

(Dual) Vocational Training in Taiwan: How Can Theory and Practice Become Better Complements?

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Abstract

The aim of this empirical study is to investigate how changes in the relation of theoretical and practical curriculum in vocational schools in Taiwan affect labor market outcomes of individuals. Therefore the effects of increasing the fraction of practical curriculum taught in vocational schools on labor market outcomes are estimated. The data used come from the Manpower Utilization Survey, the Taiwan Education Panel Study and from curriculum reforms since 1952. Results show that increases in practical curriculum have positive effects on future income, i.e. an increase of the fraction of practical courses by 10 percentage points increases income of individuals by between 3.6 to 4.3 percent. These results suggest that complementing the theory-based vocational school education by more practical curriculum would be beneficial. This could also involve a shift to a more practice oriented dual vocational training system.

JEL classification: I21, I26, I28.

Keywords: vocational school curriculum, vocational training, labor market.

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1 Introduction

In the 1980s economic prosperity led to a rising demand for skilled labor in Taiwan (Lin and Orazem, 2003). Among others globalization and technological change were important factors that triggered this demand shift. Workers in less skilled jobs were more affected by the demand shift to more skilled labor and faced a higher risk of unemployment. This is due to skill-biased technological change which is triggered by new technologies and leads to a shift in demand for higher skilled labor. A rising wage premium between skilled and unskilled workers results and higher and better skilled workers are demanded. In Taiwan, vocational schools have in the past had an important role in providing theoretical and practical training to individuals in order to address this issue. During recent decades the trend to higher education has led to vocational schools and practical curriculum having become more and more disregarded. Firms, however, are dependent on workers that have sufficient practical experience for specific tasks as would be available if workers received on-the-job training. The lack of practical training and work experience is one reason why young people in Taiwan have difficulties in finding an employment. The youth unemployment rate in Taiwan has in recent years been high and was at 10.78 percent in 2016 for 15-24 year olds compared to 3.5 percent in Germany.¹ In the recent past Taiwan has therefore aimed at promoting different programs to improve the relation between theory and practice. One example is a Dual System of Vocational Training which aims at addressing a lot of these issues and raising the employment rate for youths. A contract between a firm and a worker can then lead to an increase in workers' firm-specific human capital (Acemoglu and Pischke, 1998). This makes it less likely for the worker to leave the firm after finishing training and leads to firms making a higher effort in training of a worker. The Taiwanese government is also subsidizing other new vocational training programs and is trying to learn from existing dual vocational training programs that are successful in other countries.² For example in Germany, where the dual vocational training system is known to be the "backbone" of a highly export orientated economy. There, the practice that during a 2 to 3.5 year training period individuals spend 3 to 4 days a week doing on-the-job training in a company and 1 to 2 days a week in a school doing theoretical training has a long tradition. In Taiwan, most traditional vocational training programs train individuals for several months nonstop after which students work in firms for several months. Firms and vocational schools participating in dual vocational training programs are still rare. Therefore, a challenge in the future

¹ According to the National Statistical Bureau of the Republic of China (Taiwan) and Eurostat.

² Chuang (2013) gives an overview of government subsidy programs.

will be modernizing the framework for vocational training and complementing periods of theory at schools better with periods of practical work experience. At the same time a close cooperation with firms on the development of vocational school curricula is essential.

The aim of this empirical research project is to find out how the amount of practical curriculum in vocational schools in Taiwan affects labor market outcomes. The amount of practical curriculum that students are taught in school is a key part of the vocational education. Investigating this can offer a prediction on how a vocational training that is focused more on learning practical skills, e.g. a dual vocational training, would perform. Therefore, this study estimates the effect of changes in the amount of practical curriculum of individuals on earnings. The data used come from two data sets, the Manpower Utilization Survey and the Taiwan Education Panel Study. The empirical strategy consists of interacting cohort dummies with time and using these as instrumental variables. This is identical to constructing pseudo panels from the repeated cross sectional Manpower Utilization Survey.

This research project is related to different strands of the vocational training literature. Theoretical literature has investigated firm incentives to train apprentices. Training employees and bearing the cost of this training even when skills are general can be beneficiary to firms if labor markets are to a certain amount imperfect (Acemoglu and Pischke, 1998). In the Asian context, vocational training was in the past seen more as a way to re-train unemployed individuals and less as a measure of providing a smooth transition from education into the labor market (Biavaschi et al., 2012). For this reason vocational training incidence has only been about half as large in Asia than it was in Germany in recent years (Biavaschi et al., 2012). This is surprising since early labor market returns to apprenticeship and vocational training show strong positive effects. Riphahn and Zibrowius (2016) find strong positive effects of apprenticeship and vocational training on employment and wages for Germany. Other literature also finds strong positive effects of vocational trainings in industrialized countries (Oosterbeek and Webbink, 2007; Fersterer et al., 2008). Not much is known about the effects of the fraction of practical curriculum on early labor market outcomes. However, related research investigates the return to different curriculum in secondary school. Specifically, Dolton and Vignoles (2002) estimate the effect of a broader high school curriculum on labor market success. They find that having more different subjects between ages 16-19 does not increase later labor market wages. This indicates that curriculum breadth does not impact later productivity. Altonji (1995) use variation in curriculum of high schools to identify the effects of high school curriculum on labor market wages. He finds that the effect of ad-

ditional courses in academic subjects is small. However, he also finds that an increase in the total hours of academic courses has a significant positive effect on the years of education achieved. Since the research by [Dolton and Vignoles \(2002\)](#) and [Altonji \(1995\)](#) both study academic subjects our study which investigates whether more practical curriculum increases labor market outcomes can be seen as complementary to these studies.

