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# Underemployment and Wage Penalty in Thailand

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**Abstract:**
Underemployment is a severe form of human resource underutilization. Nevertheless, underemployment has received little attention vis-à-vis unemployment. As a result, this research investigates the scale of underemployment in Thailand using time-related, income-related, and skill-related underemployment measures. In addition, this research also examines the effect of underemployment on earnings, i.e., wage penalty. The study relies on education as a skill proxy and overeducation as a labor underutilization proxy. By using the selection-corrected two-step method, the results indicate that the underemployment rate is highest under the skill-related method and that the wage penalty is highest under the income-related method. The findings also reveal that underemployed workers suffer wage penalties. In other words, underemployed workers earn less than correctly-matched workers. Specifically, this study aims to measure the extent of underemployment in Thailand and determine the effect of underemployment on earnings. This work's novelty lies in using different measures of underemployment to quantify the extent and effect of underemployment on earnings. Essentially, the scale of underemployment and wage penalty is influenced by the measures of underemployment.

**Keywords:** time-related underemployment, income-related underemployment, skill-related underemployment, overeducation, wage penalty.

# 泰国的就业不足和工资处罚

**摘要：**
就业不足是人力资源利用不足的一种严重形式。然而，与失业相比，就业不足却很少受到关注。因此，本研究使用与时间相关、与收入相关和与技能相关的就业不足措施来调查泰国的就业不足规模。此外，本研究还考察了就业不足对收入的影响，即工资惩罚。该研究将教育作为技能代理，将过度教育作为劳动力利

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用不足的代理。通过使用选择修正两步法，结果表明，技能相关方法下的就业不足率最高，而收入相关方法下的工资惩罚最高。调查结果还表明，就业不足的工人会受到工资处罚。换句话说，就业不足的工人的收入低于正确匹配的工人。具体而言，本研究旨在衡量泰国的就业不足程度，并确定就业不足对收入的影响。这项工作的新颖之处在于使用不同的就业不足衡量标准来量化就业不足对收入的程度和影响。从本质上讲，就业不足和工资处罚的规模受到就业不足衡量标准的影响。

**关键词：**与时间相关的就业不足、与收入相关的就业不足、与技能相关的就业不足、教育过度、工资惩罚。

# 1. Introduction

The most common measure of labor market slack, unemployment, shows the number of individuals currently without a job and actively seeking one. In Thailand, unemployment has been consistently low vis-à-vis other Asian countries. For example, in 2020, the country's unemployment rate stood at 1.1 %, compared to 4.54 % in Malaysia, 5.83 % in Hong Kong, and 4.10 % in Singapore.

The unemployment rate often fails to fully capture the degree of spare productive capacity because, according to the International Labor Organization (ILO), individuals working as little as one hour during the reference week would be regarded as employed. Besides, in many developing countries, many adult individuals have odd jobs and less than full time, but they are regarded as employed.

Underemployment or labor underutilization is a condition in which workers are employed less than full-time or at jobs inadequate with regard to their training or economic needs. Measuring labor underutilization is essential for two reasons: first, labor is a productive input that cannot be stored and should not be wasted; second, productive input ownership determines incomes, and, in developing countries, most workers have only labor as their productive input.

Underemployment negatively impacts the economy (i.e., macroeconomic) and individual workers. On the macroeconomic level, underutilization of skilled labor represents a waste of resources that could have been put to productive use to grow the economy. Unemployment is associated with poor economic and social consequences, while underemployment contributes to inadequate income, welfare dependency, and life dissatisfaction (Wilkins, 2007). On the individual-worker level, underemployment also contributes to a higher incidence of depression (Dooley et al., 2000).

Specifically, this research aims to measure the scale of underemployment under different measures: time-, income-, and skill-related underemployment; and to determine the effect of underemployment on earnings by using different methods: time-related, income-related, mean realized-match, mode realized-match, and job analysis methods.

# 2. Literature Review

### *2.1. The Measurement of Underemployment*

According to ILO, there are two types of underemployment: visible and invisible underemployment. Visible or time-related underemployed workers are individuals who, during a given reference period (usually one week), (1) are willing to work additional hours; (2) are available to work additional hours; and (3) have worked fewer hours than what is considered full-time employment. The definition of full-time employment varies from country to country, e.g., 40 hours in Turkey, 30 hours in Malaysia, and 35 hours in Thailand.

