

Returns to education among the informally employed in Thailand

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Thailand experienced rapid economic development and made significant investments in education over the past four decades; however, more than half of Thai workers remain informally employed. Despite the prevalence and persistence of informal work in Thailand, little is known about the returns to investments in formal education among informal workers. Using individual-level data from the 2011, 2013, and 2015 Thailand Household Socio-economic Surveys, this study estimates the wage returns to years of education for informal workers using an instrumental variable (IV) approach to correct for potentially biased coefficient estimates on years of education due to unobserved ability. Contrary to expectations, informally employed Thai workers find substantial returns to investments in formal education. The results under the IV approach indicate that the return to an additional year of education for the informally employed is 11–12 per cent, compared to almost 15 per cent for formally employed private firm workers.

Introduction

Informal workers in Thailand currently make up more than half of the country's labour force and contribute significantly to the economy (National Statistical Office 2018). The labour force has remained highly informal despite Thailand's emphasis on increasing access to education over the past four decades as a means to economic development. Although the government has progressively provided and required higher levels of compulsory education (nine years as of 2002), it is unclear whether workers in the informal sector see significant returns to increasing investments in formal education.

The purpose of this study is to estimate the returns to formal education among informally

employed workers in Thailand, a country that is representative of other developing countries with largely informal labour forces. This study uses the Thailand Household Socio-economic Surveys (SES) compiled by the National Statistical Office of Thailand (NSO) for the years 2011, 2013, and 2015. Using an instrumental variable (IV) approach to account for the ability bias, this study finds that the wage returns to education among informally employed workers, own-account workers, and formally employed workers are 11.2, 11.9, and 14.6 per cent per year of formal education, respectively. These results suggest that even among the informally employed, there are substantial private returns to formal education in a developing country context, which raises questions about the

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conventional wisdom of pushing governments to formalise work.

The paper is organised as follows. In following sections the literature related to wage returns to education in developing economy and informal employment contexts is reviewed and background on Thailand's labour market and educational system is provided. Next, the methodology and data used to estimate returns to formal education among informal workers in Thailand's labour market are described. Finally, the empirical results, discussion, and conclusions are presented.

Literature review

Education provides numerous monetary and non-monetary benefits to individuals and societies. From a societal point of view, formal education is a tool to increase human capital that in turn drives a country's economic development and sustained economic growth. For individuals, additional education has been shown to lead to higher levels of labour income (for example Oreopoulos 2006; Dickson and Harmon 2011; Oreopoulos and Petronijevic 2013). Although the literature on returns to education is large, most previous work has focused on developed countries due in part to a lack of data from developing economies. An example of research that takes into consideration returns to education in developing economies is Psacharopoulos and Patrinos (2004), which considered the returns to education in 98 countries, both developed and developing. They find the highest returns to education belong to low and middle-income countries. In an updated study by Montenegro and Patrinos (2014), the trends in returns to education remain the same with the highest returns to education in developing economies. Fink et al. (2015) study returns to education in 61 low and middle-income countries during 1985–2012 and report that the average return to education is 6.5 per cent, with lowest and highest returns of 1.9 and 8.0 per cent in Asia and in Latin America, respectively.

Since previous studies primarily consider developed economies where formal employment is nearly universal, returns to formal education among the informally employed remain largely in question. Although informal workers [that is workers who are generally not subject to national labour legislation, income taxation, and social protection (ILO 2019)] often comprise the majority in developing countries, only a few studies on the Mincerian returns to education in informal employment exist. For example, studies by Akono and Nanfosso (2013) and Park and Qu (2013) estimate the returns to education for informal workers in Cameroon and China, respectively. In both studies, returns to education for informal workers were 4.2 per cent, which is lower than the estimated returns in the formal sector in both countries (Akono and Nanfosso 2013; Park and Qu 2013).

In Thailand, there are several recent studies on returns to various types of education. Moenjajak and Worswick (2003) compare the returns to vocational and general secondary education, finding that returns to vocational education are significantly higher than for general education graduates. Hawley (2004) studies returns to education among young workers, finding that one additional year of education leads to ten per cent higher monthly earnings. In a more recent study on returns to education in Thailand, Tangtipongkul (2015) estimates the rates of returns to different educational levels, showing very large returns to tertiary education in the Thai labour market. All three studies use various versions of the Mincerian model, yet none takes into account the ability bias. To date, Warunsiri and McNown (2010) is the only study on the returns to education in Thailand to correct for the ability bias. The paper employs both pseudo-panel and IV approaches. The instrument used in Warunsiri and McNown (2010) is whether or not a province had a university and/or a teacher training college, which theoretically reduces the cost of higher education and exogenously increases educational attainment for people living in those provinces. The return to education from the IV approach is 14.1 per cent,

which is larger than the baseline ordinary least squares (OLS) estimate of 11.5 per cent (Warunsiri and McNown 2010). This current study adds to the returns to education literature by considering wage returns among informal workers in Thailand. Thanks to available individual-level data on informal workers in Thailand, this is one of the few studies to estimate the returns to formal education in informal labour markets using nationally representative data.

earnings individuals can generate from formal work, depending on occupation, opportunity, and other conditions. Also, Maloney (1999) states that individuals might find informal employment more desirable due to inefficiencies of protection. Given that informal employment may be preferable to formal employment along some dimensions, it is of interest to know if returns to investments in formal education are comparable for formal and informal workers within a largely informal economy.