The paper is structured as follows: [section 2](#) presents an overview of the Taiwanese education system, curriculum reforms in vocational schools and efforts to introduce a dual vocational training. In [section 3](#) the data and empirical strategy are described. The empirical results are presented in [section 4](#). And [section 5](#) concludes.

2 Institutional setting

2.1 Education system in Taiwan

In Taiwan children are enrolled into school at the age of 6. The primary school lasts for 6 years after which individuals visit junior high school for another 3 years. After this the 9-year compulsory education, introduced in 1968, is complete. Since 2014 the compulsory education is 12 years. Tracking takes place after 9th grade when children visit one of the following tracks of senior high school: academic, comprehensive or vocational. While senior high and senior vocational school is 3 years (10th-12th grade) there exist five-year junior colleges that also recruit students after 9th grade for a vocational training. Entrance examinations play an important role in the education system. Tracking is done according to the test scores of senior high school and junior college examinations. These test scores also determine whether a student visits a private or a public school. The entrance examinations for junior high schools were abolished in 2003. University and college enrollment starts at about age 18 when individuals are again sorted into university, 4-year technical college or 2-year junior college plus a 2-year technical college.

2.2 The vocational training system

Taiwan's current vocational education is more similar to the US and UK than it is to countries such as Austria and Germany. E.g. in Germany apprenticeships are characterized by a social partnership which involves companies, trade unions, vocational schools (*'Berufsschule'*) and the government. Due to some of these institutional factors being absent in other countries this apprenticeship system does

not function everywhere. While in Germany there are apprenticeships there also exist full-time school vocational programs. Apprenticeships are, however, more common. They are characterized by individuals working and visiting vocational schools at the same time, receiving an income during training and being sponsored by an employer (Ryan, 2000).

In Taiwan students take part in full-time vocational school programs and therefore don't have the opportunity to experience part-time on-the-job training during education. This requires vocational schools to find the right balance of theoretical and practical curriculum. The vocational school curriculum was in the 1950s modeled on the American system after vocational schools were influenced by Japanese colonial education before that.³ The curriculum mostly included theoretical courses and less practical courses. In the following decades parallel to an industry that became more technology intensive the hours for practical courses were increased. As the industry became more capital and knowledge intensive the amount of practical courses was reduced and school autonomy was increased.

2.3 Vocational school curricula reforms since 1964

Since 1964 the vocational curriculum in Taiwan has undergone several reforms. Shin et al. (2012) classify these changes into five main periods. 1964-1972 marks a period where course hours for practical courses, i.e. vocational skill training, are increased and vocational schools are divided into 6 categories. At the same time senior and junior high vocational schools are separated, both last 3 years. The 1973-1984 period is marked by an educational expansion. Since the introduction of the 9-year compulsory education in 1968 the number of vocational schools strongly increased while at the same time junior high vocational schools no longer existed. Again, the fraction of practical courses was increased. Between 1985-1995 the curriculum was classified into 5 clusters. The hours for practical courses were reduced and professional theoretical courses were increased. At the same time school autonomy increased and schools were able to determine up to 10 percent of optional courses. The 1996-2005 period was marked by the aim to connect the curriculum of vocational schools with other schools such as 2-year junior colleges. The fraction of school-determined courses was further increased. The curriculum revisions during this period were due to an overall trend to higher education making senior high schools and universities more important. Efforts by the government to decrease the number of vocational school students also had effects on the curricula in vocational schools. The fraction of practical

³Tsurumi (1977) provides an overview of Japanese colonial education in Taiwan.

courses directly prescribed by the Ministry of Education dropped to 20 percent. In 2006 a common core curriculum for general senior high schools and senior high vocational schools was proposed and implemented in 2010.⁴

[Chen et al. \(2008\)](#) categorize the development of vocational education in Taiwan into 3 periods: agricultural period (1945-1986), industrial period (1987-1999) and information technology period (since 2000).

Table 1: Curriculum standards in vocational schools in Taiwan

	PC fraction	SC fraction	PC + SC fraction	PC + SC change
Year				
1952	0.320	0.000	0.320	
1964	0.386	0.000	0.386	+0.066
1973	0.421	0.000	0.421	+0.035
1986	0.250	0.075	0.325	-0.096
1998-2009	0.200	0.250	0.450	+0.125

Notes: PC: fraction of practical courses prescribed by the Ministry of Education, SC: fraction of school-determined courses. School-determined courses include general, professional and practical courses. References: [Shin et al. \(2012\)](#); [Chen et al. \(2008\)](#); [Hsiao et al. \(2008\)](#).

Courses in vocational schools are divided into general, professional and practical courses. General courses include Chinese language, foreign language, mathematics and others. Professional courses are specialized theoretical curriculum courses which are to provide adaptive education ([Shin et al., 2012](#)). Practical courses provide vocational skill training. The fraction of practical courses is adjusted and was changed by the Ministry of Education parallel to the transformation of the industrial structure throughout the years.