Islam and Kamarudin (2018) studied time-related underemployment in Malaysia and reported the lowest number of time-related underemployed workers of 470,700 persons in 2008 and the highest number of 643,100 persons in 2013. Meanwhile, in Thailand, the underemployed are defined as employed individuals who work less than 35 hours a week and desire to work more hours (Senkrua, 2019). Based on the 2017 Labor Force Survey by the National Statistical Office, the underemployment rate in Thailand was 0.82%, with male and female workers accounting for 59.8% and 40.2%, respectively.

Meanwhile, there are three invisible underemployment forms: income-related underemployment, underemployment related to excessive hours, and skill-related underemployment. Income-related underemployment is when a job fails to provide adequate income for a decent living. Specifically, income-related underemployed workers are individuals who have full-time jobs but earn 1.25 times below the poverty line. Teeraswat et al. (2002) found that the income-related underemployment rate in Thailand was 12.09% the year following the East Asian economic crisis. Domfe et al. (2013) reported that income-related underemployed workers accounted for 15.4% of the working-age population.

Underemployment related to excessive hours is the condition in which workers seek to work fewer hours either in the current job or in another job, with a corresponding reduction in income. The focus is on workers' willingness to reduce working hours at their current job in exchange for lower current or future earnings. However, underemployment related to excessive hours is excluded from this current study because most Thai labor forces work longer hours to earn additional income (Sazali & Tumin, 2020). Conversely, underemployment related to excessive hours is a situation in which workers seek shorter working hours in exchange for lower income.

Skill-related underemployment is the condition in

which a worker possesses a skill level higher than required for the job. Due to the unavailability of skill data, educational levels or years of formal schooling are used as skill proxy, and overeducation is used to measure skill-related labor underutilization. An individual is overeducated if his educational level exceeds the required education to perform the job. There are two measurement methods of the required level of schooling: self-assessment and objective methods. In the self-assessment, workers are asked to specify the minimum education required for their jobs (i.e., the required level of education).

Under the objective method, overeducation is measured by the realized match or job analysis method. The realized match method relies on the mean educational level plus one standard deviation (mean + 1 SD) to determine the required level of education to perform a job. However, Kiker et al. (1997) proposed using the modal value (mode) instead of the mean level of education to determine the required schooling (i.e., mode + 1 SD). Meanwhile, Bauer (2002) studied the German labor market using the mean and mode realized-match methods and reported that, under the mean realized-match method, 12.3% and 10.7% of male and female workers were overeducated; and 30.8% and 29.9% of male and female workers were overeducated under the mode realized-match method.

Job analysis (JA) is a systematic evaluation by professional job analysts who identify required levels of education for job titles in an occupational classification. Specifically, Rumberger (1987) used the U.S. Dictionary of Occupational Titles (DOT) to determine the required years of education in each occupational classification and found that 11–17% of workers were overeducated, with three years of schooling beyond the required education. Paweenawat and Vechbanyongratana (2015) used the required minimum education levels of Thailand's Ministry of Labor and found that about 47 % of male university graduates were overeducated. Meanwhile, the OECD (Organization of Economic Cooperation and Development) method is another JA method based on the International Standard Classification of Occupations (ISCO) and the International Standard Classification of Education (ISCED) (Appendix 1). Senkrua (2015) studied overeducation in Thailand using the OECD method and reported that the country's overeducation in 2011 was 8.51%.

### *2.2. The Effect of Underemployment on Earnings*

Underemployment negatively impacts individual workers, including low job and life satisfaction, poor prospects for career advancement, earnings growth and retirement savings (Li et al., 2015), person-job mismatch, unfulfilled personal and professional needs, and workplace alienation (Maynard & Feldman, 2011). As a result, this current research also investigates the effect of underemployment on earnings. Wilkins (2004) documented that underemployment was associated with lower personal income, as evidenced by the coefficient estimate indicating a 9-percent reduction in personal income for underemployed workers compared with fully employed workers.