Informal work

Informal employees are those who are in an employment relationship or are self-employed but are not subject to national labour legislation, income taxation, and social protection (ILO 2019). In general, it is believed that workers in informal employment have low productivity, work in inferior conditions, lack protection, and earn low wages (Herrera-Idarraga et al. 2012). Due to these issues, the International Labour Organization (ILO) has encouraged governments to enact policies to formalise informal employment, such as through the ILO's Recommendation No. 204 concerning the Transition from the Informal to the Formal Economy. Widespread informality can lead to serious problems not only from an economic perspective but also from social and political perspectives. According to Elgin and Sezgin (2017), large informal economies result in lower tax revenues that negatively affect the provision of public goods and services, lower productivity, and lower potential for economic growth.

Although informal work is generally thought of as inferior to formal work arrangements, several studies have found that informal employment may have private advantages for workers. For example, Park and Qu (2013) claim that individuals might decide to work informally if formal jobs offer inferior benefits compared to informal employment. Similarly, Gunther and Launov (2012) find that some individuals leave formal work and seek informal work because earnings from informal work can exceed

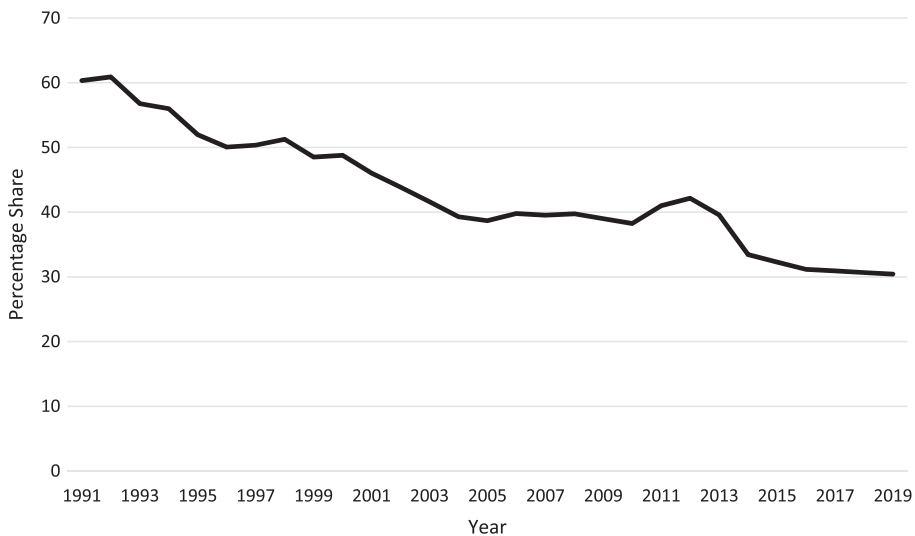
Structural change and informality in the Thai economy

Thailand was traditionally an agriculturally based economy. In the 1960s, the Thai government embarked on its first organised attempts to develop its industrial sector, including automobile manufacturing and labour-intensive textile manufacturing (Baker and Phongpaichit 2014). Following the world's oil crisis and other external factors, Thailand shifted towards export-oriented manufacturing in the 1980s, increasing exports by approximately 24 per cent per year during 1984–1989 (Baker and Phongpaichit 2014). From the 1990s onwards, the tourism and service sectors have grown dramatically due in part to the promotion of tourism by the government.

Shifts in employment shares across sectors have accompanied these structural shifts in the economy. As seen in Figure 1, the contribution of agricultural employment to the Thai economy has dropped from 60 per cent in 1991 to 31 per cent in 2018.

Since the 1990s, the shift away from agriculture has been accompanied by a shift from 'unpaid family workers' to 'employees in private companies', which is demonstrated by an increase in the proportion of private firm employees by almost 12 per cent within 20 years (Aemkulwat 2010). During the period of about 20 years from 1990, the share of workers in the agricultural sector dropped more than 20 per cent while the share of manufacturing and service sectors increased by 6 and 10 per cent, respectively (Aemkulwat 2010). A major driver of this change was the government's establishment of the

Figure 1
Thailand's agricultural employment share, 1991–2018



Source: World Bank (2019).

Industrial Estate Authority of Thailand in 1979, which was created to decentralise industries and promote the establishment of a manufacturing base in the provincial areas. Despite the structural shifts in the economy that started in the 1960s and accelerated in the 1980s, much of Thailand's labour force—including workers in employment relationships—remains informal.

Education policies in Thailand

Significant changes in the education system accompanied the development of Thailand's economy starting in the 1970s. For example, compulsory education was increased from four to six years and, based on the Third Five-year Economic and Social Development Plan (1971–1976), secondary schools were established in every district (*amphoe*) across the country (Ministry of Education 1976). In 1980 the National Primary Education Act was implemented, which stated that all villages (*tambon*) should be equipped with primary schools. Another major policy change in the Thai education system occurred in 2002 with

an increase in compulsory education from six to nine years. Currently, the Thai education system includes 12 years of basic education, including six years of compulsory education at the primary level, three years of compulsory education at the lower secondary level, and three years of non-compulsory but tuition-free education at the upper secondary level. According to Aemkulwat (2010), the number of lower secondary school students increased by 18 per cent and the number of upper secondary school students increased by 22 per cent over the 2002–2010 period. The number of vocational graduates also rose by 1.2 million people to three million between 1990 and 2010 (Aemkulwat 2010). It is clear that as a result of the government's education policies, the average level of completed education among Thais has increased dramatically since the 1970s.

Informality in Thailand

Despite the government's efforts to transform the Thai economy and significant investments in education, Thailand's labour market

remains highly informal. Official statistics report 56 per cent of workers were classified as informally employed in 2016, including informal employees working in firms and own-account workers (National Statistical Office 2018). Figure 2 shows the share of informal workers in the Thai economy in 2015 by birth cohort for workers born between 1951 and 1980. This is the data used in the main analysis in the paper.

