

Effect of Double College Major on Earning Outcomes in Lao PDR

Houngthida Phetsinorath* and Suchittra Chamnivickorn**

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Abstract

Based on Human capital Theory that investment in schooling is the main determination on individual future earning, this study aims to show further study the effects of double major (degree) on individual earning by using Lao PDR as case study. Using raw data set from the World Bank Skills toward Employability and Productivity (STEP) Measurement Program 2012, our results show that graduates with double major earn do not have any effects on individual earnings. One possible reason is that an additional major (degree) may not be the key factor to determine additional wage paid in Lao's labor market. There is only those with college/university degree double major in social science/education that are found to be statistically significant on higher earning outcomes.

Keywords: Double Major, Human Capital, Individual Earning, Mincerian Equation, Lao PDR

* Graduate Student – Graduate School of Development Economics, National Institute of Development Administration (NIDA), Serithai Road, Klong-Chan, Bangkok, Bangkok 10240 – Email: houngthida.psnr@gmail.com.

** Assistant Professor of Economics – Graduate School of Development Economics, National Institute of Development Administration (NIDA), Serithai Road, Klong-Chan, Bangkok, Bangkok 10240 – Email: suchit@nida.ac.th.

ผลกระทบจากการเรียนสองสาขาใหม่วิทยาลัย ต่อรายได้ใน สปป.ลาว

รุ่งธิดา เพชรสีนอราช* และ สุจิตรา ชำนิวิทย์กรณ์**

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บทคัดย่อ

จากทฤษฎีทุนมนุษย์ที่ได้อธิบายว่า การลงทุนในด้านการศึกษาจะเป็นปัจจัยสำคัญที่ส่งผลต่อการเพิ่มขึ้น รายได้ส่วนบุคคลในอนาคต งานศึกษานี้จึงมีวัตถุประสงค์เพื่อต่อยอดทฤษฎีดังกล่าวโดยการศึกษา ผลกระทบของการเรียนสองสาขาต่อการเพิ่มขึ้นของรายได้ส่วนบุคคลโดยใช้ข้อมูลจากประเทศ สปป.ลาว เป็นกรณีศึกษา จากการใช้ข้อมูลจากการสำรวจที่มีชื่อว่า the World Bank Skills Towards Employability and Productivity (STEP) Measurement Program 2012 ผลการศึกษาพบว่า การเรียน สองสาขาไม่ได้ส่งผลอย่างมีนัยสำคัญทางสถิติต่อรายได้ที่เพิ่มขึ้น โดยเหตุผลที่เป็นไปได้ประการหนึ่ง ก็เนื่องมาจากการที่การเรียนสาขาหรือใบปริญญาที่เพิ่มขึ้นไม่ได้ส่งผลต่อรายได้ที่เพิ่มขึ้นจากสาขานั้นๆ ในตลาดแรงงานในประเทศ สปป.ลาว แต่อย่างไรก็ดี งานศึกษาพบว่า การเรียนสองสาขาในสาขา ทางสังคมศาสตร์และศึกษาศาสตร์กลับส่งผลต่อรายได้ส่วนบุคคลที่เพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ

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* นักศึกษาปริญญาโท - คณะพัฒนาการเศรษฐกิจ สถาบันบัณฑิตพัฒนบริหารศาสตร์ (นิด้า) ถนนเสรีไทย แขวงคลองจั่น เขตบางกะปิ กทม 10240 – Email: hougthida.psnr@gmail.com.

** ผู้ช่วยศาสตราจารย์ - คณะพัฒนาการเศรษฐกิจ สถาบันบัณฑิตพัฒนบริหารศาสตร์ (นิด้า) ถนนเสรีไทย แขวงคลองจั่น เขตบางกะปิ กทม 10240 – Email: suchit@nida.ac.th.

1) Introduction

The combination of two study majors is broadly known as double major (degree). It is defined as the requirement for students to complete two related or unrelated full majors (degrees), either in the same or different university or colleges. Double major (degree) has gained global popularity. At Washington University, United States, the double major of arts and science graduates grew from 28% in 1997 to 42% in 2011. Similarly, at Georgetown University, it rose from 14% in 1996 to 23% in 2002 (Lewin, 2002). In Australia, the double degree program has increasingly drawn Australian students, especially women (Russell, Dolnicar, & Ayoub, 2008). In addition, National University of Singapore has graduated more students with double degree or second major, from 150 students in 2010 to 340 students in 2014, for an increase of 126% (Toh & Wong, 1999). Laos is no exception, a growing number of Laos students study double major, combining one college major as their first major and a foreign language, especially English, as another major for example. It is common for Lao students to study more than one major, particularly, among evening program students. Clearly, the evening program students have better opportunity to study additional major in morning and afternoon.

