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An Ex-Ante Evaluation of Labor Supply Effects: A Case of Negative Income Tax Policy in Thailand

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Abstract

This study aims to ex-ante evaluate the effects of a negative income tax initiative, proposed by the Fiscal Policy Office, on Thai labor participation and labor supply. There are two expected outcomes: cash transfers will attract those who aim to join the labor force, but the currently employed may be demotivated by the policy. A Socio-economic Survey and Labor Force Survey of 2013 are jointly applied with a truncated normal hurdle regression to estimate both effects. The estimation reveals that both effects are significant: a one-percent increase in expected wage income leads to a 1.33-percent increase in labor participation probability for single workers and a 0.41-percent increase for married workers. On the other hand, a 100-baht wage increase is estimated to result in a reduction in working hours of 1.08 for each employed worker. Overall, measured net economic loss outweighs total gains, but both values are trivial, which might not be a serious issue if the program is actually implemented. The income-distribution effect of the policy is also tiny, reducing the household income Gini coefficient by 0.005 points.

Keywords: poverty, income inequality, social welfare, negative income tax, ex-ante evaluation
JEL Classifications: D63, I38, J22

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1. Introduction

Policies involving Negative Income Tax (NIT) include the practice of direct cash transfers targeting the poor, was an initiative popularized mainly by Milton Friedman in the 1960s and implemented in 1975 in the United States as the Earned Income Tax Credit (EITC) program. Many economists, especially neoclassical economists who generally oppose market intervention, see the potential of the approach in targeting the poor efficiently. After half a century, many countries have adapted NIT into a conditional cash transfer scheme, such as the Workfare Income Supplement initiative in Singapore, Earned Income Tax Credit in Sweden, etc. Such direct transfer programs seem promising in mitigating poverty and reducing inequity without heavily distorting the free market.

Despite all the beneficial features of NIT, potential work disincentives connected to its' adoption have represented a concern, stemming from issues concerned with cash transfers dating back to the concepts' beginnings. In the 1970s after the public debate on Friedman's advocacy, a social experiment, approved by the US Congress, including guaranteed income, was carried out in the US and Canada to ensure that the labor supply would not be affected to an unacceptable degree.

In recent years, the Fiscal Policy Office in the Ministry of Finance, a key policy maker in public spending, also showed interest in NIT as they issued a study in 2013 regarding the possibility of implementing NIT policy in the Thai context. (Relevant poverty and inequality statistics, together with the Thai welfare scheme are described in the Appendix)

Since such policy has not yet been implemented in Thailand, it can be difficult for any policy maker to deal with public concerns with labor supply issues. Furthermore, studies of NIT in Thailand have neither covered such labor supply issues, nor conducted studies on the effects of cash transfers. In addition, large-scale cash transfer programs in Thailand are scarce, so behavioral responses cannot be captured empirically. Therefore, the main objective of this article is to fill this gap by ex-ante estimating the effects of NIT policy on the Thai labor supply**.** In particular**,** whether a cash transfer program would have any significant effect on the labor force. If it would, then the results will be taken into a micro-simulation to assess the magnitude of the effect on the Thai labor force. It would be beneficial for policy makers to be able to factor the conclusions of this research into consideration when drafting future policy.

Discussion will be presented in the following order. A brief review of labor participation and labor supply effects from conditional cash transfer programs can be found in section 2, together with a theoretical explanation of how conditional cash transfers affect labor and estimation techniques. Section 3 explores the proposed NIT scheme in Thailand, selected datasets and missing data issues. Then, the results of labor participation and labor supply analyses are discussed in section 4, followed by a micro-simulation to evaluate the total effect on Thai labor incentives. In addition, an extended study to examine whether any of the criteria of the proposed NIT can be relaxed to include more of the poor efficiently is outlined. Finally, the study is concluded in section 5 with a précis of the study limitations and policy implications.

2. Literature and Theory

2.1 Work incentives

As mentioned earlier a major social experiment concerning NIT in the States and Canada was conducted wherein social scientists set different guaranteed income levels and marginal tax

rates, or take-back rates, in order to contrast different settings when interpreting the collected data. Their research objective was mainly to ascertain if there was evidence of any major work disincentive. Ultimately, two conclusive results were confirmed. First, withdrawal from a whole segment was not found. Second, the amount of hours worked significantly dropped, but the effect was not likely to make the program concerned unaffordable. (Mofitt, 1981; Widerquist, 2005)

Focusing on the US EITC initiative, which has been enacted for more than 40 years with several expansions of transfer amount from time to time, each expansion of the program has allowed researchers to explore the ex-post effects from cash transfer on labor supply. Fortunately, their findings are quite consistent. For instance, Eissa and Liebman (1995) examined the first expansion and found that single women participation in the labor force increased by up to 2.8 percent, but the relative hours worked remained unchanged for those already in the labor force. Eissa and Hoynes (2005) observed using data from another expansion in 2001 that cash transfers encouraged participation at a greater rate than they slightly diminished the number of hours worked. Both Trampe (2007) and Athreya, Reilly, and Simpson (2015) confirmed the significant, but small, reduction in hours worked. The latter also uncovered a comparatively larger effect on participation. In spite of the disincentive effect, cash transfers were found to encourage participation, with the program requiring recipients to work as one of their eligibility criteria.

Ananapibut, et. al. (2014) also speculated that cash transfers would affect the Thai labor supply differently in terms of unemployed and employed citizens. Those not in the labor force would consider cash transfers as an additional means of income to what they earn, if they expected that they would receive such transfers as a supplement. As a result, cash transfers would encourage them to join the labor force. On the other hand, the employed would view them as a disincentive to work because, from their point of view, they would receive additional income without spending time working. However, such speculation is merely based on economic theory.