Figure 2 shows that the proportion of workers who are informally employed is highest in the oldest generation of workers, but still stands at 49 per cent for workers born between 1971 and 1980. Older workers are more likely to be self-employed workers, largely in agriculture. In contrast, the youngest workers are more likely to be employed in firms, but almost half of the private firm employees remain informally employed. The overall picture suggests that with structural change within the Thai economy, younger workers are less likely to be self-employed in agriculture and more likely to work in private firms; but the probability of being informally employed remains high.

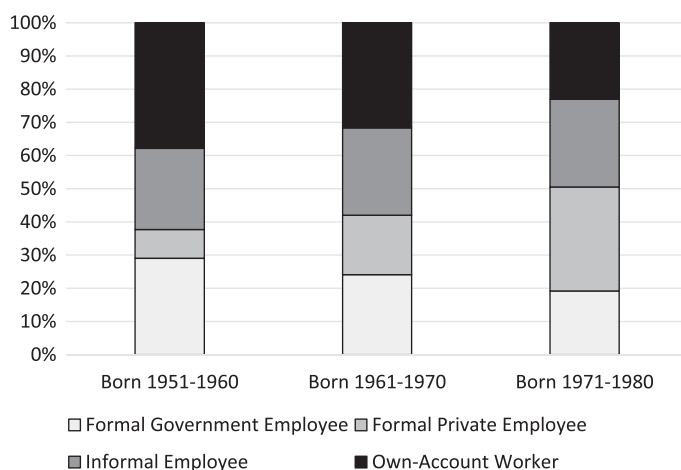
In a recent study of Thailand's informal workers, Dasgupta et al. (2015) compare earnings between the formally and informally employed in Thailand. They find that the

earnings of informal workers are significantly lower than for formal workers (56.7 per cent lower), and informally employed men generally command higher incomes than informally employed women. Not surprisingly, more highly educated persons earn more than the less educated. Elgin and Sezgin (2017) argue that the informal sector increases work opportunities for low productivity and unskilled persons who would not have a chance to work in the formal sector. However, Dasgupta et al. (2015) find that the wage gap between formally and informally employed persons is lower among the more highly educated younger generation than among the older generation, which suggests that informal employment in the Thai context may not represent highly inferior employment, and that at least some informal employment rewards skills gained through education.

Methodology

We use an augmented Mincerian model to estimate the wage returns to education for government workers, formal employees in private firms, informal employees in private

Figure 2
Share of informal Workers in Thailand, by birth cohort, 2015



Source: Authors' calculations from the 2015 SES.

firms, and own-account workers.¹ The following baseline regression is first run for the entire sample and then separately for each of the three types of workers:

$$\ln w_i = \beta_0 + \beta_1 ed_i + \beta_2 age_i + \beta_3 age_i^2 + \gamma \mathbf{X} + \varepsilon_i, \quad (1)$$

where $\ln w_i$ is the natural log of real monthly earnings of individual i , ed is years of education, and age and age^2 proxy for labour market experience. \mathbf{X} represents a vector of individual characteristics, including gender, marital status, urban residence, region of residence, as well as a set of dummy variables that indicate the survey year.

Although the Mincerian model is widely used in the returns to education literature, the approach is criticised by many researchers. One notable problem of the Mincerian model is that of omitted variables. Specifically, Himaz and Aturupane (2015) explain that there are unobservable factors, such as ability and motivation that are correlated with both schooling and wages. Inherent ability differences among individuals lead to the ‘ability bias’ when running Mincerian regressions (Blackburn and Neumark 1993; Card 1999). In other words, individuals with higher ability tend to receive higher levels of education and earnings; consequently, the coefficient on the education variable is biased upwards.

Several econometric approaches have been used to correct for the ability bias, including an IV approach. However, an IV approach has limitations in that the selected instrument has to be valid, as an invalid instrument could lead to even more upward bias on the schooling variable (Ashenfelter et al. 2000). Card (2001) points out that larger IV coefficients could occur because they estimate the effects of schooling on a small group within the sample, while the OLS estimates the effects of schooling on everyone. Oreopoulos (2006) employs the concept of Local Average Treatment Effects (LATE) to estimate the returns to schooling when compulsory minimum age-leaving laws changed from leaving at 14 years old to leaving at 15 years old in the

UK. He finds that the LATE estimates from the IV approach exceed OLS estimates for several reasons, such as individuals affected by the selected instrument might be more credit constrained or have a need to work immediately after leaving school. This is similar to the results in the case of Thailand by Warunsiri and McNown (2010) and the study on the impact of years of education on environmental behaviour in Europe by Meyer (2015).