However, there is no guarantee for double major students would get good job and earn more in Laos. Laos is a lower middle-income country with an annual average growth rate of 7.8% in the past decade (World Bank, 2016). Lao economy is mainly dependent on external demand for natural resources, namely, mining and hydropower. As mining and hydropower sectors are capital intensive, only highly productive skilled labor are needed. In other words, these sectors have not generated broad-based employment and earning for Lao labor force. In addition, employers prefer skilled labor with more professional and technical skills (World Bank, 2013). From World Economic Forum Report 2016 on Human Capital in ASEAN countries, Lao PDR is the second lowest score implies that it is very hard for business firms in finding skilled workers.

As a result, a large number of private employers (74%) fill jobs with foreign-educated graduates (Duronsoy, Syvilay & Billany, 2014). As expected, foreign investors prefer foreign workers as they are more productive than local workers. Thus, to have a better job opportunity, many Laotian students pursue double major. They expect that double major will better prepare them for the labor market and better earning, as more diverse skills through double major would signal greater productivity to potential employers.

To estimate the return to education of double college major, Rossi and Hersch (2008) estimate the Mincerian conventional earnings equation to examine the effect of having double major on earnings the equation included education, major of study, individuals demographic characteristics, and employment characteristics. The study has found that double major increases earning by 2.3% compared to single major graduates in United States. Business and science/math majors have returns more 50% greater than the returns from single major, as those majors are complementary. In addition, Hemelt (2010) has introduced additional factors, variables that might affect double major popularity and earning, namely, university qualification, to control institution quality difference and parental educations variable to control for the double major demand. The results are similar, that is, double major earns 3.2% more than single major and the quality of institutions also gives rise to double major earning. In other words, better institutions earn their graduates more incomes. Jiang (2016) investigates the effects of double major on wage in short and long runs by using the 1997 United States National Longitudinal Survey of Youth. It is found that having a second major increases wage by 13.5% in the first year of labor market. However, in the long term, the return to a second major is small and insignificant, as individual earning is primary influenced by the first major and the second major's values increase at the decreasing rate. So the difference between single and double majors disappear in long run. However, in Australia, double degree benefits students in providing broader skills and more options to work, (Russell, Dolnicar & Ayoub, 2007). As they have more skills, they have more choices for their future job and they don't have to wait long for the right job that matches their skill. Overall, the results of combination of double major are mixed i.e., some double majors are significant, but some others are not. The combination of business, engineering and science/math are significant as they are complements, they work better when they are together, and their benefits will be higher when they combined. In contrast, the combination of education major like education and business or education and science/math are not significant. The reason may be the case that individuals with single education majors are less likely to change jobs as they are satisfied with their jobs, so additional major for them are useless.

As there are few studies on the effect of double major (degree) and most studies concentrate on high income countries (Russell, Dolnicar & Ayoub, 2008; Del Rossi & Hersch, 2008; Daniel, 2010). The studies have found double major in Australia, Singapore, and U.S have positive effects on employment and earning. In Lao PDR, whether double major (degree)

actually gives graduates greater employment opportunities and earning than single major graduates has not been fully understood. Skills that workers acquire from their education might be viewed as low, even those with double major, and do not meet the demand for skills of employers. As a result, they end up earning a low pay. Therefore, this study will examine the effects of double major (degree) on earning in Lao PDR whether they benefit earnings.

2) Theoretical framework

In 1961, Theodore W. Schultz, the Noble Prize economist proposed that human capital consisted of individual's abilities, knowledge, and skills. The investment in human capital, which is the investment in individual's abilities, knowledge and skills, directly effects their earnings. The higher the investment in human capital, the higher the individual's real earnings. Later, in 1993, Gray S. Becker, Noble Prize economist extensively developed and defined human capital theory as knowledge, ideas, skills, and health, which similar to Schultz (1961). Both Schultz (1961) and Becker (1993) argue that the main activity to improve human capital is education.