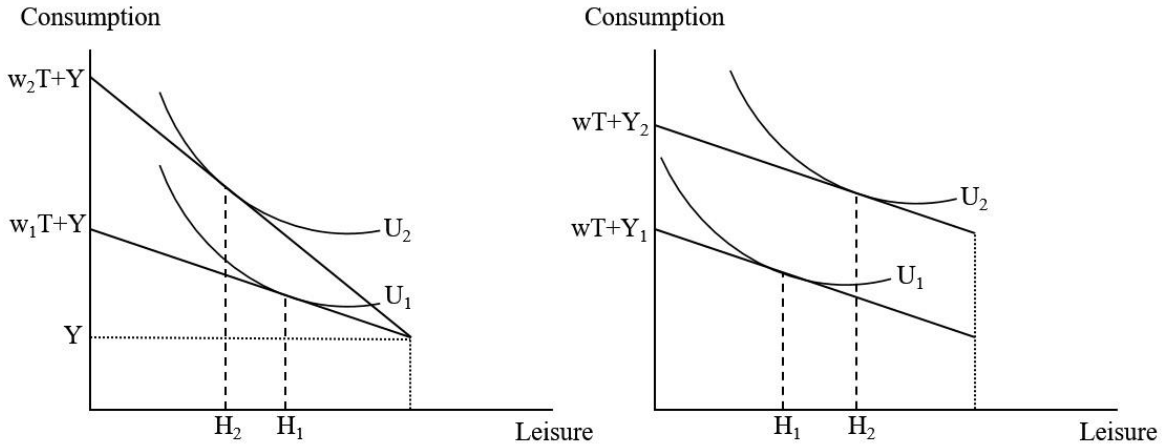
2.2 Theory of Labor Supply and Labor Force Participation

How can a conditional cash transfer program affect two groups of people differently? Firstly, earned and unearned income must be defined clearly. Earned income represents a reward, derived from paid work. In economic sense, any return from time spent on work is considered earned income, such as wages or profit from a business. Unearned income, on the other hand, can be derived without time being spent. Income from such sources as land rent, interest, dividends or winning the lottery do not require additional time being invested.

Conditional cash transfers act as either earned or unearned income for different groups of people, as mentioned in the previous subsection, if one has to work in order to become eligible for such a program. According to basic labor-leisure choice theory, Figure 1 explains why earned income and unearned income are treated differently. The left figure shows that when earned income increases, from w_1 to w_2 while unearned income Y remains constant, the budget line tilts upward because total time cannot be extended. Consequently, the indifferent curve moves upward from U_1 to U_2, giving up leisure from H_1 to H_2.

On the other hand, the budget line in the right figure shifts upward as a result of unearned income increasing from Y_1 to Y_2, keeping earned income constant. Since receiving more unearned income does not cost time from a labor perspective, the budget line can directly shift upwards and this agent can enjoy more leisure from H_1 to H_2. This is how cash transfers discourage people who are already participating in the labor force and acts as unearned income.

Figure 1: Changes in Earned and Unearned Income

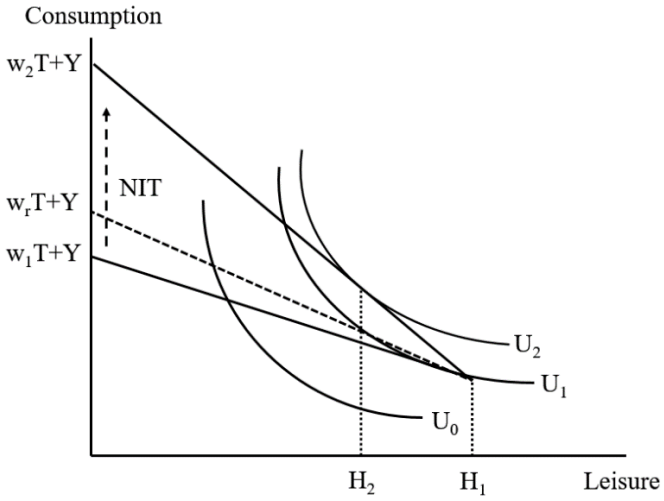


Source: Adapted from Borjas (2015)

Meanwhile, people who are not in the labor force who chose not to work are assumed to have their utility maximized. The budget constraint w_1T+Y in Figure 2 shows that their earned income level is not persuasive enough for them to work. In this case, a "corner solution" occurs and they choose not to work, allocating all their time to leisure at H_1. In the figure, U_1 represents the indifferent curve indicating a consumption set that provides the highest utility under this budget line instead of U_0. The figure also shows the dotted imaginary budget line w_rT+Y, reflecting the earned income level that has a slope equal to U_1's, or the so-called "reservation wage". If the expected earned income is not high enough to make the budget constraint steeper than this imaginary line, they voluntarily choose not to work.

Conditional cash transfers now act as earned income. If the program is designed to provide cash transfers only for those who work, the out-of-labor-force would consider cash transfers as an addition to their earned income if their earned income allows them to be eligible to receive NIT. Hence, if the transfer is attractive enough that it can tilt their budget line to be steeper than the reservation wage, supposed it is tilted to w_2T+Y, the agent can move his indifferent curve further to U_2 by giving up some of his leisure time from H_1 to H_2.

Figure 2: Reservation Wage for the Unemployed



Source: Adapted from Borjas (2015)

2.3 Model and Estimation

This article then mainly tries to utilize the mentioned theoretical explanation to constitute an ex-ante evaluation. Previous studies, such as Bourguignon, Ferreira, and Leite (2002), utilized logit models to estimate how many children in Brazil would go back into formal education system given the government offered a "Bolsa Escola" program or cash transfer for parents, conditional on their children's enrollment. Then Leite, Narayan, and Skoufias (2011) tested the models' predictive accuracy ex-post using empirical data drawn from the "PROGRESA", a campaign in Mexico with the same enrolment conditions as Bolsa Escola. It is of particular note that they found ex-ante and ex-post evaluations to be quite accurate with only small errors with some groups of children.