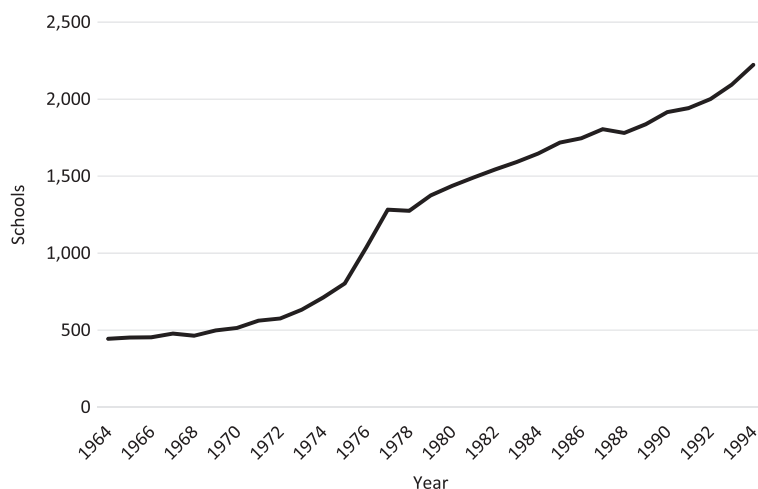
Given the problem of the ‘ability bias’ found in OLS wage regressions, an IV approach is employed here. Warunsiri and McNown (2010) construct an IV from the locations of universities and/or teaching training colleges, which could plausibly increase higher education attainment for individuals located close to these institutions. Chankrajang and Muttarak (2017) study green returns to education in Thailand also employing an IV approach to avoid the ability bias issue. They used the number of state primary school teachers per 1000 children as a proxy for the supply of education. In a similar vein, this study uses the number of secondary schools per 100 km² in each province in the year individuals in the sample were 13 years old, which is the age students normally enter secondary school. We chose this instrument for two reasons. First, the establishment of secondary schools was largely dictated by a central government policy that was applied uniformly across Thailand. In particular, the Third National Economic and Social Development Plan (1972–76) called for secondary schools to be built in every district of the country (Ministry of Education 1976). Figure 3 shows the number of public secondary schools in Thailand from 1964 (before the policy) to 1994.

Figure 3 demonstrates that the increase in the number of secondary schools was slow in the 1960s, but increased significantly after 1972 when the central government promulgated the Third Five-year National Economic and Social Development Plan (1972–76).

The second reason for choosing this instrument was that the majority of individuals who were school-aged in the 1970s and 1980s have

1 For government and private firm employees, monthly labour income is used as the wage measure, while business income is used for own-account workers. Since own-account workers have no employees, business income is comparable to labour income for employees.

Figure 3
Numbers of public secondary schools, 1964–1994



Source: Authors' computation from Ministry of Education Annual Statistics Report (Ministry of Education Thailand, 1968–2001).

low levels of completed education. Compulsory education was only four to six years prior to 2002, which is reflected in the fact that 56 per cent of the sample used in this study completed six years of primary education or less. Thus, better access to secondary schools due to the implementation of the central government policy could have plausibly encouraged families to invest in education beyond what was required by law. By measuring the density of secondary schools in each province from 1974 to 1994 when individuals in the sample were 13 years of age, we capture access to secondary education at the age when individuals would have entered secondary school. Equations (2) and (3) show the two-stage least squares approach, instrumenting years of education with the number of secondary schools per 100 km².

$$\text{Stage 1: } Ed_i = \alpha_0 + \alpha_1 \text{SchoolPerArea}_i + \alpha_2 age_i + \alpha_3 age_i^2 + \gamma X_i + \epsilon_i. \quad (2)$$

$$\text{Stage 2: } \ln w_i = \beta_0 + \beta_1 \hat{Ed}_i + \beta_2 age_i + \beta_3 age_i^2 + \delta X_i + \epsilon_i. \quad (3)$$

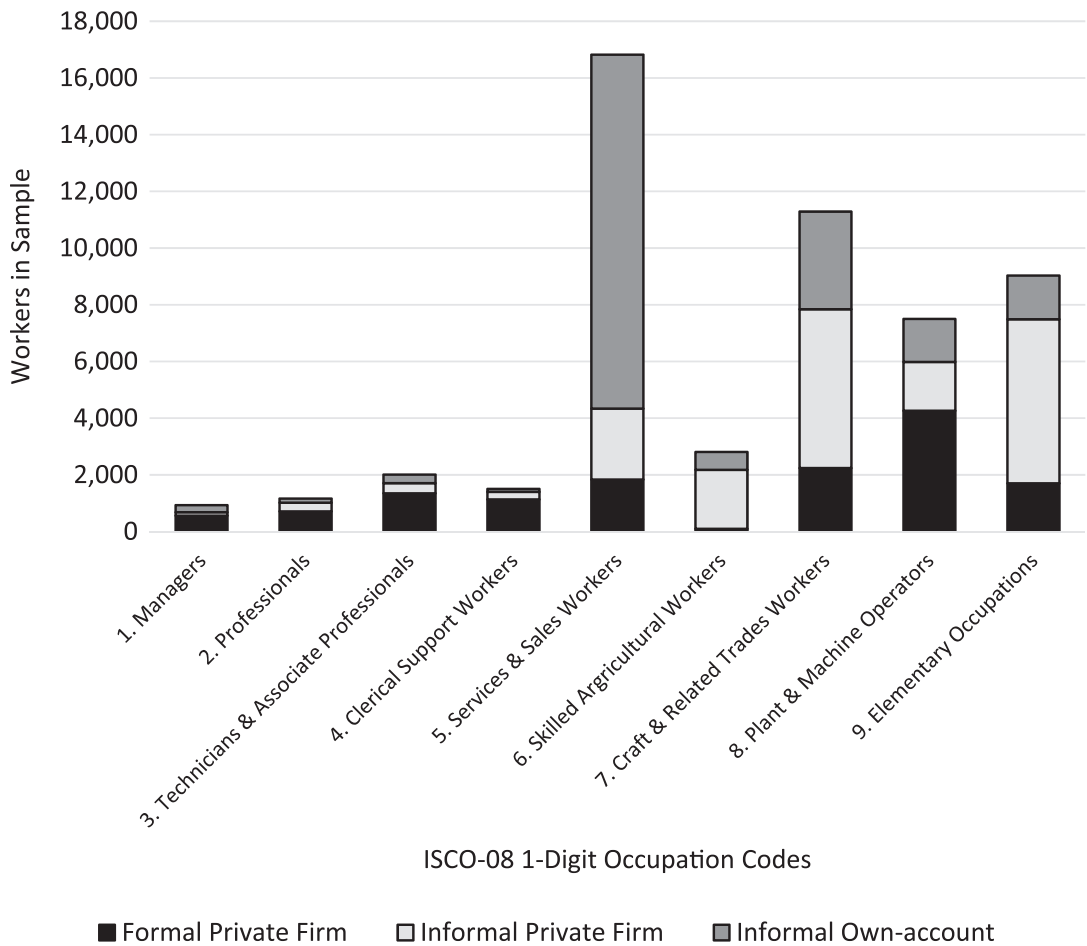
All specifications were run with standard errors clustered at the province-year of birth level to account for within-group correlation.