Overeducation is a form of underemployment. Evidence shows that overeducated workers were paid less than correctly matched workers. Meanwhile, Pholphirul et al. (2016) studied overeducation in Thailand using the Labor Force Survey of Quarter 3 in 2018 and found that overeducated workers earned 18.6% less than correctly matched workers, while horizontally mismatched workers earned 7.2% more than correctly matched workers. A horizontal mismatch is a mismatch between the type of qualifications acquired by individuals and those required for their current job.

Varakamin (2017) interviewed 58 companies in a major industrial estate in Thailand and reported that overeducation reduced earnings by 37.8%, suggesting a negative correlation between overeducation and earnings.

## 3. Theoretical Background

In this research, underemployment is explained by four theories: theory of labor-leisure choice, human capital theory, job signaling model, and relative deprivation theory.

The theory of labor-leisure choice is linked to time-related underemployment. Figure 1 shows the equilibrium hours of work in the labor-leisure choice model, where the horizontal axis represents the number of hours of leisure/work and the vertical axis represents the monetary income (Y).

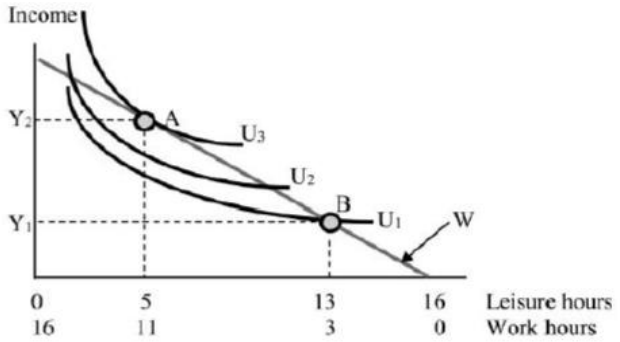


Figure 1. Graphical illustration of time-related underemployment (Beukes et al., 2017)

In the figure, assuming that an individual sleeps eight hours a day, there remain 16 hours to allocate between work and leisure. Work is the number of hours dedicated to a paid job and the remaining hours for leisure and other activities. To maximize utility, an individual would prefer Point A on Utility $U_3$ by working 11 hours and receiving the income of $Y_2$. However, this individual is currently employed at Point B on Utility $U_1$, working only three hours daily. In other words, this individual is underemployed and receives a lower income of $Y_1$.

According to Becker's (1993) human capital theory, education is essential for improving an individual's productivity (i.e., human capital) and future earnings. In

Thailand, the average number of labor force schooling years increased from 10.54 in 2016 to 10.82 in 2020 for the 15-39 age group and from 7.74 in 2016 to 8.36 in 2020 for the 40-59 age group (Office of the Education Council, 2022). With the excess supply of educated workers, highly educated workers are preferred over lowly educated workers in positions previously filled by the latter. Highly educated workers are therefore overeducated relative to the required education while receiving lower returns on education. The human capital theory posits that overeducation leads to disequilibrium in the labor market. Nevertheless, overeducation is usually short-term as businesses adjust the production process and workers reduce investment in education.

According to Spence's (1973) job signaling model, hiring is an investment decision where an employee's attributes play an essential role in hiring as employers possess no prior knowledge of the employee's marginal product. The job signaling model categorizes personal attributes into two groups: indices and signals. Indices are observable and unalterable attributes such as gender, race, and nationality, while signals are observable and alterable characteristics such as education. Employers normally make conditional probability assessments of employees' productive capacity based on combinations of indices and signals. Meanwhile, potential employees are unable to change indices, but they could alter signals. The costs involved in making the changes are signaling costs. Potential employees normally focus on signals, education in particular, that maximize the difference between offered wages and signaling costs.

The relative deprivation theory posits that individuals always compare themselves with their peers. The theory helps to understand workers' dissatisfaction when they compare their employment with others', especially if they perceive that they are underpaid. Underemployment evokes a feeling of relative deprivation, which affects individuals' attitudes toward their current jobs.

## 4. Study Data

This research relied on the 2017 National Labor Force Survey (LFS) data. The data are collected quarterly by the National Statistical Office of Thailand (NSO). The study samples were individuals aged 15–60 and employed in the formal sector, including government employees, state enterprise workers, and company employees.