Therefore, a simple semi-log empirical labor supply specification can be used to estimate earned and unearned income effects. As seen in Equation 1 below, three essential variables for the estimation comprise hours worked h_i as a dependent variable, wage or earned income w_i, and unearned income Y_i. Z_i is a vector of socio-economic factors capturing personal preferences, while ε_i is the error term.

$$h_i = \alpha + \beta \ln w_i + \gamma Y_i + \delta Z_i + \varepsilon_i \quad (1)$$

β and γ represent the coefficients of interest in order to examine the effects of earned and unearned income. Following Blundell, McCurdy, & Meghir (2007), w_i is converted into log scale to capture the curvature of changes in substitution and income effects. However, using log scale for unearned income is inappropriate because γ would reveal percentage changes. Zero unearned income is very common in surveys. Hence, a tiny increase in unearned income causes infinite change as a percentage, which is not reasonable - especially when the coefficient is to be used for micro-simulation. However, to check if there is any curvature in unearned income effects, decile interaction terms will also be included in the results.

Two of the most common problems when estimating labor participation and labor supply are zero hours worked and missing earned income for non-participants. The latter will be dealt with and discussed in the data section.

Linear regression estimated by ordinary least square with many zero hours worked included will lead to a biased estimation. A popular model used to tackle this problem is called 'truncated normal hurdle', which was developed by Cragg (1971) to be applied on top of the Tobit model. To estimate the behavioral effects on labor, the model is divided into two parts, which in this case are labor participation and labor supply. The labor participation part accounts for the non-participants versus the participants, similar to the Probit model, as follows:

$$P(h = 0|x) = 1 - \Phi(x\varphi) \quad (2)$$

$\Phi(\varphi)$ is a cumulative distribution function for all the independent variables x, which includes independent variables from Equation 1, and their coefficients φ.

For the labor supply part, only the participants with non-zero hours worked are estimated.

$$h|(x, h > 0) \sim \text{Normal}(x\phi, \sigma^2) \quad (3)$$

In both parts it is assumed that the unobserved are normally distributed. Coefficient vectors are in different notations (φ and ϕ) because both parts are estimated separately. The log-likelihood function for the estimation is shown below:

$$l_i(\theta) = 1[h_i = 0]\log[1 - \Phi(x_i\varphi)] + 1[h_i > 0]\left\{\log \Phi(x_i\varphi) - \log \Phi\left(\frac{x_i\phi}{\sigma}\right) - \frac{1}{2}\log(2\pi\sigma^2) - \frac{1}{2\sigma^2}(y_i - x_i\phi)^2\right\} \quad (4)$$

To conclude this section, independent variables from Equation 1 are plugged into vector x in equations 2 and 3. β and γ in the equation 2 and equation 3 respectively represent the coefficients of interest. If β, estimated from equation 2, is significantly different from zero and positive, it means that earned income significantly encourages people to join the labor force. On the other hand, if γ is also significant and negative, estimated from equation 3, then unearned income is considered to have a discouraging effect on the labor force. Less working hours should be expected if one receives more unearned income.

3. Research Methods

3.1 Proposed NIT Scheme for Thailand

This subsection reviews the official proposed NIT scheme in Thailand, outlining the criteria set for potential beneficiaries by the Thai FPO and detailing how cash transfer would be calculated and distributed. These conditions will be plugged into the micro-simulation if the estimations reveal significant effects as mentioned earlier in order to evaluate how the program would potentially affect the Thai labor market.

According to the Thai FPO study, the proposed NIT scheme contains five criteria determining recipients. First, they must hold Thai citizenship. They also need to be aged between 15 to 60 years old and currently in employment. Fourth, their earned income must not exceed 80,000 baht[1] annually and lastly their unearned income must not be in excess of 2,400 baht a year.[2] (Ananapibut, et. al., 2014)

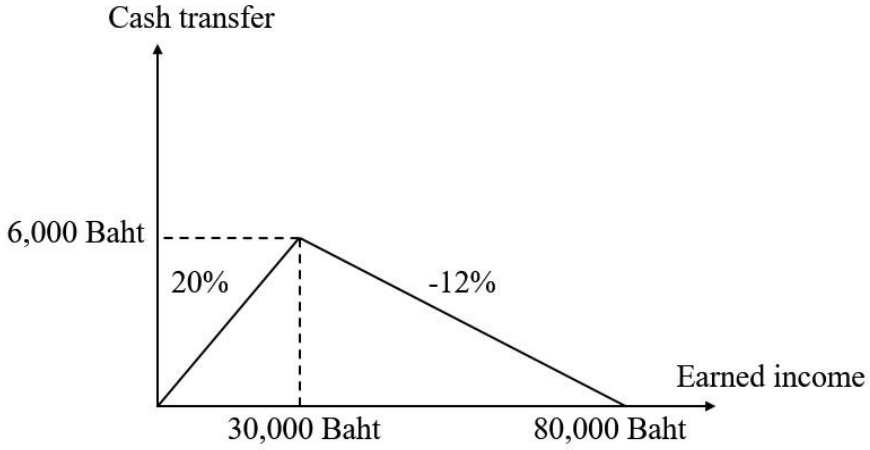
The amount of transfer would be calculated regardless of the beneficiaries' marital status, gender, or number of dependent children in order to prevent confusion when the program is first implemented. This stands in contrast with many countries where socio-economic status considerations may determine the amount beneficiaries receive. Divided into two parts according to earned income, those who earn less than 30,000 baht annually fall under the phase-in range, while people who earn more than that, but less than the ceiling of 80,000 baht, fall into the phase-out range. These phases were decided on based on rough calculations of the Thai poverty line and minimum wage, respectively. The cut-off benchmarks at 30,000 and 80,000 baht roughly correspond to the annual Thai poverty line and minimum wage, respectively.