Data

We employ the SES collected by the NSO covering the years 2011, 2013, and 2015. Although the SES is conducted every year, only the odd years collect detailed information on the individual labour and business earnings needed for the analysis. The sample includes formal and informal private firm employees and own-account workers born between 1950 and 1981 (aged 31–65 years old at the time of the survey).² We excluded younger workers because they were not directly affected by the central government policy to expand secondary education in the 1970s; in addition to being largely subject to different compulsory education laws that increased compulsory education to nine years

2 Government workers are excluded from the sample since salaries are defined by a rigid, uniform pay structure where completed formal education is part of the compensation formula.

Figure 4
Distribution of occupations across worker type



Source: Authors' calculations from the 2011, 2013, and 2015 SES.

in 2002. We also exclude Bangkok from the analysis for three reasons. First, the structure of Bangkok's economy is historically an outlier from the rest of the country, with fewer workers engaged in agriculture and more workers engaged in services and white collar work. Second, Bangkok was largely unaffected by the expansion of secondary schools due to the Third National Economic and Social Development Plan because the city

already had an extensive secondary school system by the 1970s.³ Finally, Bangkok is a magnet for migrant workers from other provinces. Unlike other regions in Thailand, Bangkok has a positive net migration flow, which means it is problematic to assume that current Bangkok workers lived in Bangkok at the time they were secondary school age (NSO 2019). For these reasons we excluded Bangkok from

3 The number of secondary schools in Bangkok increased by 55 per cent between 1964 and 1980, compared to an average increase in secondary schools of 224 per cent across all other provinces (Ministry of Education, 1968–2001).

the main analysis but provide OLS results for Bangkok in Table A1 for comparison.

Labour income for private firm employees and business income for own-account workers are converted to real terms based on the CPI announced by the Bank of Thailand for the base year of 2015 (Bank of Thailand 2020). We define formal employees as private firm workers who are covered by Section 33 under the Social Security Act (1990), or other employer-provided welfare programs.⁴ Informal workers are defined as those in private firm employment without employer-provided social welfare, as well as those engaged in own-account work. The dataset includes observations on 53,044 workers who report labour income or business income in the case of own-account workers.⁵

Figure 4 presents the sample's distribution of occupations classified by the one-digit level International Standard Classification of Occupations, 2008 across worker type. Figure 4 shows that formal workers in private firms make up the vast majority of workers in skilled occupations, which are located on the left side of the chart. In contrast, own-account workers are concentrated in service and sales work. Informal private firm workers and own-account workers make up the majority of workers in the lower-skilled occupations located on the right side of Figure 4, with the exception of 'plant and machine operators'. Importantly, formal and informal private firm workers, as well as informal own-account workers, are all well-represented across the lower-skill occupations and are not necessarily segregated by skill.

Table 1 shows summary statistics for the sample used in the analysis, stratified by worker type. Several differences stand out when comparing the means of our variables of interest across different types of workers. For the whole sample the mean years of schooling is 7.8 years, while for informally

employed workers in private firms and own-account workers the means are only 6.3 and 7.7 years, respectively. In contrast, the average years of education are higher for formal private firm employees at ten years. Real monthly labour earnings also diverge with the mean of the whole sample equal to 11,446 baht, which is significantly more than the mean for informally employed private firm workers at only 7510 baht. The highest mean earnings among these three groups belong to formal private firm employee, at 14,226 baht, followed by own-account workers at 13,174 baht. The summary statistics are consistent with previous research that shows formal workers are more likely to have more education and higher incomes than informal workers (Dasgupta et al. 2015).

Empirical findings

OLS baseline model

The empirical results for the baseline OLS models are reported in Table 2. The baseline OLS model using the pooled sample reported in column 1 indicates that an increase in education by one year on average increases monthly earnings by 5.0 per cent.⁶ The baseline results also indicate that informal private firm employees and own-account workers on average earn 42.6 and 7.0 per cent less than formal private firm employees. In addition, women earn on average 22.3 per cent less than men, while married individuals earn 10.0 per cent more than workers who are single. Living in urban areas where there are more employment opportunities is associated with higher wages by 8.9 per cent on average. Interestingly, real earnings in 2013 and 2015 are significantly higher than the base year, 2011, by 11.5 and 13.8 per cent, respectively.

4 There are three schemes under the Social Security Act (1990), including Section 33, Section 39, and Section 40. Section 33 refers to employer-provided social security, while Sections 39 and 40 are voluntary schemes.

5 For own-account workers, we use business income instead of labour income. Since own-account workers are self-employed and do not have other employees, business income is comparable to labour income in this case.