Modern human capital presents that education, especially formal education is a key to improve individual productivity and increase economic output (Becker, 1993). As a result, better-educated individuals end up in better jobs and get higher earnings rather than those with little education. In addition, more educated individuals may be keen to develop new technology which would raise overall productivity. For higher productivity, individuals need to investment in education, from schools to colleges. Different institutions provide diverse knowledge and skills, both general and specific skills (Becker, 1993). Moreover, other activities like health care, child care, migration, and on-the-job training also raise individual's productivity. For on-the-job training, by providing it to their employees, allowing firms to secure greater outputs. However, most trainings provided by firms are limited in scope, and valuable just for the firms that give trainings, as there is cost of training.

To estimate the return of education, Mincerian earning equation is widely used. Jacob Mincer (1974) emphasizes the importance of education and on-the-job training on earnings. As there is positive relation between education, on-the-job training, and earning, it reflects that the higher investment in human capital, the higher the earnings. This earning equation is widely used to estimate the earnings of different groups, for example, males and female.

Mincer modeled the earnings in natural logarithm form as the function of years of education and years of potential post school labor market experience. The equation can be written as Ordinary Least Square (OLS) model:

$$\ln W_i = \beta_0 + \beta_1 S_i + \beta_2 EX_i + \beta_3 EX_i^2 + \varepsilon \quad (1)$$

where W_i is the monthly earning of the i th individual, S_i is number of years of schooling completed, EX_i is number of years the individual has worked after finishing school (experience), EX_i^2 is experience squared, as the productivity of individual will be declined when they are getting older. Experience can be equal to age minus year of schooling minus six ($EX = \text{age} - S - 6$). Since Mincer (1974) assume that individuals start school at age of 6, and finished at S years of schooling, and begin working immediately after S years of schooling.

In sum, an aggregation of investment in activities like education, on the job training, health, and migration increase individual's human capital leading to their higher productivity. In other words, individual's productivity is an increasing function of their human capital. Individuals acquire most of their human capital through schooling and on-the-job training, which raises their productivity resulting in higher earning.

3) Data

This study is based on the data from World Bank Skills Towards Employability and Productivity (STEP) Measurement program, which being the first program to measure skills in low and middle income countries. The program collects data on labor market skills, measure the distribution of cognitive, non-cognitive, and job-relevant skills in both backward and forward linkages, (i.e., skills acquisition and education achievement) as well as social background and personality, skills acquisition and living standards, economic growth, and reductions in inequality and poverty. The main objective of STEP program is to provide data that enable better understanding of labor skills for policy makers and support policymakers to improve labor productivity, and employability, as well as other skills relevant issue. Similar to one of Lao PDR government's objectives, i.e., to improve their labor force quality by giving the priority to education, vocational education, and training. The program started in 2012 and the data files are available through the World Bank's micro data catalog on July 2014. Target population of this survey is individuals aged 15-64 years living in private urban dwellings. The final sample of Lao PDR STEP survey is 2,849 households.

As this study aims to examine the effect of double major in higher education on earning, so the dataset for this study will limit to education and employment modules of STEP survey for the total of 484 respondents. Even though, STEP survey does not contain direct questions on double major (degree), this study claims that individuals who report both a primary field and another field for their higher education are individuals with a double major (degree).

Earning is the net monthly wages, salary or profits from business after payroll taxes including over time earning, but not include non-monetary earning like accommodation, transport, and food. Between single and double major, 1 out of 4 single major graduates (25.49%) earn 617,000 – 798,000 Kips, while 1 out of 4 double major graduates (25%) earn 963,000 – 1,800, 000 Kips. It seems that double major earn twice more than single major. However, compared to earnings in quintile 4 (963,000 – 1,800, 000 Kips), double major earning is only 23.38%, while it is 76.62% for single major. Thus, it cannot be said that double major earn higher than single major (Table 1), possibly because individual earning does not depend only on skills, but also other factors, e.g., experience and personal characteristics.