The research investigated both visible and invisible underemployment in Thailand. Time-related underemployment was used to study visible underemployment. In this study, time-related underemployed workers are those who, during a given reference period (usually one week), will and are available to work additional hours and have worked fewer hours than 35 hours per week (i.e., 35 hours per week are considered full-time employment in Thailand).

For invisible underemployment, this research focused on two types of underemployment: income-related and skill-related underemployment. Income-related underemployed workers are individuals who have full-time jobs and whose income is 1.25 times below the poverty line. In this study, a worker's income included monthly wage, bonus, overtime pay, and other incomes. The poverty line by region was THB 3165, 2861, 2411, 2403, and 2768 per person per month for the capital Bangkok, Central Plains, North, Northeast, and South, respectively, given the THB 32/USD exchange rate (Office of the National Economic and Social Development Council, 2017).

This study used education as the proxy for skills for skill-related underemployment due to skill data unavailability. Overeducation reflects underutilization of human capital or underemployment. Specifically, this research compared three overeducation measurements: mean realized-match method, mode realized-match method, and job analysis method.

Under the mean realized-match method, a worker is overeducated if the number of their years of schooling is greater than that of the mean years of schooling plus one standard deviation (i.e., mean + 1 SD). Meanwhile, under the mode realized-match method, a worker is overeducated if the number of their years of schooling is greater than that of the mode years of schooling plus one standard deviation (i.e., mode + 1 SD). Under the job analysis (JA) method, workers are overeducated if their educational level is higher than required. Besides, this research relies on the Thailand Standard Classification of Occupations (TSCO) of the Ministry of Labor of Thailand for the JA method. The TSCO is based on the International Standard Classification of Occupations (ISCO) (Appendix 2).

Essentially, this research utilizes five methods to measure underemployment: time-related underemployment, income-related underemployment, overeducation under the mean realized-match method, overeducation under the mode realized-match method, and overeducation under the JA method. The definitions of all variables are tabulated in Appendix 3. It is expected that different methods would lead to different scales of underemployment and unequal wage penalties.

## 5. Research Methodology

In this research, the underemployed individuals are not fully employed despite their willingness to work additional hours. Therefore, evidence shows that underemployment presents the problem of sample selection (Caroleo & Pastore, 2018). Besides, sample selection could lead to biased coefficient estimates in regression analysis (Grilliches, 1977). The sample selection can be solved by using Heckman's two-step procedure. Specifically, the effects of underemployment on earnings are determined by the selection-corrected two-step method.

The first step is concerned with the employment choice and can be mathematically expressed as

$$E_i^* = \beta_i X_i + \varepsilon_i \quad \text{where } \varepsilon_i \sim N(0,1)$$

where $E_i^*$ is a dummy variable coded 1 if an individual is employed and 0 if otherwise. The explanatory variables ($X_i$) include age, age squared, gender, marital status, level of education, and region of residence.

Specifically, age is the number of years of age, and gender is a dummy variable coded 1 for males and 0 for females. Marital status is also a dummy variable coded 1 for married and 0 for single, divorced, widowed, or separated. Level of education is a dummy variable and categorized by skill levels: low-skilled education (educational levels below upper-secondary education), intermediate-skilled education (upper-secondary and post-secondary education), and high-skilled education (university education). The probit estimation (i.e., the result of the first step of Heckman's two-step method) is used to construct a selection-bias control factor (i.e., inverse Mills ratio). The inverse Mills ratio (imr) is then included as an explanatory variable in the wage equation (the second step of Heckman's two-step method).

The second step analyzes the effect of underemployment on earnings by incorporating underemployment dummies into the equation,

$$\ln wage = \beta_{1i} X_i + \beta_{2i} un_i + \alpha imr_i + \varepsilon_i$$

where ln wage is the natural logarithm of the monthly wage, $un_i$ is a dummy variable coded 1 if a person is underemployed and 0 if otherwise, imr is the self-correction term included for bias correction, $X_i$ is the control variable including age, age squared, gender, marital status, educational level, occupation types, municipal area, and household head. Types of occupation are categorized into three groups by skill levels: low-skilled, intermediate-skilled, and high-skilled. The municipal area is a dummy variable coded 1 if a person lives in the municipal area and 0 if otherwise. The household head is also a dummy variable coded 1 if an individual is head of the household and 0 if otherwise.