6 Our estimate is significantly lower than the baseline OLS estimate of 11.5 per cent found by Warunsiri and McNown (2010) because the current analysis excludes government workers who have high wage returns to education.

Table 1
Summary statistics

	All (N = 53,044)		Formal private firm employee (N = 13,870)		Informal private firm employee (N = 18,754)		Informal own-account worker (N = 20,420)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Real monthly total income (2015 baht)	11,446	9750	14,226	9801	7510	5412	13,174	11,504
Years education	7.804	4.375	10.032	4.452	6.308	3.574	7.666	4.368
Age	44.594	7.373	41.518	6.675	44.774	7.280	46.519	7.219
Female indicator	0.495	0.500	0.480	0.500	0.428	0.495	0.567	0.496
Married indicator	0.745	0.436	0.745	0.436	0.735	0.441	0.756	0.430
Municipal area indicator	0.625	0.484	0.622	0.485	0.542	0.498	0.704	0.457
Central region indicator	0.409	0.492	0.643	0.479	0.332	0.471	0.320	0.466
North region indicator	0.208	0.406	0.133	0.340	0.210	0.407	0.257	0.437
Northeast region indicator	0.211	0.408	0.107	0.309	0.237	0.426	0.256	0.436
South region indicator	0.173	0.378	0.116	0.321	0.220	0.415	0.168	0.374
Survey year 2011	0.357	0.479	0.354	0.478	0.358	0.480	0.358	0.479
Survey year 2013	0.322	0.467	0.332	0.471	0.318	0.466	0.317	0.465
Survey year 2015	0.321	0.467	0.314	0.464	0.323	0.468	0.325	0.468
Secondary schools per 100 km ²	0.472	0.535	0.756	0.692	0.378	0.412	0.364	0.435

Source: Authors' calculations from the 2011, 2013, and 2015 SES.

Table 2
Returns to education, by worker type (OLS estimates)

	(1) All	(2) Formal private firm	(3) Informal private firm	(4) Informal own-account
Dependent variable: ln real total income				
Years of education	0.050*** (0.001)	0.071*** (0.001)	0.049*** (0.001)	0.035*** (0.002)
Informal employee	-0.426*** (0.007)			
Own account worker	-0.070*** (0.008)			
Age	0.064*** (0.006)	0.046*** (0.009)	0.035*** (0.008)	0.075*** (0.011)
Age ²	-0.001*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)
Female indicator	-0.223*** (0.006)	-0.183*** (0.008)	-0.247*** (0.008)	-0.236*** (0.012)
Married	0.100*** (0.006)	0.066*** (0.009)	0.089*** (0.009)	0.140*** (0.013)
Municipal area	0.089*** (0.006)	0.012 (0.008)	0.072*** (0.008)	0.176*** (0.014)
Survey year 2013	0.115*** (0.007)	0.169*** (0.009)	0.135*** (0.010)	0.062*** (0.015)
Survey year 2015	0.138*** (0.007)	0.167*** (0.010)	0.154*** (0.010)	0.110*** (0.015)
Constant	7.379*** (0.141)	7.400*** (0.199)	7.628*** (0.177)	7.243*** (0.261)
Regional controls	Yes	Yes	Yes	Yes
Adj. R ²	0.260	0.392	0.190	0.099
Observations	53,044	13,870	18,754	20,420

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Formal private firm employees are the excluded worker category in column 1; clustered standard errors at the province-year of birth level in parentheses.

Source: Authors' calculations from the 2011, 2013, and 2015 SES.

This is likely the result of a significant nation-wide increase in the minimum wage in 2013.

Columns 2–4 report OLS regression results separately for the three different groups of workers. The coefficient estimates on years of education vary across the three groups. The highest return to education is 7.1 per cent for formal private firm workers. The OLS estimates for returns to education for informal workers are modest at 4.9 per cent for informal private firm workers and 3.5 per cent for own-account workers. These relatively low returns could reflect low ability among the informally employed or low productivity in informal employment regardless of educational attainment. Similar to the results using the entire sample, women from all three employee groups have lower wages than

men, particularly among informally employed women who face 24–25 per cent lower earnings than informally employed men. Interestingly, we see an increase in informal worker wages after the implementation of the new minimum wage rates in 2013 by 13.5 per cent even though informal workers are not subject to minimum wage laws in Thailand.

IV model

As mentioned above, it is possible that the coefficient estimates reported in Table 2 could be biased upwards due to the ability bias. To account for this possibility, we ran a second estimation using the IV approach. The goal is to identify off variation in access to secondary

Table 3
Returns to education by worker type (IV estimates)

	(1) All	(2) Formal private firm	(3) Informal private firm	(4) Informal own-account
Dependent variable: ln real total income				
Years of education	0.136*** (0.015)	0.146*** (0.015)	0.112*** (0.030)	0.119*** (0.036)
Informal employee	-0.170*** (0.047)			
Own account workers	0.039* (0.022)			
Age	0.080*** (0.007)	0.058*** (0.011)	0.049*** (0.010)	0.092*** (0.014)
Age ²	-0.001*** (0.000)	-0.000** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)
Female indicator	-0.190*** (0.009)	-0.179*** (0.010)	-0.239*** (0.010)	-0.164*** (0.033)
Married	0.146*** (0.011)	0.120*** (0.016)	0.114*** (0.015)	0.189*** (0.026)
Municipal area	0.005 (0.016)	-0.042*** (0.015)	0.019 (0.026)	0.067 (0.048)
Survey year 2013	0.089*** (0.009)	0.133*** (0.014)	0.122*** (0.012)	0.040** (0.018)
Survey year 2015	0.073*** (0.014)	0.103*** (0.018)	0.111*** (0.023)	0.046 (0.031)
Constant	5.804*** (0.321)	6.059*** (0.360)	6.688*** (0.480)	5.714*** (0.699)
Regional controls	Yes	Yes	Yes	Yes
Observations	53,044	13,870	18,754	20,420

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Formal private firm employees are the excluded worker category in column 1; clustered standard errors at the province-year of birth level in parentheses.