Cash transfers within the phase-in range represent simply 20 percent of earned income all the way up to 6,000 baht representing the maximum transfer, as shown in Figure 3. For example, if one earns 20,000 baht a year, he will receive an additional 20 percent, or 4,000 baht. In the meantime, if another earns more than 30,000 baht, the total cash transfer will be 6,000 baht

[1] 1 USD is approximately 35-36 Thai baht in 2015.
[2] Calculated from average 3 percent return rate of 80,000 Baht from low-risk investment.

minus 12 percent of the earnings value in excess of 30,000 baht. For instance, if one earns 40,000 baht annually, he will receive 6,000 minus 12% of 10,000, which amounts to 4,800 baht.

Figure 3: Cash Transfer Calculations



Source: Adapted from Ananapibut, et. al. (2014)

Muthitacharoen (2014) applied these criteria to the 2013 Socio-economic Survey (SES) and concluded that there would be approximately 8.6 million beneficiaries which would amount to a public expenditure of roughly 27,000 million baht annually.

However, it is could be argued that if the policy is implemented, contributing workers whose income is not recorded in the dataset would also rationally file claims to receive cash transfers. Take this basic example of a household with a business owner and two contributing workers, suppose that the business owner earns 120,000 Baht a year, he is not eligible due to his earning being in excess of the annual earned income ceiling. Nevertheless, if all the household members share this income, they can claim that each of them earns 40,000 Baht a year and, thus, eventually end up being eligible for the program.

Therefore, for every household with at least one contributing worker, the author equally splits earned income from business and agricultural work in which the labor share is often blurry, using the same set of data. The results are slightly different from Muthitacharoen (2014). The number of beneficiaries can reach up to 9.6 million in total and it would cost 28,114 million baht of annual public expenditure instead.

It is worth noting that both estimations would amount to about 1.2 percent of total public expenditure in 2013 (2.4 trillion baht), which is even more affordable than the heavily criticized schemes detailed in the appendix. Furthermore, out of 9.6 million people who would be likely to receive cash transfers, 2.93 million are considered poor according to the 2013 poverty line classification. This represents roughly 30 percent of all recipients, or 47 percent if the near-poor is included, which is more inclusive than any previous welfare scheme in Thailand, as can be seen in the appendix.

3.2 Data

The Thailand 2013 SES Survey is selected to be the main dataset used for the estimation because it includes almost every key variable required for the estimation, also in addition to other independent variables, such as age, sex and marital status and so on. Briefly, it is a national

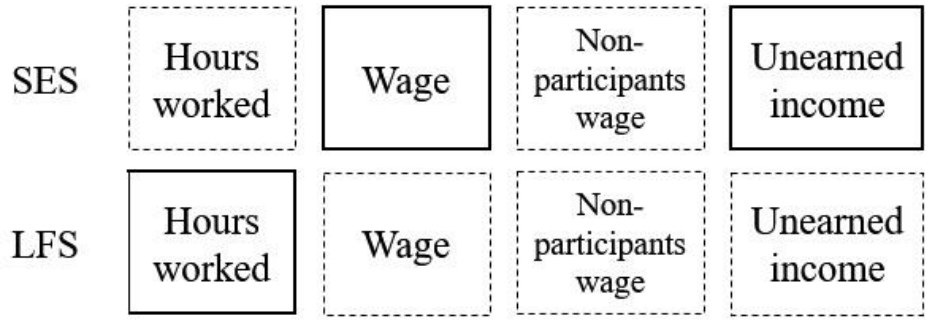
cross-sectional household survey of the socio-economic status of Thai citizens. Household expenditure data is collected every year, but household income data is compiled every two years in odd years, such as 2013.

The reason why the author chooses cross-sectional data over panel data is because the Thai SES panel data available is very limited and fragmented. Data is only available for 2005, 2006, 2007, 2010 and 2012, which is prior to the structural 300-baht minimum wage policy being introduced which potentially might affect labor force participation. Moreover, the author intends to evaluate the effects using the latest dataset available to capture the most up-to-date labor behavioral responses.

From Equation 1, we can see that there are three key variables needed for this estimation, hours worked, wages representing earned income and unearned income. There is also non-participant wage data which is essential and missing. In addition, hours worked is also partially missing.

Figure 4 illustrates the variables for which we have complete data using a solid box, with the dotted boxes representing those with missing or unavailable data.

Figure 4: Missing Data



Source: Collected by author

Fortunately, there is another national survey available called the Labor Force Survey (2013 LFS), a national quarterly survey on working status which contains the complete hours worked data. Both surveys cannot be linked directly as they were separately conducted and LFS is collected on a quarterly basis.

A technique used to fill in all the missing information is called Multiple Imputation (MI). It is a widely used method to generate missing data from a customized regression model, with added standard normal random variables to maintain the distribution shape. Missing data is generated multiple times. Each set of data will be incorporated into the terminal regression, then the results are averaged out. Schafer & Graham (2002) is a rich source for greater detail on this topic. In this study, the imputation is applied ten times, according to the percentage of missing data and efficiency suggested in Schafer & Graham (2002). The imputation process is divided into two parts as follows.

3.2.1 Hours Worked

In SES 2013, work and income variables are recorded separately by way of the broad occupational characteristics of employees, business owners and agricultural workers. Employees' hours worked is recorded completely, while the business owner and agricultural worker data is all missing.

Since LFS contains complete data, as presented in

Figure 4, hours worked data is imputed from LFS into SES. Todosijevic (2012) shows that it is possible to share imputed data between two similar datasets, which in this case are both national surveys.