# 6. Results and Discussion

### *6.1. The Scale of Underemployment*

Table 1 presents the extent of underemployment under different measures of underemployment. Underemployment rates were noticeably higher under education-related underemployment (overeducation), vis-à-vis those of time-related and income-related underemployment.

Specifically, under the JA method, overeducation was 30.61 %, with male and female workers accounting for 29.16% and 31.91%, respectively. The relatively high overeducation estimate could be attributed to the systematic underestimation of job requirements due to skill-biased technological change under the JA method. Other studies also reported high rates of overeducation under the JA method. For example, Kler (2005) documented the overeducation rate of 21% in Australia using the JA method.

Under the mean realized-match method, overeducation was 10.49%, with male and female workers accounting for 12.17% and 8.6%, respectively. Meanwhile, Fernández and Ortega (2008) found that overeducation in Spain was about 15% for male natives and 13.8% for female natives.

Under the mode realized-match method, overeducation in Thailand was 10.98%. Meanwhile, the proportion of overeducated workers in South Africa declined from 28.4% in March 2002 to 5.8% in the final quarter of 2016 (Baidoo, 2018).

On the contrary, the rates of underemployment were considerably low under the income-related and time-related methods. Under the income-related method, underemployment was 1.19%, with male and female workers accounting for 0.89% and 1.53%. Domfe et al. (2013) studied underemployment in Ghana and reported a rate of underemployment of 15.4%. According to Baidoo (2018), the income-related underemployment rate was 18% in South Africa. Meanwhile, the rate of time-related underemployment in Thailand was 0.58%, which was substantially lower than that in the UK (9.9%) (Tam, 2010). The time-related underemployment rates in South African workers were between 2.7–6.2% of the total employed workers (Baidoo, 2018).

Table 1. The scale of underemployment under different measures

| Measure of underemployment | Overall (%) | Male (%) | Female (%) |
|---|---|---|---|
| Visible underemployment | | | |
| Time-related underemployment | 0.58 | 0.67 | 0.47 |
| Invisible underemployment | | | |
| Income-related underemployment | 1.19 | 0.89 | 1.53 |
| Education-related underemployment (Overeducation) | 10.49 | 12.17 | 8.6 |
| - Overeducation by the mean realized-match method | 10.98 | 14.65 | 6.74 |
| - Overeducation by mode realized-match method | 30.61 | 29.16 | 31.91 |
| - Overeducation by JA method | | | |

### *6.2. The Effect of Underemployment on Earnings*

Table 2 presents the results of the first step of Heckman's two-step procedure to determine the probability of whether respondents were employed (1) or unemployed (0). Age plays an important role in labor force participation, and the results indicated that the likelihood of participating in the labor force increased with age ($\beta = 0.04,\ p < 0.05$). However, the marginal productivity of workers decreased with age, as evidenced by the negative coefficient estimate of age squared ($\beta = -0.0003,\ p < 0.05$).

Gender also plays an important role in labor force participation, especially in developing countries. Specifically, males were less likely to participate in the labor force ($\beta = -0.11,\ p < 0.05$). Moreover, according to Morin (2013), male workers generally lag behind female workers in terms of job skills and levels of schooling, leading to low-skill occupations and lower wages for male workers.

Marital status also significantly affects labor force

participation. In this study, unmarried workers were used as the reference group, and the results showed that married workers were more likely to participate in the labor market ($\beta = 0.16$, $p < 0.05$). The finding could be attributed to increased post-marriage financial responsibilities, thereby necessitating participation in the labor market.

Education plays an essential role in human capital development and is also regarded as the key determinant of employment. The result indicated that workers with high-skilled education are more likely to be employed ($\beta = 0.26$, $p < 0.05$).

Table 2. The result of probit regression on labor force participation

| Variables | Coefficient | Standard error |
|---|---|---|
| Age | 0.04* | 0.006 |
| Age squared | -0.0003* | 0.0001 |
| Male | -0.11* | 0.02 |
| Married | 0.16* | 0.02 |
| Low-skilled education (reference) | | |
| Intermediate-skilled education | -0.002 | 0.02 |
| High-skilled education | 0.26* | 0.03 |
| Bangkok (reference) | | |
| Central | -0.02 | 0.04 |
| North | -0.12* | 0.043 |
| Northeast | -0.21* | 0.04 |
| South | -0.14* | 0.04 |
| Constant | 1.28* | 0.105 |

*Note:* * denotes the 5% significance level.