Source: Authors' calculations from the 2011, 2013, and 2015 SES.

education based on the uniformly implemented central government policy described above, which increased access to education across the country in the 1970s and 1980s. The first stage results (reported in Table A2) show that the instrument for years of education—the number of public secondary schools per 100 km² in a province at the time the individual was 13 years of age—has a strong relationship with completed years of education and passes standard tests for weak instruments. Table 3 reports the IV results for the three groups of workers.

The resulting coefficient estimates for years of education in the IV specification are higher than for the OLS specification for the pooled sample and among the three worker groups. For the pooled sample, the estimated return to an additional year of education is 13.6 per cent,

which is similar the previous IV estimates by Warunsiri and McNown (2010) of 14.1 per cent. Formally employed private firm workers have a wage return of 14.6 per cent. The estimated returns to education for informally employed workers and own-account workers are 11.2 and 11.9 per cent, respectively. The IV results imply that returns to investments in formal education, even among the informally employed and own-account workers in Thailand, are substantial. Although the informally employed are less educated on average than the formally employed, the results here suggest that workers on average find substantial returns to the formal education that they do complete before entering the informal labour market.

The final analysis considers the returns to education by gender. In the previous IV results, women in the pooled sample earn

Table 4
Returns to education by worker type by gender (OLS and IV estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: ln real total income							
	All		Formal private firm		Informal private firm		Informal own-account	
	Male	Female	Male	Female	Male	Female	Male	Female
Years of education (OLS)	0.051*** (0.001)	0.049*** (0.001)	0.071*** (0.001)	0.070*** (0.001)	0.045*** (0.002)	0.053*** (0.002)	0.038*** (0.002)	0.032*** (0.002)
Years of education (IV)	0.122*** (0.017)	0.158*** (0.022)	0.119*** (0.020)	0.172*** (0.018)	0.106*** (0.030)	0.116*** (0.044)	0.116*** (0.038)	0.106* (0.061)
Observations	26,789	26,255	7213	6657	10,728	8026	8848	11,572

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Other controls include worker type (pooled regressions), age, age², marital status, urban residence, and region of residence; clustered standard errors at the province-year of birth level in parentheses.

Source: Authors' calculations from the 2011, 2013, and 2015 SES.

19 per cent less than men, and as much as 23.9 per cent less among informally employed private firm workers. Although it is clear that women on average earn less than men, it is not clear whether they have different wage returns to investments in formal education. We run the same OLS and IV specifications as above stratified by gender. Table 4 reports the OLS and IV coefficient estimates on years of education for men and women separately by worker type.⁷

Consider the pooled results for men and women in columns 1 and 2, respectively. The IV results indicate that men earn on average 12.2 per cent higher labour income for each additional year of education, compared to 15.8 per cent among women. This is consistent with previous work by Warunsiri and McNown (2010) that finds that women have higher returns to education than men due to the fact that women come from a lower baseline level of completed education. When we look at the returns to education within formal and informal work, we find that women have much higher returns to education in formal employment compared to men (17.2 per cent vs. 11.9 per cent). In informal employment, however, the returns to education are almost identical between men and women at 10.6–11.6 per cent. Remarkably, men's returns to education across formal and informal employment is very consistent, ranging from 10.6 per cent for informal

private firm work to 11.9 per cent in formal private firm work. Women, however, find substantially higher returns to education in formal private firm employment at 17.2 per cent compared to 11.6 per cent in informal private firm work and 10.6 per cent in own-account work. The more formal pay structures within formal employment may act to ensure that women are rewarded for their educational investments.

Returns to education across all samples are higher under the IV specification compared to the OLS results. Although the IV approach was originally adopted to solve the theorised upward bias in the OLS estimates caused by unobserved ability, the results from this study show that the OLS estimates are actually biased downwards, comparable to previously mentioned research, including Oreopoulos (2006) and Warunsiri and McNown (2010). The higher IV results are presumably due to high opportunity costs associated with further education and/or credit constraints among low-income households. Griliches (1977) theorises that the downward bias is due to the high opportunity cost of gaining more schooling for high ability persons. In other words, the additional wages high ability individuals could gain from additional investments in formal education are less than the additional earnings they could reap from dropping out of school early

⁷ The first stage results are reported in Table A3.

and going to work right away. In labour markets that are dominated by agriculture and other lower skilled work where additional investments in education do not necessarily translate to higher earnings, the opportunity cost argument is a plausible explanation. The other potential channel is through credit constraints. The reduction in the cost of attending secondary education with the proliferation of schools across Thailand may have resulted in high ability youth from credit-constrained households gaining the opportunity to attend secondary school. Both of these channels are plausible in the case of Thailand given the structure of the labour market and the low-income status of the majority of Thai households in the 1970s and 1980s when the investment decisions on formal education were made for the individuals represented in the sample.