Therefore, the SES dataset is divided into four quarters to match with the LFS quarterly survey which also accommodates seasonally varying working hours amongst agricultural sector data. Then, hours worked for each observation is imputed, representing LFS to SES by quarter, within a truncated regression model. Control variables consist of region, area of municipality, age, age squared, year of education, sex, marital status, interaction terms of sex and marital status, working status and a broad group of occupational categories. Truncated regression caps the lower bound and upper bound of hours worked from 0 to 416.5 hours per month, according to the maximum hours worked in the LFS data.

Averaged results are displayed in Table 1. Since LFS hours worked is in a weekly format, it is assumed here that 4.25 weeks equals a month. Multiplication of figures by 4.25 before imputation is undertaken so as to fit with the monthly format in SES results in terms of the equal minimum and maximum hours worked in LFS.

Mean and median imputed hours worked is very close to the original data in SES. It is also worth noting that mean and median imputed business owners' hours worked are higher than employees', while agricultural workers' are lower; which is intuitively quite realistic.

Table 1: Imputed Hours Worked Descriptive Statistics

Dataset	Min	Mean	Median	Max	SD	n
LFS Q1 (original)	4.25	188.12	191.25	416.50	61.70	119,005
LFS Q2 (original)	4.25	191.44	204.00	416.50	59.91	123,344
LFS Q3 (original)	4.25	187.84	204.00	416.50	57.29	129,185
LFS Q4 (original)	4.25	187.07	199.75	416.50	55.74	124,900
SES Q1 (imputed)	4.63	195.62	195.50	403.56	60.29	7,469
SES Q2 (imputed)	1.51	195.90	195.38	398.40	57.83	7,346
SES Q3 (imputed)	2.26	193.71	194.11	384.00	55.43	7,439
SES Q4 (imputed)	0.09	191.87	190.83	389.67	54.90	7,531
SES employee (original)	3.00	189.56	200.00	416.50	52.17	33,021
SES business owner (imputed)	4.11	216.45	216.74	395.52	52.92	15,096
SES agricultural worker (imputed)	2.57	171.88	171.46	366.92	51.65	14,689

Source: Author's calculations.

3.2.2 Non-participant Wages

After the first imputation and all data being appended, we arrive at a single dataset, leaving the wages of the unemployed blank. To impute this data, most studies within the literature suggest employing a Heckman Selection model to handle potential selectivity problems. Independent variables chosen for the selectivity part are considered as a "barrier" to entering the workforce instead of unknown reservation wages, which are sex, marital status, number of children aged 0-6 and disability.

Independent variables for the wage equation are also the same as those for selectivity. In addition, year of education, age, age squared, region and area of municipality are also taken into account. Table 2 shows the results of both parts. Lambda in the wage equation is negatively

significant, suggesting that error terms in the selection and wage equation are negatively correlated. Therefore, applying a Heckman selection model is valid here.

Table 2: Heckman Selection Model Results

Independent variables	Selectivity		Wage equation	
	Coefficient	Robust S.E.	Coefficient	Robust S.E.
Region (base case: Bangkok)				
1.Central	n/a		-0.202*	0.012
2.North	n/a		-0.539*	0.013
3.Northeast	n/a		-0.849*	0.014
4.South	n/a		-0.347*	0.013
Municipality (base case: municipal)				
5.Non-municipal	n/a		-0.119*	0.008
Sex # Marital status (base case: Single male)				
6.Single female	-0.147*	0.021	0.040*	0.014
7.Married male	1.062*	0.022	0.215	0.179
8.Married female	-0.446*	0.029	-0.164*	0.013
9.Female#number of children aged 0-6	-0.216*	0.015	0.0008	0.048
10.Year of education	n/a		0.091*	0.001
11.Age	n/a		0.045*	0.002
12.Age squared	n/a		-0.0004*	0.000
Disability (base case: abled)				
13.Disabled	-0.980*	0.048	-0.483	0.221
Lambda (λ)	n/a		-0.476*	0.025
Constant	0.409*	0.015	7.590*	0.048
Psuedo r-squared / R-squared	0.1071		0.2906	
N	80,736		61,582	

Note: * denotes statistical significance at 99 percent. The others are not significant.
Source: Author's calculations.

Once the imputation processes are completed, Table 3 below summarizes the descriptive statistics of all variables for the regression. There are a few points worth mentioning. First, the table only includes three examples (out of ten) of imputed monthly hours worked and logs of earned income. Hours worked in the first row exclude zero working hours to avoid any downward-bias. Imputed log earned income is distributed very similarly to the available data since non-participants should be randomly distributed as well as working people. Second, the marital status of being separated, widowed or divorced are all considered as being single for reasons of simplicity. Lastly, income flows are all transposed in monthly terms to help ensure easier interpretation of results. Other variables are straightforward.

Table 3: Descriptive Statistics

	Min	Mean	Median	Max	SD	n
Dependent variable						
Hours worked (monthly)	3	189.56	200	416.50	52.17	33,021
Hours worked (imputed#1)	3	194.47	195	395.52	56.84	29,785
Hours worked (imputed#2)	0	193.89	194	411.35	57.05	29,785
Hours worked (imputed#3)	2	194.21	194	414.38	56.76	29,785
Continuous independent variables						
Earned income (monthly)	4	12,679	8,000	4,379,584	37,717	68,446
Log earned income (monthly)	1.39	8.89	8.99	15.29	1.09	68,446
Log earned income (imputed#1)	4.46	8.76	8.76	12.59	1.02	19,154
Log earned income (imputed#2)	4.72	8.77	8.76	12.78	1.03	19,154
Log earned income (imputed#3)	4.63	8.77	8.77	12.81	1.04	19,154
Unearned income (monthly)	0	511.26	27.38	160,417	2,537	124,598
Age	0	38.06	39	99	21.75	124,598
Year of education	0	9.45	9	24	5.31	124,598
Number of children aged 0-6 in the household	0	0.37	0	5	0.64	124,598
Discrete independent variables	n	%				
Region						
1.Bangkok	7,518	6.03				
2.Central (excluding Bangkok)	34,777	27.91				
3.North	28,959	23.24				
4.Northeast	34,402	27.61				
5.South	18,942	15.2				
Area						
1.Municipal	73,892	59.3				
2.Non-municipal	50,706	40.7				
Sex						
Male	59,157	47.48				
Female	65,441	52.52				
Marital status						
Single	36,540	36.22				
Married	64,331	63.78				
Disability						
Abled	121,593	97.59				
Disabled	3,005	2.41				