Table 1: Monthly Earning Quintiles classified by Single or Double Major (Number of Persons)

Earning	Single or Double Major		Total
	Single Major	Double Major	
Quintile 1 (0 – 616,000 Kips)	89	8	97
% row	91.75	8.25	100.00
% column	21.60	11.11	20.04
Quintile 2 (617,000 – 798,000 Kips)	105	16	121
% row	86.78	13.22	100.00
% column	25.49	22.22	25.00
Quintile 3 (799,000 – 962,000 Kips)	81	13	94
% row	86.17	13.83	100.00
% column	19.66	18.06	19.42
Quintile 4 (963,000 – 1,800, 000 Kips)	59	18	77
% row	76.62	23.38	100.00
% column	14.32	25.00	15.91

Table 1: Monthly Earning Quintiles classified by Single or Double Major (Number of Persons)

Earning	Single or Double Major		Total
	Single Major	Double Major	
Quintile 5 (1,800,001 – 50,000,000 Kips)	78	17	95
<i>% row</i>	<i>82.11</i>	<i>17.89</i>	<i>100.00</i>
<i>% column</i>	18.93	23.61	19.63
Total	412	72	484
<i>% row</i>	<i>85.12</i>	<i>14.88</i>	<i>100.00</i>
<i>% column</i>	100.00	100.00	100.00

Source: Skills Towards Employability and Productivity (STEP) survey, 2012

Close to fifteen out of 100 respondents take double major (degree). Almost half of double major graduates complete college education (43.06%), with middle diploma second (29.17%), and high diploma third (11.11%). One possible reason is that college has more study majors choice than other education levels (Table 2).

Table 2: Education Level classified by Single or Double Major (Number of Persons)

Education year	Single or Double Major		Total
	Single Major	Double Major	
Vocational low diploma	103	6	109
<i>% row</i>	<i>94.50</i>	<i>5.50</i>	<i>100.00</i>
<i>% column</i>	25.00	8.33	22.52
Middle diploma	141	21	162
<i>% row</i>	<i>87.04</i>	<i>12.96</i>	<i>100.00</i>
<i>% column</i>	34.22	29.17	33.47
Higher diploma	80	8	88
<i>% row</i>	<i>90.91</i>	<i>9.09</i>	<i>100.00</i>
<i>% column</i>	19.42	11.11	18.18
Bachelor degree	76	31	107
<i>% row</i>	<i>71.03</i>	<i>28.97</i>	<i>100.00</i>
<i>% column</i>	18.45	43.06	22.11
Masters degree	12	5	17
<i>% row</i>	<i>70.59</i>	<i>29.41</i>	<i>100.00</i>
<i>% column</i>	2.91	6.94	3.51
Doctoral degree	0	1	1
<i>% row</i>	<i>0.00</i>	<i>100.00</i>	<i>100.00</i>
<i>% column</i>	0.00	1.39	0.21
Total	412	72	484
<i>% row</i>	<i>85.12</i>	<i>14.88</i>	<i>100.00</i>
<i>% column</i>	100.00	100.00	100.00

Source: Skills Towards Employability and Productivity (STEP) survey, 2012

Out of 7 study major groups, 40.70% choose social science/education which is almost double those who choose business/economics (21.49%), and more than triple those who choose engineering (12.18%) and medicine (10.95%). Clearly, science, agriculture, and arts/humanities major are not popular as their skills appear not to be productive enough in labor market. Unlike social science/education and business/economics majors, these are practical as they provide general skills that are productive across firms, which in turn, provide endless number of job opportunities to students (Table 3).

Table 3: Working Sectors classified by Single or Double Major (Number of Persons)

Study major	Single or double major		Total
	Single major	Double major	
Agriculture	21	1	22
<i>% row</i>	95.45	4.55	100.00
<i>% column</i>	5.10	1.39	4.55
Arts/Humanities	10	10	20
<i>% row</i>	50.00	50.00	100.00
<i>% column</i>	2.43	13.89	4.13
Social science/Education	175	22	197
<i>% row</i>	88.83	11.17	100.00
<i>% column</i>	42.48	30.56	40.70
Business/Economics	79	25	104
<i>% row</i>	75.96	24.04	100.00
<i>% column</i>	19.17	34.72	21.49
Science	20	6	26
<i>% row</i>	76.92	23.08	100.00
<i>% column</i>	4.85	8.33	5.37
Engineering	56	6	62
<i>% row</i>	90.32	9.68	100.00
<i>% column</i>	13.59	8.33	12.81
Medicine	51	2	53
<i>% row</i>	96.23	3.77	100.00
<i>% column</i>	12.38	2.78	10.95
Total	412	72	484
<i>% row</i>	85.12	14.88	100.00
<i>% column</i>	100.00	100.00	100.00

Source: Skills Towards Employability and Productivity (STEP) survey, 2012

Even though, combinations of double major are numerous, it is quite common for students to choose the combination of major along the same disciplines: social science/education and business/economics major (13.88%), double major in social science/education (12.5%), and double major in business/economics (11.11%). These majors will be better while they work

together than when they work separately, as these study majors complement each other (Table 4). Business/economics (34.72%) and social science/education (30.56%) majors appear to be common to other majors. Their apparent general skills are transferable to other skills that would increase the benefit of the study major. Undoubtedly, business/economics and social science/education are the leading choices for double major students, which is consistent with Hemelt (2010) who has found that students take business as one of the two study majors, with the hope that business combination will give them higher earnings (Table 3).