Conclusions

This study estimates the returns to education for informally employed workers in Thailand using an IV approach to solve the ability bias issue using nationally representative survey data. The results indicate that informal private firm workers and own-account workers have a 11.2 and 11.9 per cent return to each additional year of education, respectively. The estimated returns to education among informal workers are not much lower than for formal workers at 14.6 per cent. These substantial returns to formal investments in education for informal

workers are inconsistent with our priors based on earlier work on informal employment, such as by Dasgupta et al. (2015) and Elgin and Sezgin (2017), which point to low wages among workers with low levels of education. The results of this study indicate that opportunities in Thailand's informal labour market do in fact compensate for additional years of formal education and, presumably, skills.

Many countries, including Thailand, have made efforts to formalise their informal economies citing better work conditions for workers. While it is assumed that returns to formal education among informal workers are relatively low, this study finds that the opposite is true, casting doubt that formal employment is significantly better than informal employment at least on the dimension of wage returns to education. Beyond wages, informal workers in Thailand have access to some forms of social protection, such as universal health coverage, a universal non-contributory old-age pension, and a voluntary social security scheme. Social protection provided by the government combined with similar wage returns to formal education as found in the rest of the labour force means that informal workers in Thailand are not significantly disadvantaged compared to their formally employed counterparts. Whether the same is true for other developing countries with significant informal employment is an empirical question that should be addressed in other country contexts.

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APPENDIX

Table A1 Returns to education, by worker type in Bangkok (OLS estimates)

	(1) All	(2) Formal private firm	(3) Informal private firm	(4) Informal own-account
Dependent variable: ln real total income				
Years of education	0.079*** (0.002)	0.095*** (0.002)	0.066*** (0.005)	0.030*** (0.005)
Age	0.051*** (0.014)	0.061*** (0.013)	0.005 (0.024)	0.045 (0.037)
Age ²	−0.000*** (0.000)	−0.001*** (0.000)	0.000 (0.000)	−0.001 (0.000)
Female indicator	−0.167*** (0.018)	−0.137*** (0.019)	−0.266*** (0.035)	−0.172*** (0.042)
Married	0.079*** (0.015)	0.053*** (0.012)	0.083*** (0.029)	0.099* (0.050)
Survey year 2013	0.115*** (0.018)	0.111*** (0.020)	0.209*** (0.028)	0.073 (0.048)
Survey year 2015	0.148*** (0.019)	0.122*** (0.021)	0.196*** (0.029)	0.151*** (0.052)
Constant	7.475*** (0.297)	7.015*** (0.272)	8.476*** (0.530)	8.301*** (0.809)
Adj. R ²	0.325	0.490	0.339	0.063
Observations	5769	3278	975	1516

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the year of birth level in parentheses.

Source: Authors' calculations from the 2011, 2013, and 2015 SES.

Table A2 First stage regressions

	(1) All	(2) Formal private firm	(3) Informal private firm	(4) Informal own-account
Dependent variable: years of education				
Secondary schools per 100 km ²	0.537*** (0.060)	0.606*** (0.088)	0.522*** (0.077)	0.464*** (0.083)
Informal employees	-2.874*** (0.052)			
Own account workers	-1.192*** (0.054)			
Age	-0.199*** (0.035)	-0.194** (0.088)	-0.220*** (0.043)	-0.209*** (0.050)
Age ²	-0.000 (0.000)	-0.000 (0.001)	0.000 (0.000)	-0.000 (0.001)
Female indicator	-0.376*** (0.035)	-0.065 (0.073)	-0.137*** (0.050)	-0.832*** (0.057)
Married	-0.522*** (0.040)	-0.702*** (0.084)	-0.380*** (0.056)	-0.583*** (0.065)
Municipal area	0.987*** (0.037)	0.749*** (0.080)	0.840*** (0.049)	1.303*** (0.058)
Survey year 2013	0.287*** (0.042)	0.501*** (0.091)	0.184*** (0.060)	0.249*** (0.069)
Survey year 2015	0.729*** (0.043)	0.850*** (0.095)	0.660*** (0.061)	0.725*** (0.068)
Constant	17.857*** (0.791)	17.858*** (1.883)	14.659*** (0.974)	17.699*** (1.138)
Regional controls	Yes	Yes	Yes	Yes
Adj. R ²	0.273	0.156	0.185	0.216
Observations	53,044	13,870	18,754	20,420
<i>Weak IV test</i>				
Cragg-Donald Wald	215.598	108.743	64.884	38.851
F-statistic				
Stock-Yogo critical value at 10%	16.38	16.38	16.38	16.38

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Formal private firm employees are the excluded worker category in column 1; clustered standard errors at the province-year of birth level in parentheses.

Source: Authors' calculations from the 2011, 2013, and 2015 SES.

Table A3 First stage regressions by gender

	(1)	(2)	(3)	(4)		(5)		(6)	(7)	(8)
	All		Male	Formal private firm		Informal private firm		Informal own-account		
	Male	Female		Male	Female	Male	Female	Male	Female	
Secondary schools per 100 km ²	0.568*** (0.077)	0.477*** (0.067)	0.587*** (0.119)	0.637*** (0.094)	0.458*** (0.120)	0.575*** (0.096)	0.458*** (0.120)	0.556*** (0.125)	0.382*** (0.104)	
Adj. R ²	0.257	0.296	0.150	0.172	0.201	0.177	0.201	0.171	0.245	
Observations	26,789	26,255	7213	6657	8026	10,728	8026	8848	11,572	
Wald IV test										
Cragg-Donald	128.198	80.372	55.116	55.809	21.294	45.443	21.294	26.457	13.596	
Wald F-statistics										
Stock-Yogo critical value at 10%	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Other controls include worker type (pooled regressions), age, age², marital status, urban residence, and region of residence; clustered standard errors at the province-year of birth level in parentheses.

Source: Authors' calculations from the 2011, 2013, and 2015 SES.