Source: Author's calculations from appended data

4. Results

4.1 Regression Results

The estimation results are shown in Table 4 for both parts of the model. Independent variables are separated into several groups by table block in the following order. The first set contains interested variables, which are earned income, unearned income and their interaction

with sex and marital status. The following sets comprise region and area with the last referring to other individual characteristics.

First, let's focus on participation. Expected earned income (number 1) has a significant effect on decisions within the labor force. If earned income increases by one percent a month, a citizen would be 1.327 percent more likely to join on average. Interaction term with marital status (number 3) reveals that for married citizens, the effect of wages is far less strong, only 0.414 percent. Sex interacting with earned income is not significant; so only the value in the grey boxes will be used for micro-simulation in the next subsection.

In addition, another interesting feature concerns sex and marital status which significantly affects decisions to work. Number of children aged 0-6 in a household is not a significant factor in terms of men, but for women it is, reducing the probability by four percent per child. This might be a social reflection that bringing up children is more likely to be a female responsibility in Thailand. Finally, disability represents a considerable barrier as it significantly decreases probability to work by 36.6 percent.

Moving on to the labor supply column, unearned income shows a significant discouraging effect (number 5) in terms of hours worked. Averagely, people tend to work 1.08 hour less per month for every 100 Baht of unearned income increase. Interaction terms suggest that the unearned income effect is invariant across different sex and marital status categories. Hence, only one coefficient from the supply part in the grey box is used for the micro-simulation.

Number of children and disability, for both men and women, are not statistically significant in this context. Presumably, these variables might play far more important roles of deterring participation in the first place. With other variables, their significance, direction and magnitude of effects align with the expected theoretical point of view.

Table 4: Regression Results

(Dependent variable: hours worked) Independent variables	Estimation part Labor participation – Probit (Marginal effect)	 Labor supply – Truncated regression (Coefficient)
1. Log earned income	1.327** (0.331)	12.389** (1.262)
2. Female # Log earned income	1.344 (1.148)	-5.767** (1.775)
3. Married # Log earned income	-0.913* (0.402)	-5.556** (1.363)
4. Female # married # Log earned income	-2.336 (2.012)	5.352* (2.028)
5. Unearned income x 100 [1]	-0.874** (0.150)	-1.080** (0.276)
6. Female # Unearned income x 100	0.119** (0.026)	0.083 (0.065)
7. Married # Unearned income x 100	-0.064 (0.040)	0.054 (0.065)
8. Female # Married # Unearned income x 100	0.081 (0.058)	-0.060 (0.080)
9. 10^{th} decile # unearned income x 100 [2]	0.684** (0.148)	1.029** (0.274)
Region (base case: Bangkok)		
10. Central	0.722 (0.633)	9.928** (1.028)
11. North	1.683* (0.686)	-1.342 (1.247)
12. Northeast	4.662** (0.681)	-3.690** (1.115)
13. South	3.865** (0.716)	-25.091** (1.239)
Municipal area (base case: municipal)		
14. non-municipal	0.850** (0.329)	-13.054** (1.239)
Sex and marital status (base case: single male)		
15. Female	-6.666** (0.525)	58.419** (16.238)
16. Married	11.202** (0.708)	55.425** (12.674)

17. Female # married	-8.445** (0.736)	-53.717** (18.764)
Individual characteristics		
18. Year of education	0.334** (0.047)	-1.219** (0.095)
19. Age	6.032** (0.075)	0.998** (0.240)
20. Age squared	-0.072** (0.001)	-0.019** (0.003)
21. Number of children aged 0-6 in household	0.308 (2.312)	-1.154 (0.906)
22. Female # Number of children aged 0-6 in household	-4.001** (0.383)	0.337 (1.105)
23. Disability	-36.626** (1.730)	2.895 (3.644)
Constant	-4.697** (0.133)	93.248** (11.467)
Classification / Sigma	83.62	51.482** (0.263)

Note: 1) Since the effect is tiny, unearned income is multiplied with 100.

2) Only the tenth decile interacted with unearned income in a significant manner. Other deciles are controlled, but are not shown here for table concision.

*/** denotes statistical significance at 90 and 95 percent, respectively. # sign refers to the interaction term. No serious collinearity is detected and robust standard error is displayed in parentheses.

Source: Author's calculations.

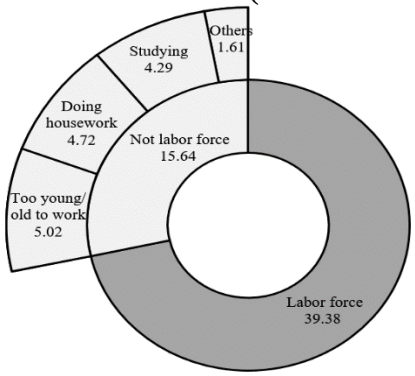
It is worth noting that omitted variables can be an issue within any estimation. Rather than socio-economic characteristics, for instance, time-varying minimum wage should be included into the model as well since it correlates to both earned income and participation. Once again, a panel regression is not a viable option because the crucial minimum wage raise to 300 baht occurred in 2012. Therefore, the earned income effect here can have an upward bias.