However, some combinations across the disciplines, which would provide widely different skills or knowledge, are not popular, among students. For instance, the combinations of agriculture and social science/education, social science/education and science, engineering, and medicine are rare (1.38%). Similarly, agriculture, arts/humanities and engineering as well as business/economics and medicine are overwhelmingly course requirements. Their difficulty and different course requirements make students to spend more time and cost, which outweigh their benefit. It discourages students to pursue these combinations (Table 4).

Table 4: Percentage of Persons with Double Major classified by Working Sectors

Double major combination	Persons	Percentage (%)
Agriculture and Social science/Education	1	1.38
Agriculture and Business/Economics	2	2.77
Arts/Humanities and Social science/Education	2	2.77
Arts/Humanities and Business/Economics	6	8.33
Arts/Humanities and Science	3	4.16
Social science/Education and Social science/Education	9	12.5
Social science/Education and Business/Economics	10	13.88
Social science/Education and Science	1	1.38
Social science/Education and Engineering	6	8.33
Social science/Education and Medicine	4	5.55
Business/Economics and Business/Economics	8	11.11
Business/Economics and Science	5	6.94
Business/Economics and Engineering	6	8.33
Science and Science	3	4.16
Science and Engineering	2	2.77
Engineering and Engineering	3	4.16
Engineering and Medicine	1	1.38
Total	72	100%

Source: Skills Towards Employability and Productivity (STEP) survey, 201

4) Empirical results

Our estimations show that education, work experience, and place of residence have significantly effect on earnings. That is, more year of schooling, work experience, and Vientiane residents earn more than others, which are consistent with Onphandala and Suruga (2006), Tangtipongkul (2015) and Arshad and Ghani (2015). Education and work experience relate positively to earnings, that is, one additional year of schooling and work experience increase the earnings by 13% and 6%, respectively. On the other hand, experience squared relates negatively to earning, so the return of post school investment declines over time implying diminishing returns to experience. Note that the return of investment in schooling, i.e., investment in human capital is higher than that of work experience which is post school investment. As education is the key determinant of earning, it serves as a signal of a worker's productivity. Even after schooling, worker's productivity rises over time, due to on-the-job training. It is one important component of a worker's human capital accumulation. In addition, Vientiane residents earn 31% more than other residents. The difference is statistically significant, because Vientiane, like other capitals cities in the world, is the national center of political and economic activities. Vientiane residents earn higher than others as they have better job opportunities, and more well-paid jobs are available from private and international organizations (Table 5).

For gender difference, men earn 7% less than women, but it is statistically insignificant. Thus, gender difference does not affect individual earnings, especially, those who are highly educated. It seems that discrimination in the educated labor market is absent. Both males and females are very productive, so they receive better job offers and higher pays, regardless of their gender. Similarly, married individuals, though statistically insignificant, earn 7% more than single individuals, but divorced/widowed individuals earn 26% less than single individuals (Table 5). Obviously, marital status does not affect individual earning, either. It could be due to the higher share of married workers, and productivity of both married and non-married are equally good. Married individuals can focus on their work, without worrying about household chores, as these responsibilities half on their spouses. Thus, they productive at work. Similarly, non-married individuals increase their productivity by pursuing higher education level and job training as they have less family commitments.

Our regression results show that double major earn 8% more, but it is statistically insignificant (Table 5). Here, double major does not affect individual earnings, which is in contrast to other studies that have found a positive and significant effect of double major on earnings (Rossi and Hersch, 2008; Helmet, 2010; Jiang, 2016). Unlike well-developed labor markets, say, United States where workers get paid based on their skills, Lao labor market is still underdeveloped, so workers as a whole are viewed as productively low. Due to high share of self-employed and unpaid family workers, and shortage of skilled labor, workers get low pay and skills might not be a key factor in setting the pay. Double major/degree graduates involve higher cost than those pursue single major/degree, in terms of tuition and fees as well as opportunity cost of study. It reflects that the cost of double major/degree investment outweigh the benefit of the investment, so investment in double major is not profitable.