The region of residence also influences the labor force participation. Specifically, workers residing in the North, Northeast, and South were less likely to participate in the labor force than those residing in the capital Bangkok (reference). Conversely, there was no statistical significance for workers with a residence in the Central region, vis-à-vis the reference. Generally, workers living in metropolitan areas where jobs are concentrated have greater job opportunities.

Table 3 shows the regression results of the underemployment effect on earnings under different underemployment measurement methods. The explanatory variable is underemployment which is a dummy variable, while the remaining variables are control variables, e.g., age, gender, and marital status. The regression results indicate a statistically negative relationship between underemployment and earnings. Specifically, underemployed workers earn lower wages or face wage penalties. Furthermore, the extent of the wage penalty varies, depending on the measurement methods of underemployment.

Time-related underemployed workers earned 70% less than workers who work full time ($\beta = -0.7$, $p < 0.05$). Muller (2009) studied the wage differential between part-time and full-time female workers in South Africa and found that part-time workers suffered a wage penalty.

Income-related underemployed workers earned 119% less than fully employed workers with income 1.25 times below the poverty line ($\beta = -1.19$, $p < 005$). In addition, under the mean realized-match method, overeducated workers (or underemployed workers) earned 7% less than workers with the same amount of education who are working in occupations that fully utilize their educational capability ($\beta = -0.07$, $p < 005$).

Under the mode realized-match method, the wage gap between overeducated and correctly matched workers was 8%. In other words, overeducated workers earned 8% less than correctly matched workers ($\beta = -0.08$, $p < 0.05$).

Under the job analysis method, overeducated workers earned 2% less than correctly matched workers ($\beta = -0.02$, $p < 0.05$). Paweenawat and Vechbanyongratana (2015) studied overeducation among university graduates in Thailand and found that overeducated university graduates experienced a 19% wage penalty vis-à-vis their correctly matched counterparts.

The control variables are as follows: age is an intermediary index for years of experience, and earnings generally increase with age. Age squared captures the concavity of the age-earnings relationship. Male workers earn 7–10% higher wages than female workers (Table 3). The lower female wages could be attributed to career disruptions for family reasons. The career breaks result in loss of on-the-job training and work experience.

Married workers receive higher wages than single workers. Bardasi and Taylor (2005) found a significantly positive relationship between marriage and wages, with married workers earning a 9% wage premium. Meanwhile, years of schooling were significantly positively correlated with wages. Highly educated workers earned higher wages. The research results showed that workers with intermediate-skilled education and those with high-skilled education earned 22–30% and 73–90% higher than those with low-skilled education. Wannakrairoj (2013) found that, in Thailand, the return on an additional year of education was 11% in urban areas and 10% in rural areas.

Workers in high-skilled occupations, such as legislators or senior officials, earned 42–65% more than those in low-skilled occupations (the reference group), such as butlers or janitors. Workers in intermediate-skilled occupations, such as clerks, sales workers, or assemblers, earned 15–28% more than the reference group. In addition, workers with a residence in the municipal area earned more than those in non-municipal areas. Specifically, workers in Bangkok received higher wages than those in other regions, i.e., the North, Northeast, Central, and South.

The inverse Mills ratios are positive and statistically significant under the five measurement methods, indicating that the selection-bias assumption is valid. As a result, Heckman's two-step procedure is necessary to determine the effects of underemployment on earnings (wage penalty). Besides, the omission of the probability of employment (i.e., in the first step) in the wage analysis (in the second step) could result in a bias in the analysis results.