4.2 Micro-simulation Results

The results from the regression are then incorporated into the simulation. With respect to the first part concerning predicting how many people would be encouraged to join the labor force, some Thai labor statistics are of relevance. According to the National Statistical Office (2014),

Figure 5 shows that there are 15.64 million people who fall within the labor age bracket, but were not considered as being in the labor force in 2013. Considering this context, people who are too young/old and studying should not be encouraged to work. Thus, the encouraging effect from cash transfers should be simulated for two sub-groups, those who are doing housework and others, totaling about 6.33 million people.

Figure 5: Labor Force in Thailand 2013 (Unit: millions)



Source: National Statistical Office (2014)

Hence, the selected samples to be simulated need to fit these criteria: people in the sample are aged within 15-60, not studying, and the model can correctly specify their employment status with a probability of less than a 0.5 threshold, due to the assumption of normal distribution for the unobserved. If these provisions are met, the transfer is calculated based on their imputed wages added with the increase of probability based on cash transfers. If the total probability exceeds 0.5, they are considered to pass the employment hurdle and join the labor force.

Results are displayed in culation includes imputed wages.

, showing that only about 160,000 people are encouraged to join the labor force, or only about 2.5 percent of the selected non-participating group. The total number of beneficiaries comes to 9.75 million and the program would cost 28,763 million baht a year. The additional expense incurred by the economy would be approximately 4,252 million baht per year, assuming the total of imputed wages multiplied by the imputed hours worked represents a proxy to marginal labor productivity.

According to the regression results, people who receive a maximum cash transfer would only work 5.4 hours less a month, or approximately 3.4 percent of the common 160 working hours contained in the proposed NIT model. The total disincentive for those who are already working amounts to 6,820 million baht annually, calculated from reducing the hours worked multiplied by their wages in total. However, there is a major drawback worth noticing: the model cannot distinguish the labor supply effect between the phase-in and phase-out range. People who earn income within the phase-in range should be encouraged to work more because they would earn more in absolute monetary terms until they reach the peak transfer amount. Thus, the discouragement value is speculated to be smaller.

The labor participation and labor supply effects found here are roughly in alignment with those to be found in the relevant literature, though the participation effect does not overcome the value of decreased hours worked. Nevertheless, the author does not draw the strong conclusion that the policy will result in a better-or-worse-off economy based on calculated economic value because the results should be considered at the individual level as well. Though ex-ante evaluation can only extract average results, at least policy makers can rest assured that both sides of the effect exist and they seem to be small compared to the size of the economy.

Table 5: Simulation Results (unit: millions people/million Baht per annum)

	No NIT	NIT implemented	NIT implemented with micro-simulation
Number of beneficiaries (million)	-	9.59 (14.8)[1]	9.75 (15)[1]
Public expenditure (million baht)	-	28,114	28,763
Economic value[2]	-	-	+4,252
			-6,820
Household income Gini coefficient	0.520	0.515	0.514

Note: 1) Percentage of total Thai population 64.79 million as of 2013.

2) Economic value is a measure of gains from the new-comer and losses from those who are currently working.

- Total economic gain is a sum of the new-comer's annual predicted wage x predicted hours worked.

- Total economic loss is a sum of the annual wage x less hours worked of those who are in the labor force. Source:

Source: Author's calculations.

Lastly, the household income Gini coefficient is calculated before and after NIT to measure effects on inequality. The calculations show that cash transfers would slightly improve household income inequality, causing Gini coefficients to drop by 0.005 points and 0.006 points with simulated effects. The reason that the coefficient is different from the official figure drawn from the National Economic and Social Development Board is that the author's calculation includes imputed wages.

4.3 Extended Study: Relaxing Proposed Criteria

Though about 2.93 million beneficiaries are classified as being poor, the proposed scheme only covers about one-third of all citizens within this category in the Thai population. Therefore, the author then explores further if there is any criterion which can be relaxed because at the heart of this policy is the drive to target the poor and be inclusive as much as possible.

Three criteria are broken down to see how many of the poor the policy can include, as shown in Table 6. Subsequently, we benchmark the efficiency of each criterion by comparing the proportion of the poor and near-poor included within the baseline policy, which is about 46.5 percent. However, children aged below 15 are not considered since they are not of working age.

According to Table 6, relaxing the age criteria to 70 years old and heightening the unearned income ceiling up to 4,000 baht a year are effective, as they can include more than 46.5 percent of the poor and near-poor into the scheme. However, relaxing the earned income criteria does not seem effective since it leads to the inclusion of a lot of non-poor people into the scheme. Each 10,000-baht range change results in a continued drop in the proportion. If the goal is to reach out to include more of the poor and near-poor efficiently, then making appropriate changes to the age and unearned income criteria seem to be a more reasonable course of action.

Table 6: Beneficiaries Including Relaxing Each Criteria

	Included beneficiaries (million)	Proportion of the poor and near-poor among group	Extra public expenditure (million baht)
Age			
61-65	0.369	53.4	1,058
66-70	0.119	55.38	391
Earned Income			
80-90k	1.481	25.38	Cannot evaluate [1]
90-100k	1.959	22.23	
100-110k	1.558	18.52	
110-120k	1.194	14.27	
Unearned Income [2]			
2,400-3,200	0.639	57.32	1,924
3,200-4,000	0.468	46.56	1,428

Note: 1) According to Ananapibut, et. al. (2014), transfers only based on earned income of less than 80,000 Baht a year, so the rule does not apply to higher levels of earned income.