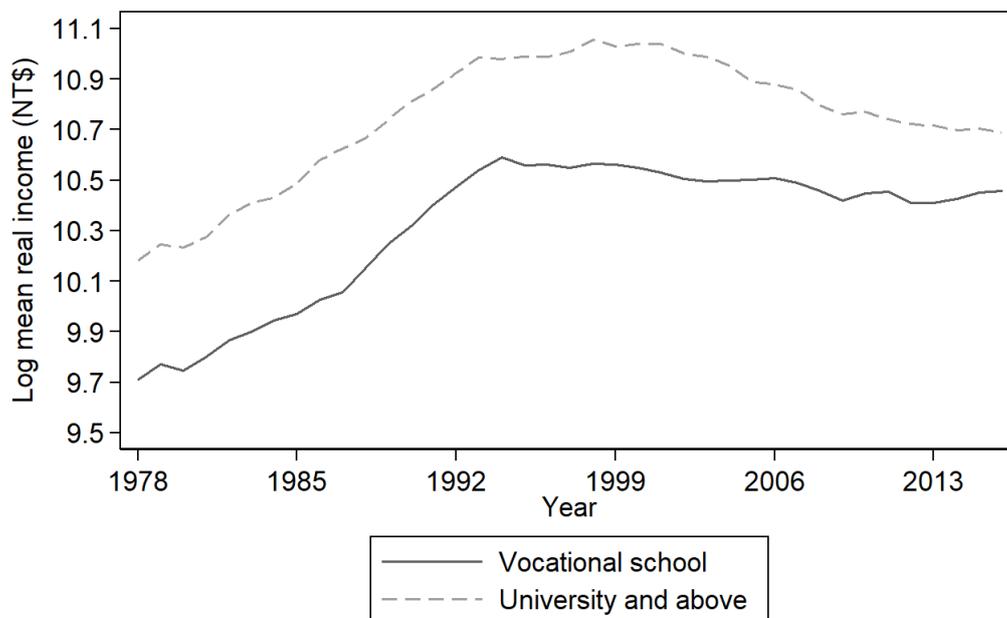
[Table 1](#) depicts curricula changes between 1952-2009. The fraction of practical courses (PC) which was prescribed by the Ministry of Education was initially at 32 percent in 1952. At that time schools had little autonomy which is why there were no school-determined courses (SC). The majority of courses were made up of general and professional courses. Starting in 1986 the number of school-determined courses increased. The SC also include a small fraction of practical courses which are, however, no longer chosen by the Ministry of Education. In 1964 the fraction of PC increased by 6.6 percentage points and in 1973 again by 3.5 percentage points. In 1986 the amount of practical curriculum then dropped again from 42.1 percent to 0.25 percent. Since SC were introduced which also included some practical courses the overall decline of PC and SC was

⁴[Shin et al. \(2012\)](#) offer an overview of these periods and vocational school curricula reforms.

9.6 percentage points. This was corrected in 1998 by increasing PC and SC to an overall of 45 percent of all curriculum courses.

2.4 Vocational education and training in the 21st century

The decentralization of the vocational education system that started in 2001 changed the vocational education and meant that more school-determined courses were adopted (Shin et al., 2012). This resulted in vocational schools being able to adopt better to changes in the industrial structure of the economy. Another important change came due to the rising demand for higher education. This trend increased the demand for senior vocational schools and universities. Comprehensive high schools were introduced with the aim of simplifying the transition to tertiary education. Vocational schools were seen as less important in the education system. This can also be seen by the changes in the vocational school curriculum. The original curriculum framework until the 1980s emphasized the importance of practical skills by stating practical courses as one of three main categories. In the revision of 1998 the practicum is now included in the professional courses. The amount of practical courses in the curriculum is in the following years at a low level. The Curriculum Guide 2010 changed this and set a minimum of 30 credit hours of practical courses. School-based curriculum was increased to 40-50 percent (Shin et al., 2012).



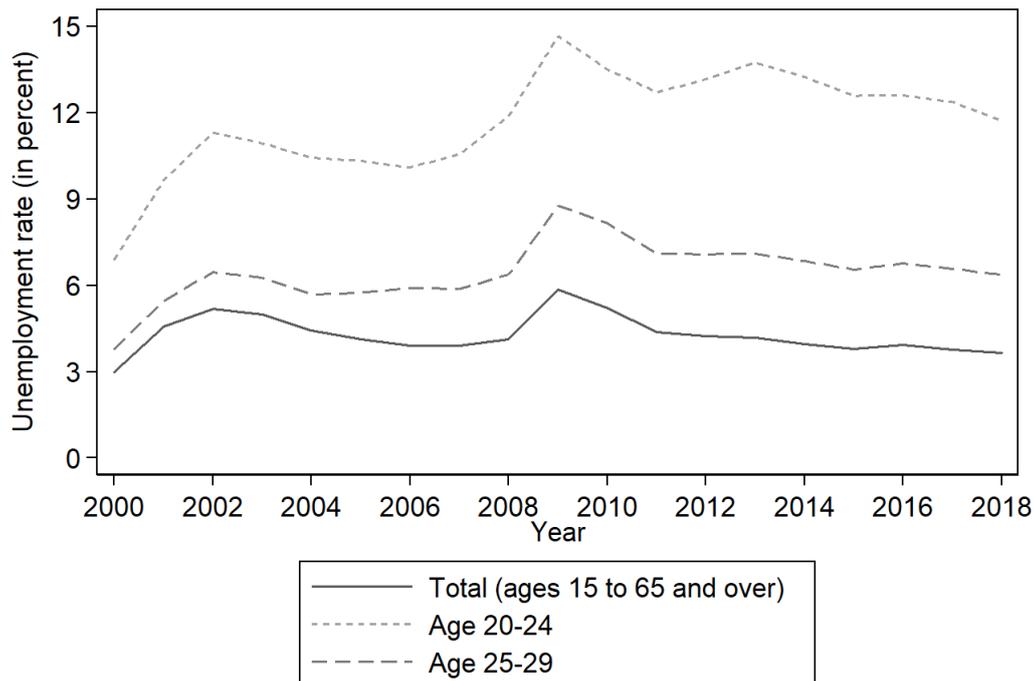
Notes: Manpower Utilization Survey 1978-2016;
 Weighted real average monthly logarithmized mean income from major job with positive earnings;
 2016 Consumer Price Index;
 All individuals aged 18-65.