Table 3. The regression results on the effect of underemployment on earnings

| Variables | Model 1 (Time-related ) | Model 2 (Income-related) | Model 3 (Overeducated under mean method) | Model 4 (Overeducated under mode method) | Model 5 (Overeducated under JA method) |
|---|---|---|---|---|---|
| Underemployed | -0.7* | -1.19* | -0.07* | -0.08* | -0.02* |
| Age | 0.04* | 0.04* | 0.04* | 0.05* | 0.04* |
| Age squared | -0.0003* | -0.0002* | -0.0003* | -0.0003* | -0.0001* |
| Male | 0.08* | 0.07* | 0.1* | 0.1* | 0.07* |
| Married | 0.18* | 0.17* | 0.18* | 0.18* | 0.16* |
| Intermediate-skilled education | 0.26* | 0.25* | 0.3* | 0.3* | 0.22* |
| High-skilled education | 0.87* | 0.85* | 0.9* | 0.89* | 0.73* |
| Intermediate-skilled occupation | 0.16* | 0.15* | 0.16* | 0.16* | 0.28* |
| High-skilled occupation | 0.445* | 0.42* | 0.48* | 0.5* | 0.65* |
| Central | -0.17* | -0.16* | -0.15* | -0.16* | -0.16* |
| North | -0.35* | -0.34* | -0.34* | -0.34* | -0.32* |
| Northeast | -0.44* | -0.42* | -0.42* | -0.43* | -0.37* |
| South | -0.31* | -0.31* | -0.39* | -0.41* | -0.33* |
| Municipal area | 0.07* | 0.06* | 0.09* | 0.1* | 0.07* |
| Inverse Mills ratio | 9.55* | 9.67* | 8.96* | 9.62* | 8.73* |
| Constant | 7.46* | 7.51* | 7.43* | 7.33* | 7.48* |

*Note:* * denotes the 5% significance level.

# 7. Conclusions and Policy Recommendations

This research aims to investigate the scale of underemployment in Thailand under different underemployment measures and determine the underemployment effect on earnings (i.e., wage penalty) under different measurement methods. The measurement methods include time-related, income-related, mean realized-match, mode realized-match, and job analysis methods.

The study relied on the 2017 National Labor Force Survey data of the National Statistical Office of Thailand. The study samples were individuals aged 15–60 and employed in the formal sector, including government employees, state enterprise workers, and company employees.

For the novelty of this research, the application of various measures of underemployment to quantify the extent and the earnings effect of underemployment differentiates this work from previous research studies on underemployment in the context of Thailand. The choice of underemployment measures (i.e., time-related, income-related, skill-related underemployment) plays a role in the scale of underemployment and wage penalties experienced by incorrectly matched (overeducated) workers. As a result, relevant governing bodies are encouraged to adopt different quantitative methods (or underemployment measures) to analyze the country's underemployment situation. The practice enables the integration of diverse perspectives on underemployment and contributes to formulating strategies and policies effectively addressing the underemployment issue.

The results indicated that the underemployment scale varied among different underemployment measures. For example, the time-related and income-related underemployment in Thailand was 0.58% and 1.19%, respectively. For skill-related underemployment, this research relied on education as the skill proxy and overeducation for human capital underutilization. The findings showed that overeducation was 10.49% under the mean realized-match method and 10.98% under the mode realized-match method. Meanwhile, overeducation was excessively high under the job analysis method (30.61%) as a result of the systematic underestimation of job requirements due to skill-biased technological change.

Regarding the effects of underemployment on earnings (i.e., wage penalty), the results showed that underemployed workers in Thailand earned less than fully-employed workers. The income-related underemployed workers suffered a 119% wage penalty, while the time-related underemployed workers experienced a 70% wage penalty. Under the job analysis method, overeducated workers earned 2% less than correctly matched workers. Meanwhile, overeducated workers were paid 7% less than correctly matched workers under the mean realized-match method and 8% under the mode realized-match method.

Given an oversupply of the overeducated workforce and wage penalty, policymakers (i.e., the government) should refocus education policies and financial assistance programs by shifting the focus from encouraging general education enrollment (i.e., university education) to upper vocational education. Workers with a vocational degree are in short supply and thus earn higher wages than those with a degree in general education (Ministry of Labor, 2018). Furthermore, entrepreneurship courses should also be offered in higher educational institutions because self-employment could alleviate the lack of demand for certain types of skills.

# 8. Limitations and Further Study

This current research focuses primarily on the effects of underemployment on earnings (i.e., wage penalty). Future research could thus extend the scope to investigate other individual-level impacts of underemployment, e.g., individual mental health and interpersonal relationships. The findings would lead to

measures and actions beneficial to underemployed individuals. Besides, the scope of future study could also be widened to examine the effect of underemployment on macroeconomic-level productivity and overall economic growth.