Most of the jobs that available in Lao PDR are not very attractive for double major/degree graduates, as economy growth is mainly based on capital incentive investment, the workers who expert in a technical skill is needed more than the workers with variety skills. Even workers with double major/degree seem more productive than single major/degree workers, but they do not get higher wage as their higher productivity. It implies that wage does not reflect labor productivity and relatively low wages and slow growth in those wages.

Similar results are found for vocational and college graduates, but coefficients are slightly higher. Double major earn roughly 16% more for vocational graduates across the board (Table 5) and earn less 3% for college graduates (Table 5). Even though statistically insignificant, vocational graduates earn 8% higher than all other groups and about 20% higher than college graduates. It may due to the cost of vocational education is lower than others, as vocational education programs generally last 2 years, which is half shorter than college education.

As social science/education major are popular, they will be estimated in order to analyze their effects. Through statistically insignificant, double major in social science/education relate positively to earning, which is consistent with earlier results that double major earns more, but statistically insignificant. On the other hand, other double majors, namely social science/education and business/economics, social science/education and engineering statistically insignificant are negative on earning (Table 5 (1)). Similarly, for those with vocational degrees, social science/education majors relate negatively to earnings, through statistically insignificant

(Table 5 (2)). It may be due to a large number of vocational students choose majors that relate to technical fields, like engineering and science than social science/education major, so social science/education major combinations are quite limited, and it rarely leads to high pay. For college students, double major in social science/education are statistically significant on earnings. It reflects that pairing the same or related disciplines enhance earnings (Table 5).

Table 5: Estimated Results on Earnings (Log Scale) classified by Vocational Degree and College Degree

Variable	Full Sample	Vocational Degree	College Degree
Schooling year	0.1323 (0.0355) ***	0.1808 (0.0712) ***	0.1563 (0.0950)
Experience	0.0578 (0.0157) ***	0.0734 (0.0195) ***	0.0322 (0.0308)
Experience squared	-0.0013 (0.0003) ***	-0.0016 (0.0004) ***	-0.0011 (0.0008)
Double major	0.0782 (0.1348)	0.1638 (0.1991)	-0.0367 (0.1751)
Gender	-0.0780 (0.0885)	-0.0154 (0.1042)	-0.3580 (0.1690)
Marital Status	Single is the reference group		
Married	0.0072 (0.1416)	0.0491 (0.1916)	0.0447 (0.2084)
Divorced/Widowed	-0.2683 (0.2060)	-0.1581 (0.2567)	-0.6692 (0.3941)
Residence	0.3111 (0.0855) ***	0.3135 (0.1033) ***	0.2229 (0.1576)
	Major Combination		
Social Science/Education and Social science/Education	0.1123 (0.3270)	-0.2306 (0.4239)	0.8766 (0.5203) *
Social science/Education and Business/Economics	-0.1620 (0.5337)	-0.2156 (0.9454)	-0.0037 (0.6157)
Social science/Education and Engineering	-0.3326 (0.3891)	-0.3127 (0.5032)	-0.7017 (0.6214)
Constant	11.2805 (0.5466) ***	10.3624 (1.0362)	11.4316 (1.5169) ***
Observation	484	359	125
Adj R-squared	0.0910	0.0778	0.0615

Note: *Significant at 10%, ** Significant at 5%, *** Significant at 1%. Standard errors in parentheses

5) Conclusion

Empirical findings reveal that education, work experience, and place of residence affect individual earnings. Education and work experience are positively related to earning. Educated and experience workers are highly productive as they accumulate their human capital. Earning of an individual is conceptually a function of human capital investment that more years of education and work experience result in higher earning.

Double major can be regarded as an investment in education. The effect of double major on earning is that double major higher individual earning by 8%, but it is statistically insignificant. Here, double major does not affect individual earnings, which is in contrast to other studies that have found a positive and significant effect of double major on earnings. Different double major combinations give different returns. Estimations here are consistent with earlier results, that is, double major positively and negatively relate to earning, but largely statistically insignificant. However, there is only those with college/university degree double major in social science/education is statistically significant higher earning. It reflects that the combination within the same or related fields yield higher the earning

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