Figure 1: Mean log income of vocational school and university degrees

As a result the strong expansion of higher education led to higher degrees being devalued. This can be seen in [Figure 1](#) where the log of the mean monthly real income is depicted for individuals with the highest degrees vocational school and university. A stagnation of income between the years 2000 and 2016 can be seen for university degrees. The income of vocational school degrees stays relatively constant and can therefore significantly diminish the university wage premium over time. In the year 2000 the income with a university degree was 63% higher than with a vocational school degree. In 2016 this gap had diminished to 26%. It is important to note that the age structure of the two groups is not the same. In a period of economic stagnation this might cause younger less experienced individuals with university degrees to be more likely to lose their job than older workers with vocational school degrees. This could force individuals with university degrees to accept less well paid jobs and could in part explain the decline in the income gap. While there are likely to be many other explanations for this it is striking to see that the income of vocational school degrees almost stays constant between 2000-2016. This indicates that the vocational degree is more robust than higher degrees in an economic period with very little growth.

Another important factor to consider that calls for changes in the vocational education and training system is the youth unemployment. [Figure 2](#) shows a strong increase especially in the unemployment rate for ages 20 to 24 years between 2000 and 2009. While for this group unemployment was at 6.9 percent in the year 2000 it was at 14.7 in the year 2009. In 2018 the average unemployment rate was still at 11.7 percent and therefore has only dropped slightly compared to the year 2009. This is further evidence that increasing frictions have made the labor market entry of individuals more difficult in the 2000s and 2010s compared to the 1990s. [Figure 3](#) shows that the unemployment rate of individuals with a degree from vocational school has been considerably lower than that of university graduates since 2010. This could be due to increasing efforts of the Taiwanese government in promoting vocational training programs. However, as mentioned above the vocational degree seems to be in general more robust to periods of economic uncertainty.

The increasing problems young people face when entering the labor market have led the government of Taiwan to address these issues. The National Development Council constructs Four-Year National Development Plans that give a picture on the policy directions of Taiwan. The 2013-2016 plan include the change to a 12-year compulsory schooling system. The 2017-2020 plan mentions “narrowing the gap between school curricula and job markets”. This indicates a shift to an education system that focuses more on vocational training. The Ministry of Education concretizes this in the Objectives for 2019 by wanting “to nar-



Notes: Unemployment rate (yearly average); National Statistics Republic of China (Taiwan).

Figure 2: Youth unemployment rate in Taiwan

row the gap between students’ academic knowledge and their practical skills”.⁵ Ever since the 1950s the government has developed policies to support vocational training. In 1981 the Bureau of Employment and Vocational Training (BEVT) was founded to develop training programs (Chuang, 2013). Recent vocational training measures undertaken by the Ministry of Labor to lower the youth unemployment rate are summed up as:

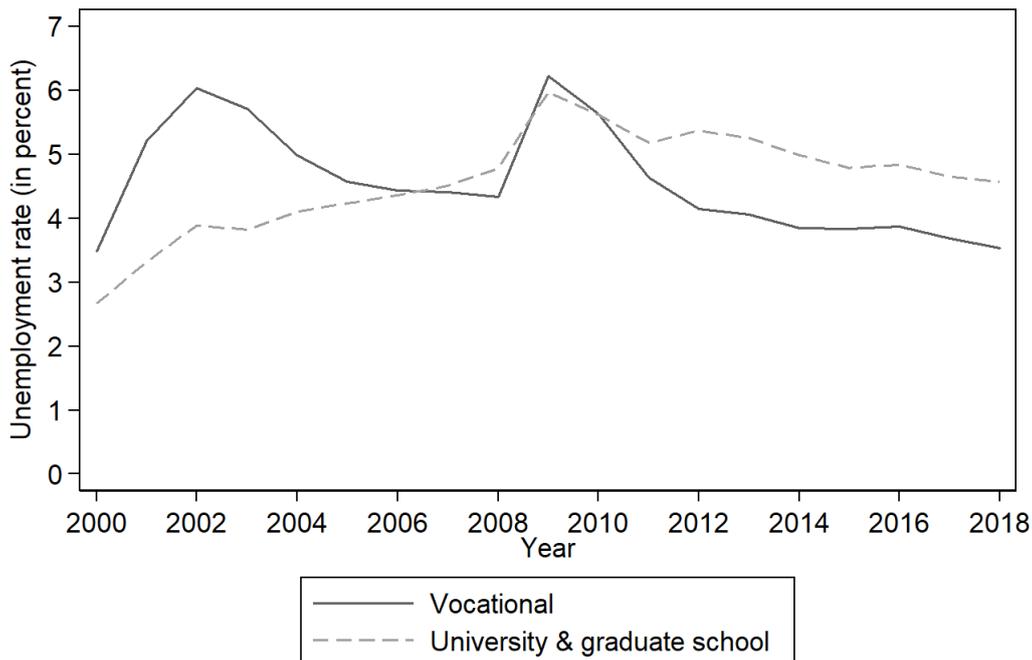
“[...] the agency implements various vocational training programs for youth, including the Dual System of Vocational Training Project in Taiwan, Subsidy Program for Universities and Colleges Implementing Employment Courses, Industry-Academy-Training Center Co-op Program, Youth’s Employment Ultimate Plan, and Mentoring Training Project.”

(Workforce Development Agency, Ministry of Labor, 2017)⁶

At the same time the Ministry of Education wants to reform the curriculum in institutions and increase the focus again on practical curriculum in the Technical and Vocational Education (TVE). This becomes apparent in the following statement:

⁵<https://english.moe.gov.tw/cp-9-17647-d7a42-1.html>

⁶https://www.wda.gov.tw/en/News_Content.aspx?n=0D3F36CCE6B574B6&sms=1DB30D69E65EBF64&s=E9DE55CD6D29A140 , accessed 2018-08-09



Notes: Unemployment rate by education attainment (yearly average); National Statistics Republic of China (Taiwan).

