling – firm tenure-8 for male age over 20 (6 for male age under 20).[1] As

female workers are likely to move in and out of labor market discontinuously due to

marriage or child raising, we only consider employed male workers in our study.

Due to the limited information of the data, the data for analyzing job switch are

workers with firm tenure less than one and half years. There are two types of job

switch, voluntary and involuntary.[2] Topel (1990), Gibbons and Katz (1991), and

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[1] In Taiwan, Male is suggest to military service once they reach the age of eighteen and leave the
school.
[2] The voluntary are workers who quitted the job at his/her own will. It may be due to reasons such as

6

Neal (1995) point out that the productivity of these two types of workers is quite different, on average, voluntary workers have higher productivity than the involuntary ones. Hence, for unbiasedness reason, in our estimation we separately test these two groups of workers. Table 1 shows the basic properties of the data. The monthly working hours and firm tenure slightly decline over time, while general experience increases gradually and relatively stable. However, the real hourly wages and years of schooling increase significantly. Hourly wage increases from $57.40 to $164.02, and years of schooling from 8.15 and 11.33 years. Work experience remained relatively stable from 10.45 to 9.83, and firm tenure increase from 5.45 to 6.31 years. In the period 1978-1999, on average 10.77% of private employed workers change job every year and about 68.67% of them change industry. Workers who change job on average earn 21% more than workers who do not change. Among workers who change job stayers earns more than movers, 15% for the group of voluntary change and 27% for the group of involuntary change. However, the average years of school remain very stable around 9.69 for all groups. As for the work experience (excludes firm tenure), change job workers are slightly larger than the employed workers. However, for those who change job, stayers roughly have same work experience as movers for both voluntary and involuntary groups, but the involuntary group has 6.3

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low pay, no job security, poor working environment, inadequate working time, etc. The involuntary are workers who left last job not at his/her will but under the regulations of the working place. It may be due to reasons such as workplace shutout or business shrinkage, seasonal or temporary job completed, etc.

year longer than the voluntary group.   For firm tenure, all the groups who change job

have same firm tenure for less than one year.   This is mainly due to that the MPUS

only ask workers question of whether he or she changed job within the last two years.

For the period of 1979-1999, about 10% of workers change job each year, among

them, 90% are voluntary and only 10% are involuntary.   Among these job changers,

over 50% are movers, 71% and 58% in the voluntary and involuntary groups,

respectively.   That is workers who change job tend to change industry too, especially

for the voluntary changers.

IV. Estimation Results

As the job switching is likely a self-selection process, we first estimate the

probability of switching job.[3]   Table 2 shows the results for the first stage probit

model for job switching with explanatory variables including worker characteristics,

occupation, work location, firm size, and job growth of the preswitch industry.   The

results shows that workers who are married, higher educated, more experienced,

production and machine operator or professional, and live in Taipei city tend to not

switch job.   Moreover, we also find that preswitch industry's employment share and

its growth rate have a positive and significant effect on workers probability to stay in

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[3] As for the possible selective bias of the voluntary switchers, Krueger and Summers (1988) find that selectivity forces are not very important in the longitudinal analysis.

the job.   This is consistent with the search theory that the search cost is usually lower

for an industry that is more easily to find a job as the industry expanded.   Table 3

shows the results of wage regression with the selection correction term obtained from

the first stage probit model.   Estimation of equation (4) finds that the interaction

term of the change industry dummy (IND) and work experience has a positive and

significant coefficient, 0.038 for the voluntary group and 0.048 for the involuntary

group.   If we run wage regression for each group separately, i.e., equations (2) and

(3), we find in both cases, the coefficient of work experience for stayers is significant

higher than that for the movers, 16.13% for the voluntary group and 13.01% for the

involuntary group.[4]   These results strongly imply that workers who change industry

do incur wage loss mainly because of the existence of industry-specific human capital.

More interestingly, we find that after this industry-specific human capital is taking

account, the coefficient of firm tenure became insignificant in the involuntary group,

however, it remain positive and significant for the voluntary group.   As our data is

confined on workers with firm tenure less than one and half years, therefore positive

and significant effect of firm tenure is likely to reflect the job-related skill effect as

pointed out by Altonji and Shakotko (1987) and Altonji and Williams (1992).

Moreover, the greater effect of the firm tenure for the movers than for the stayers,

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[4] This result is consistent with the finding of Gibbons and Katz (1991) that lay off workers are, on
average, less productive than coworkers who are observationally similar.

about 20% for the voluntary group, confirms this job-related skill matching hypothesis.   This finding is consistent with Neal (1995) and Parent (2000) that firm-specific factors may contribute little to the observed slope of wage tenure profiles or what matters most for the wage profile in terms of human capital is industry-specificity, not firm-specificity.

Additionally, the effect of industry-specific human capital may be varied among different educational levels.   Table 4 shows the results by including the interaction term of work experience with educational dummy.   In general, for both voluntary and involuntary groups, the effect of general experience is declining along the educational ladder, the lower the educational level and the greater the effect.   The reason may be that general training is more important for low skill workers than for high skill workers as low skill workers usually learned general skill at the workplace while high skill workers normally received general training from colleges and universities.   More interestingly, we find that the effect of industry–specific human capital is significant for all educational levels and its effect is increasing along the educational ladder.   The effect for university level is about 3.5 times that for primary school.   These results imply that industry-specific human capital is more important for higher education workers.   In Taiwan for the period 1978-1999, the ratios of workers who switch job and change industry are about 70% for primary and high

schools, and 65% and 60% for junior college and university, respectively.   These

findings are also consistent with many empirical findings that in general higher

educational workers usually also received more on-the-job training and thus buildup

their specific human capital.

V. Concluding Remarks

Using Taiwan's Manpower Utilization Survey data, this paper investigate the

effect of industry-specific human capital on wage profile.   From the information of

last year job change of junior tenure workers, we infer the effect of industry-specific

human capital by comparing the effect of work experience for switchers (who change

industry) and stayers (who do not change industry).   Other things being equal,

holding firm tenure constant movers actually incur wage loss measured by the wage

premium of the work experience.   The greater value of the effect of firm tenure than

average, especially for movers in the voluntary group, reflects an underlying

job-related matching process.   It is mainly for this gain from better job match that

overcomes the wage loss that stimulates cross-industry job change.   This explain

why people who change job tend to change industry because the wage gain from

better job match outweighs the wage loss due to industry-specific human capital.

We also find that the effect of general work experience declines with education,

while the effect of industry-specific human capital increases with education.   This is

because low education workers usually receive their general skill training at the workplace, while the high education workers gain their general training mainly from college or universities. Therefore, we should observed the effect of general work experience declines with educational. However, more educated workers usually also receive more on-the-job training than the less educated ones. Thus, workers that are more educated accumulate more skill-related industry-specific human capital than others do. As a result, the effect of industry-specific human capital increases with education. The evidence that the proportion of workers who change job and change industry declines with education supports that the industry-specific human capital increases with education. The experience of Taiwan's labor market confirms the existence of industry-specific human capital and the rapid voluntary job switching across industries is consistent with the search theory of job match.

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