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## Appendix

### *Appendix 1. Overeducation under the OECD Method*

Table A1.1. Conversion of the International Standard Classification of Occupations (ISCO)'s nine categories into three categories by skill levels

| Occupational titles | Low-skilled | Intermediate-skilled | High-skilled |
|---|---|---|---|
| 1. Managers | | | X |
| 2. Professionals | | | X |
| 3. Technicians and associate professionals | | | X |
| 4. Clerical support workers | | X | |
| 5. Service and sales workers | | X | |
| 6. Skilled agricultural, forestry and fishery workers | | X | |
| 7. Craft and related trades workers | | X | |
| 8. Plant and machine operators, and assemblers | | X | |
| 9. Elementary occupations | X | | |

Table A1.2. Conversion of the International Standard Classification of Education (ISCED)'s eight categories into three categories by skill levels

| Educational level | Low-skilled | Intermediate-skilled | High-skilled |
|---|---|---|---|
| 1. Pre-school | X | | |
| 2. Primary education | X | | |
| 3. Lower secondary education | X | | |
| 4. Upper secondary education | | X | |
| 5. Post-secondary education | | X | |
| 6. Bachelor's degree | | | X |
| 7. Master's degree | | | X |
| 8. Doctorate | | | X |

Table A1.3. Correspondence of ISCED educational levels and ISCO employment levels

| ISCED educational level | ISCO employment level | | |
|---|---|---|---|
| | Low-skilled | Intermediate-skilled | High-skilled |
| Low-skilled | Matched | Undereducated | Undereducated |
| Intermediate-skilled | Overeducated | Matched | Undereducated |
| High-skilled | Overeducated | Overeducated | Matched |

### *Appendix 2. Job Analysis Method for Measuring Underemployment*

Table A2.1. The Thailand Standard Classification of Occupations (TSCO) of Thailand's Ministry of Labor, based on ISCO and ISCED

| Category | Description | Required education |
|---|---|---|
| 1 | Legislators and senior officials | University degree |
| 2 | Professionals | University degree |
| 3 | Technicians and associate professionals | High school or technical vocational degree |
| 4 | Clerks | High school degree |
| 5 | Service workers and shop and market sales workers | High school degree |
| 6 | Skilled agriculture and fishery workers | High school degree |
| 7 | Craft and related trades workers | High school degree |
| 8 | Plant and machine operators and assemblers | High school degree |
| 9 | Elementary occupations | Elementary school |
| 0 | Military | - |

### *Appendix 3. The Variables Used in This Study*

| Variables | Descriptions |
|---|---|
| Employed | Dummy variable coded 1 if employed and 0 if unemployed |
| Ln(wage) | Natural logarithm of monthly wage |
| Underemployment | |
| Time-related | Dummy variable coded 1 if working less than 35 hours per week and 0 if greater than or equal to 35 hours per week |
| Income-related | Dummy variable coded 1 if individuals work full time and earn income less than 1.25 times below the poverty line and 0 if otherwise |
| Overeducated by the mean realized-match method | Dummy variable coded 1 if a worker's year of schooling is greater than mean years of schooling plus one standard deviation and 0 if otherwise |
| Overeducated by mode realized-match method | Dummy variable coded 1 if a worker's year of schooling is greater than model years of schooling plus one standard deviation and 0 if otherwise |
| Overeducated by the JA method | Dummy variable coded 1 if a worker's educational level is higher than required education in each occupation and 0 if otherwise |
| Age | Years of age |
| Age squared | Age multiplied by age |
| Male | Dummy variable coded 1 if male and 0 if otherwise |
| Married | Dummy variable coded 1 for married and 0 for single, divorced, widowed, or separated |
| Educational level | Categorical variable taking the value of 1 if low-skilled education, 2 if intermediate-skilled education, and 3 if high-skilled education |
| Occupation | Categorical variable taking the value of 1 if the low-skilled occupation, 2 if the intermediate-skilled occupation, and 3 if the high-skilled occupation |
| Municipal area | Dummy variable coded 1 if a worker lives in a municipal area and 0 if otherwise |
| Region | Categorical variable taking the value of 1 if Bangkok, 2 if Central, 3 if North, 4 if Northeast, and 5 if South |

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