Figure 3: Unemployment rate by education attainment

“The purpose is to plan curriculum reform in TVE institutions’ practical curricula and cultivate instructors’ practical professional capabilities, thereby returning to the original intent of TVE being practical and application-oriented, as well as expanding the model of cultivating talents through tightly-woven industrial-academic relationships. This is done to increase student competitiveness in the job market in the future. [...]”

(Ministry of Education, 2014)⁷

The efforts of both ministries collude. In the past Taiwan’s Ministry of Education could relatively easily set the amount of practical curriculum by changes in the curriculum. The new reforms of the TVE include the idea of having a closer industrial-school relationship than before. The “Dual” vocational education and training (VET) has existed in Germany for many decades. It strongly relies on a cooperation between companies and vocational schools.

For this reason it is important to consider the industrial structure of Taiwan’s industry. Taiwan has a unique industrial structure which is dominated by Small and Medium Enterprises (SME). In the year 2016 78% of all employees were employed by SMEs (SMEA, 2016). Because these are often family-owned companies they are also influenced to a larger extent by Confucian values than larger

⁷https://ws.moe.edu.tw/001/Upload/5/ReIFile/7801/38355/2014_TVE-En.pdf , accessed 2018-08-09

firms. These values are equally important as skills. Warner (2010) reports that the values societal order, hierarchy, reciprocity, control, insecurity, family-based collectivism and knowledge almost all correlate positively with human resource management. The government starts by setting the legal framework for a dual VET environment. Firms and vocational schools then engage in an arrangement about a dual VET. The trainees are paid a salary by the firm because they increase the productivity of the company. The employer profits by being able to train apprentices with specific on-the-job skills and therefore reducing the likelihood of employees exiting the firm when they finish their training due to human capital being firm specific. Therefore the employer also chooses its trainees which means that students have to apply directly to firms. The school based curriculum in Taiwan has been developed for many decades and therefore provides the necessary skills by offering a sufficient amount of professional and practical courses. The general courses provide additional skills for example in languages and other general courses. A framework curriculum is already provided by the Ministry of Education which can also partly be used in a dual VET program. For the training provided in the firm an instructor is required to train apprentices. This means that firms incur various costs for instructors and trainees salaries before an apprentice reaches the productivity level which justifies these costs. Therefore firms might decide not to train apprentices and search the labor market for employees. Pilot programs can solve this issue by promoting the dual VET apprenticeship. Another idea is to use foreign companies in Taiwan that already have existing apprenticeship programs in other countries, e.g. Germany, to start to train apprentices.

As a comparison it is interesting to look at the VET in Germany. There, the dual VET lasts about 3 years in total. Trainees spend about 70 percent of the time at the company and receive on-the-job training. The remaining 30 percent of the time is spent in the vocational schools. While most apprenticeships are organized in a way where individuals visit the firm 3-4 days a week and the school 1-2 days a week there exist also apprenticeships where blocks of several weeks in school or in the company alternate. Regarding German companies in Taiwan offering VET, the German Trade Office reports that there have already been efforts by German companies in Taiwan to develop a dual vocational training.

3 Data and Empirical Strategy

3.1 Taiwan Manpower Utilization Survey (TMUS)

The primary data set used to evaluate the curriculum reforms is the Taiwan Manpower Utilization Survey. It is a repeated cross-sectional household survey. Since 1978 it offers an integrated survey of households and establishments. It includes individuals aged 15 and above and collects the employment status of the labor force.

The samples used for this analysis includes men aged 18-65 which are the household head and were born between 1937-1980. The first sample includes only individuals with the highest education a senior vocational school degree (VOC). The second sample also includes individuals with a senior high school degree (HS). [Table 2](#) shows characteristics of these two educational degrees. Since the exact educational biography is unknown it is assumed that individuals started vocational school at age 15. This is used to assign the treatment variable which is the fraction of practical courses including school-determined courses for the years 1986-1995. To create the treatment variable the curricula reforms between 1952-1995 are used ([Table 1](#)). Most VOC individuals choose engineering as their academic field. The average age when VOC individuals were interviewed is 41.7 and their average real income is 43,708 NT\$. For HS individuals the fraction of practical courses is assumed to be zero. Furthermore, there is no information available about academic field in the data. Most of the variables of VOC and HS have similar means and the real income is about the same.

Due to the data being a repeated cross-section an empirical strategy is undertaken to construct a pseudo panel as proposed by [Deaton \(1985\)](#). For the birth cohorts a classification of nine cohort groups is chosen.

3.2 Taiwan Educational Panel Study (TEPS)

The second data set used is the Taiwan Educational Panel Study (TEPS). The TEPS is a longitudinal data set which includes students born in 1984/85 and 1988/89. Due to the trend to higher education during the last decades only a small proportion of these students have only senior vocational school as their highest degree. The 1984/85 birth cohorts are interviewed in 2001 when in 11th grade and about age 17. The 1988/89 birth cohorts are surveyed in 2005, also in 11th grade. These educational career paths are linked with labor market information for the same individuals when they are between 20-30 years old.

The TEPS data does not cover enough cohorts to evaluate the curricula reforms that are evaluated with the TMUS. However, it offers insight into other

Table 2: Taiwan Manpower Utilization Survey

Variable	Mean	Std. Dev.	Min.	Max.	N
<i>Senior vocational school, VOC (highest degree):</i>					
Fraction of practical courses (PC + SC)	0.385	0.039	0.32	0.421	59857
Birth year	1958.643	9.577	1937	1980	59857
Current age in full years	41.714	9.517	18	65	59857
Persons aged 15 years or over in HH	2.855	1.362	1	19	59857
Academic field: Engineering	0.675	0.468	0	1	59857
Survey Year	2000.357	9.813	1978	2016	59857
Real income (CPI 2016)	43707.503	34562.81	1022.913	1354461.625	53220
<i>Cohorts</i>					
1940-43	0.049	0.216	0	1	57902
1944-48	0.08	0.272	0	1	57902
1949-52	0.109	0.312	0	1	57902
1953-57	0.2	0.4	0	1	57902
1958-61	0.171	0.376	0	1	57902
1962-66	0.174	0.379	0	1	57902
1967-70	0.104	0.306	0	1	57902
1971-75	0.077	0.266	0	1	57902
1976-79	0.036	0.187	0	1	57902
<i>Senior high school, HS (highest degree):</i>					
Fraction of practical courses (PC + SC)	0	0	0	0	30152
Birth year	1956.741	9.105	1937	1980	30152
Current age in full years	43.556	9.880	18	65	30152
Persons aged 15 years or over in HH	2.893	1.396	1	12	30152
Academic field: Engineering	0	0	0	0	30152
Survey Year	2000.297	10.181	1978	2016	30152
Real income (CPI 2016)	43729.586	37359.061	1301.067	1354461.625	25912
<i>Cohorts</i>					
1940-43	0.058	0.234	0	1	29254
1944-48	0.1	0.3	0	1	29254
1949-52	0.151	0.358	0	1	29254
1953-57	0.237	0.425	0	1	29254
1958-61	0.162	0.369	0	1	29254
1962-66	0.137	0.344	0	1	29254
1967-70	0.078	0.268	0	1	29254
1971-75	0.054	0.227	0	1	29254
1976-79	0.022	0.147	0	1	29254

Notes: Real income with Consumer Price Index (CPI) of 2016. Data: Taiwan Manpower Utilization Survey.

Table 3: TEPS summary statistics, individuals with vocational education (highest degree)

Variable	Mean	Std. Dev.	Min.	Max.	N
Attended school programs for pre-job training	0.152	0.36	0	1	322
No. of teachers who use practical examples	2.597	0.932	1	5	543
Ind. has job to gain experience	0.107	0.31	0	1	326
Job at age 25	0.794	0.405	0	1	452
Income at age 25	6.021	1.913	1	17	379
Job at age 30	0.878	0.328	0	1	320
Income at age 30	7.284	2.748	1	17	261
Age at start of first job	19.741	1.949	15	25	174
Female	0.386	0.487	0	1	572
Visited private school	0.54	0.499	0	1	572
CAB ability test score	0.192	0.971	-1.871	2.956	534
GAB ability test score	0.598	1.074	-1.765	4.528	534
MAB ability test score	0.022	1.036	-2.386	2.912	534

Notes: Sample consists of individuals with vocational school as their highest degree. CAB, GAB and MAB are estimates from comprehensive, general and mathematical analysis of ability tests. Income classified into 17 classes. Data: TEPS/TEPS-B.

determinants that might increase students practical skills in school which are unrelated to the curriculum. Three variables have been identified that could have effects on labor market outcomes. These are depicted in [Table 5](#). The sample only includes individuals with senior vocational school as their highest degree. The first question that is related to practical experience is “Did you attend school programs especially for pre-job training?”. The second question relates to teacher methods and is: “How many teachers use practical examples to further demonstrate key concepts?”. While the third question chosen relates to job experience: “Do you have a part-time job currently?” and “What is the main reason why you have a part-time job?”.

The variables for labor market outcomes are whether a person has found a job at age 25, the income class at age 25, person has a job at age 30, income at age 30 and the age at the start of the first job. Other variables used are Gender, if the school was a private school and ability test scores during vocational school. The sample used with individuals that have achieved a vocational school degree as their highest degree consists of 572 individuals.

3.3 Empirical Strategy

Following [Deaton \(1985\)](#) a pseudo-panel can be created from the MUS repeated cross-sectional data making it possible to follow cohorts over time that share fixed characteristics. The year of birth is chosen and the cohort classification is chosen as depicted in [Table 2](#). It is important to consider that the year of the sur-

vey leads to generations being included at different levels. This is due to younger individuals joining the labor market later and older individuals leaving the labor market. A within transformation is normally applied for each cohort. This means that the variables for all years are centered on the mean of the cohort value (Guillerm, 2017; Deaton, 1985).

Moffitt (1993) shows that this kind of grouping can also be seen as an instrumental variables (IV) procedure. I follow this approach and use the cohort dummies interacted with time as instruments for the cohorts. This simplifies the estimation procedure and allows working with the individual level data. The estimator is identical to the standard within estimator based on the pseudo panel of cohort c averages. Estimation is done in a two-step procedure. First, explanatory variables x_{it} for individuals i and time t are regressed on the instruments. The predicted values of x_{it} are then used in the second step where the outcome y_{it} is regressed on the means of the cohort values \bar{x}_{ct} and the cohort indicators. Both data sets are analyzed using ordinary least squares (OLS) with the difference that for the MUS a two-step procedure is used while the TEPS data is analyzed in one step.

4 Results

4.1 The effect of practical curriculum on income

The regression results can be seen in Table 4. Panel A consists of the main sample which includes individuals with senior vocational school as their highest degree. Panel B expands the sample by including individuals that hold a senior high school degree as their highest education. While panel A only uses the variation in time and fraction of practical courses, panel B is able to also include senior high school individuals. For the latter group it is assumed that these students had zero percent of practical courses.

The estimation of panel A (1) include cohorts effects. The same background variables are included in all regressions of Table 4. The coefficient is 0.43 percent and is significant at the 5 percentage level. These results suggest that an increase in the fraction of practical courses by 10 percentage points increases income by 4.3 percent. An alternative interpretation is that every increase in practical courses by 1 percentage point increases income by 0.43 percent. The effect size is therefore considerable. However, it is important to note that panel A only uses the senior vocational school sample and therefore can only rely on variation in time and level of practical courses for identification.

Panel B includes the senior high school individuals which are assumed to have

Table 4: The effect of increasing practical courses in vocational school on log earnings

	Panel A: VOC sample	Panel B: VOC + HS sample
	(1)	(2)
Fraction practical courses \times 100	0.0043** (0.0020)	0.0036* (0.0020)
Age	✓	✓
Age ²	✓	✓
No. of household members	✓	✓
Academic field: Engineering	✓	✓
Cohort effects	✓	✓
Observations	51558	76716

Notes: Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, The standard errors (in parentheses) are adjusted for clusters at the year of birth \times 100 + cohort level. Cohorts instrumented by cohorts interacted with pseudo panel years. Pseudo panels refer cohort mean panels. VOC: Senior vocational school, HS: senior high school.

a zero fraction of practical courses. Both degrees are similar in that the degree is obtained at a similar age and it is the highest education obtained. The mean income of individuals that have VOC or HS as their highest degree is similar as can be seen in Table 2. Analyzing the income by year as shown in Figure 4 supports this finding. There are only small periods, e.g. years 1980-85, 1990-92, 2000, 2004, 2008, where the income differs on a small level.

Estimates in (2) of Table 4 report that an increase in practical courses by 1 percentage point increases income by 0.36 percent. This coefficient is significant at the 10-percent level. Overall, the results from panel B suggest that the relationship between the fraction of practical courses and income is robust when adding HS individuals. It is also reassuring to see that the effect sizes are similar to the analysis using the VOC sample.

4.2 The role of pre-job training, practical examples and work experience

While there is evidence that increasing the fraction of practical curriculum increases future income it remains still unknown how other factors that are related to practical curriculum impact on labor market outcomes. The three variables described in subsection 3.2 were chosen for the analysis of the effect of practical determinants on the likelihood of having a job at age 25 and age 30, the income class at age 25 and age 30, and the age when starting the first job. These variables can only be found in the TEPS data and not in the MUS. As previously discussed using the TEPS to analyze individuals with VOC as their highest degree comes

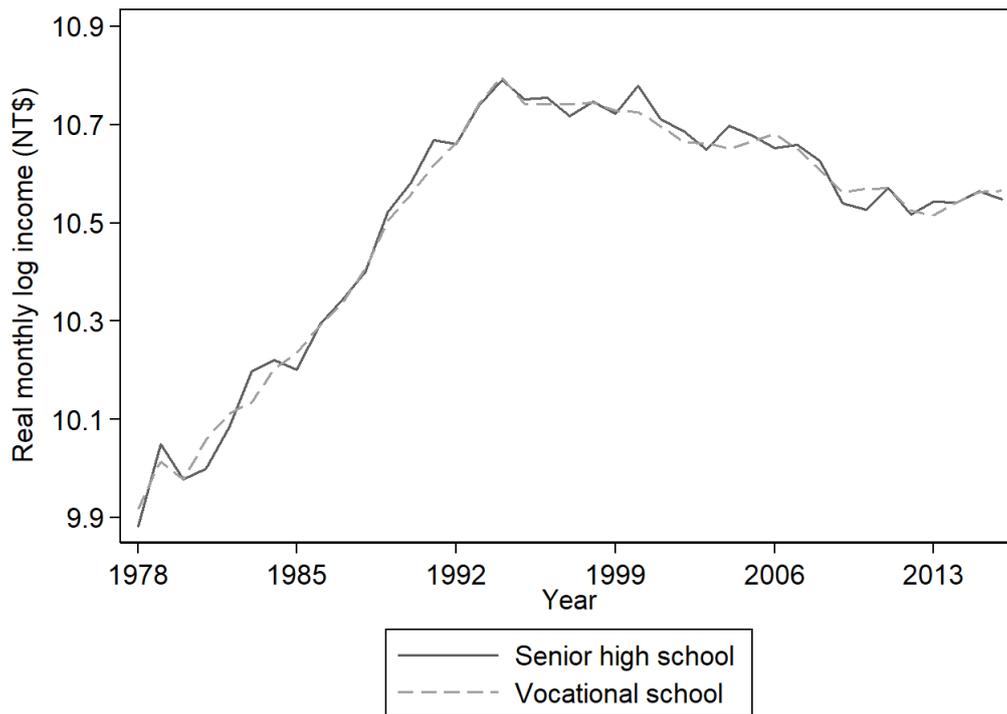


Figure 4: Mean income of VOC and HS highest degrees

with the downside of analyzing a small sample size. The OLS estimations in [Table 5](#) are from 15 separate regressions. Each including one of the labor market outcome variables as dependent variable and one of the treatment variables. At the same time each regression controls for gender, an indicator whether a private school was visited and the comprehensive, general and mathematical ability test scores.

Surprisingly, in none of the 15 regressions the coefficient shows any significance at the 10-percent level. Having attended a school program for pre-job training has a very small negative effect of 2 percent on finding a job at age 25. A similar effect size is found on the job at age 30. For the income classes the effect sizes in (2) and (4) are less than one category and are therefore also small⁸ The negative coefficient in (5) suggests that individuals with that attend the school program for pre-job training start their first job 0.72 years earlier than individuals who did not attend the program. However, none of the coefficients are significant.

Panel B of [Table 5](#) shows even smaller coefficients for the effect of increasing the number of teachers by one class⁹ on labor market outcomes. The likelihood of having a job at age 25 or age 30 only increases by about 1 percent. There is

⁸The change in one unit corresponds to about NT\$ 5000.

⁹A one unit increase in the variable class corresponds to an increase of about 2 teachers.

Table 5: The effects of pre-job training, practical examples and part-time job during vocational school on labor market outcomes

	Job at age 25 (1)	Income at age 25 (2)	Job at age 30 (3)	Income at age 30 (4)	Age start of first job (5)
<i>Panel A:</i>					
Attended school programs for pre-job training	-0.0215 (0.0761)	-0.2500 (0.3245)	-0.0312 (0.0541)	-0.5654 (0.4148)	-0.7182 (0.4933)
Observations	186	165	283	232	82
<i>Panel B:</i>					
No. of teachers who use practical examples	0.0134 (0.0224)	0.0694 (0.1035)	0.0110 (0.0236)	-0.2941 (0.2167)	-0.0150 (0.1774)
Observations	421	355	290	236	164
<i>Panel C:</i>					
Student has part-time job to gain experience	0.0388 (0.0953)	-0.0265 (0.2684)	-0.0532 (0.0695)	0.4759 (0.5896)	-0.6132 (0.5358)
Observations	191	170	287	232	85

Notes: Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The robust standard errors are in parentheses. OLS estimates. Sample consists of individuals with vocational school as their highest degree. Panel A, B and C all control for Gender, an Indicator for whether a private school was visited and CAB, GAB and MAB ability test scores. CAB, GAB and MAB are estimates from comprehensive, general and mathematical analysis of ability tests. Income is classified into 17 classes. Data: TEPS/TEPS-B.

no clear pattern for the income at age 25 and 30 and the age at which the first job is started is almost unaffected. At the same time none of the coefficients are significant at the 10-percent level.

Panel C analyzes the impact of having a job to gain practical experience¹⁰ on labor market outcomes. There is no clear pattern to be seen in terms of the direction of the coefficients. While the effect of the variable on the likelihood to find a job at age 25 is positive it is negative on the likelihood to have a job at age 30. The opposite is the case for income. Finally, having a part-time job to gain experience leads to a 0.61 year younger age at the start of the first job. Again, none of the coefficients are significant at the 10-percent level.

4.3 Implementation of curriculum reforms

Overall, the results from subsection 4.1 suggest that increasing the practical curriculum in vocational schools can increase future income. However, how schools implement reforms plays an important role. When implementing a curriculum reform the vocational schools had strict guidelines to follow. This changed in the 2000s when vocational schools gained more autonomy. The leadership of vocational schools therefore becomes more important and with the development of a school-determined curriculum the school principal has more responsibility. Furthermore, schools have to align and monitor the curriculum and help teachers with their curriculum units. In a qualitative study of the leadership of voca-

¹⁰This excludes students who state they had a job for any other reasons.

tional schools [Hsiao et al. \(2008\)](#) find that the principal of a vocational school has become increasingly important in recent years since the vocational education system in Taiwan is shifting to a decentralized system. This means that vocational high school principals are required to act as a manager and leader at the same for an effective reform implementation. Therefore the successful curriculum implementation strongly depends on the skills of the vocational school leader. Considering the findings by [Hsiao et al. \(2008\)](#) the empirical findings from [subsection 4.1](#) could contain a large amount of heterogeneity. However, this can't be analyzed due to there being no variables that identify schools in the MUS data.

5 Conclusion

The aim of this study is to estimate the effects of increasing the amount of practical curriculum in vocational schools on early labor market outcomes in Taiwan. The data come from the Manpower Utilization Survey as well as the Taiwan Education Panel Study. At the same time curriculum standards in vocational schools in Taiwan are used.

Results show that there are small but significant effects of increasing the fraction of practical courses in vocational schools on the future income of individuals. An increase of practical courses by 10 percentage points increases income by between 3.6 and 4.3 percent. At the same time there is no significant effect of students attending school programs for pre-job training, the number of teachers using practical examples or students having part-time jobs to gain experience on labor market outcomes.

These results offer some insights which are useful for policy recommendations. The positive effects of increasing the fraction of practical curriculum suggest that it could be beneficial for Taiwan to move from a school based vocational education to a dual vocational training system. A dual system automatically increases the amount of practical on-the-job skills received by apprentices because apprentices spend only part of their time studying in vocational schools and the other part receiving on-the-job training in firms. The government has started dual programs during the last decade but implementing such a training system comes with some challenges. Most notably creating a model which implements market- as well as school-based learning locations is important ([Euler and Wieland, 2015](#)). For this to work a consensus between firms, schools and government institutions has to be reached.

One of the biggest challenges for a dual vocational education and training (VET) to function in Taiwan is that of making the program more attractive for

youths. Due to the trend to higher education the apprenticeship system is competing with higher degrees such as university and university of applied sciences degrees. At the same time the youth unemployment rate indicates that there exist educational mismatches. There could be several reasons why these mismatches might occur. One of the main explanations is that youths in general tend to achieve the highest possible degree due to Confucian beliefs and the assumption of the highest degree maximizing the utility of lifetime earnings.

The image of vocational training in Taiwan is therefore essential for its future development. Euler and Wieland (2015) mention that in countries where vocational training has a poor image mostly this is due to traditional academic education being valued more than the more practical vocational training. However, this image could change since the real income of university graduates has diminished in the last couple of years and the unemployment rate for individuals holding a vocational degree has been lower than for a university degree. It is possible that new vocational training programs will therefore find more acceptance in Taiwanese society. In countries such as Germany the dual system is in fact linked to lower youth unemployment (Riphahn and Zibrowius, 2016).

In Taiwan career counseling could be implemented at schools with the aim of informing youths about the VET and about possibilities of further tertiary education after achieving a VET degree. University dropout rates, employment rates and income by degrees should be included in information material for students and parents. The counseling should not only be done in 7th-9th grade but also at grades 10-12. This could illustrate to students in senior high school that a dual vocational training can be a very promising career path.

While it is not yet possible to empirically estimate the effects of pilot VET programs in Taiwan on labor market outcome due to the lack of data, results from this study show that individuals profit from more practical curriculum in school. This suggests that a VET could provide a smoother transition from school into the labor market for young adults without a university degree.

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