2) Mimics a 3 percent return from low-risk investment, two intervals of unearned income represent 4 and 5 percent of the return.

Source: Author's calculations.

5. Concluding Remarks and Limitations

The FPO initiative study of NIT policy for Thailand seeks to both counter prevailing poverty and inequity within society and tackle public spending efficiency at the same time. This study expands the scope of that study to address the effects of conditional cash transfers on labor participation and labor supply.

The results are roughly on the same track as those found in the relevant literature concerning the effects of EITC programs. Both effects are found to be statistically significant, but at the same time quite trivial. To be precise, the proposed NIT scheme will reduce hours worked at a maximum of 5.4 hours a month, which is about 3.4 percent of the typical 160 hours worked a month by citizens, and will cost about 6.8 billion baht a year considering the whole economy. On the other hand, a percent of cash transfer can increase the probability to join the labor force by 1.3 percent for single people, and 0.41 for married. Overall, it can attract about 160 thousand citizens into the labor force, adding 4.3 billion baht in value to the whole economy.

However, this study has certain drawbacks. First, this is just an ex-ante evaluation that may not be exactly accurate. Nevertheless, the intention is to examine the effects in advance so that policy makers can observe expected outcomes from such programs. Second, the model cannot separate the effects from within the phase-in and phase-out range, which should be different. Lastly, the survey data is not sufficiently complete to allow the achievement of the research objectives to their full potential. Imputation is then a necessary tool, but it can be sensitive to modeling and explanatory variable selection. Varying results are expected if different imputation models are chosen.

There are also some other interesting findings uncovered along the way. The statistical significance of sex, marital status, and number of children found in the regression is very intriguing, though not innovative. It can reflect social values and the role of women in a household, making it costlier for them to join the labor force compared to men. Married women have the lowest probability of working, when holding other variables constant. As well as number of children in a household, it discourages four percent per one child for women. The children do not significantly affect men's probability to work. With all the factors discussed, the results justify the States' EITC multiple formulae and transfer rates based on marital status and number of children. As mentioned earlier that the proposed simple formula is intended to prevent confusion at its first implementation, different conditions and calculations should be added later on to enhance the effectiveness of cash transfers. Different groups of labor categories have different preferences towards working. Therefore, further specific studies should be carried out to target each group effectively

The proposed scheme covers only one-third of all the poor in Thailand, so the data is explored further to see how the scheme criteria can be relaxed efficiently. First, based on the percentage of the poor and near-poor included, first, covering up to age 70 seems to be a valid strategy. Manprasert, et. al. (2016) stated that Thailand is about to become an aging society within ten years. A concerning fact is that as the Thai labor force grows older, the more likely they are to become small-scale self-employed citizens producing without economies of scale. Some elderly laborers go on to earn low incomes and savings throughout their remaining lifetime. Therefore, including the elderly into the labor force with additional cash transfers can be beneficial to the overall economy in the short term.

Second, lifting the unearned income ceiling also includes more of the poor and near-poor into the scheme efficiently. The criterion was set at a three percent return annually, a level which

can be argued about in terms of subjectivity. The relaxation is only done on a trial-and-error basis to show its suitability, on which policy makers can base on their later discussions concerning the criterion.

As for the inequality improvement, the scheme can improve Gini coefficients by 0.005 points. This might be a tiny number, but it is a humble expectation for any first implementation. On the other hand, any welfare scheme that can close the inequality gap suddenly may bring about greater disincentives. Policy makers should, therefore, attempt to promote mutual understanding that the policy is not supposed to solve the issues immediately. Instead, its main focus is to act as an efficient social safety net that can partially support those who are in need.

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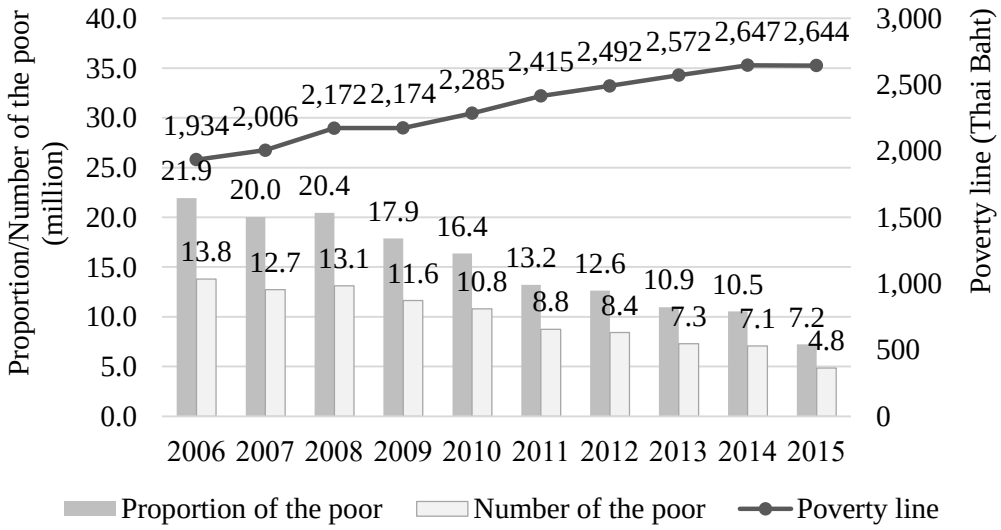
Appendix

Profile of Poverty, Inequality and Implemented Welfare Scheme issues in Thailand

FPO has been considered a NIT fit for Thailand due to the prevailing poverty and income inequality situation. According to Figure A.1 and Figure A.2, the number of poor people in Thailand has significantly dropped from 22 million to 5 million during the last decade[3]. However, income inequality has only slightly improved, considering the Gini coefficient and quintile income share. Moreover, the top and bottom decile income share gap has not come closer significantly over time.

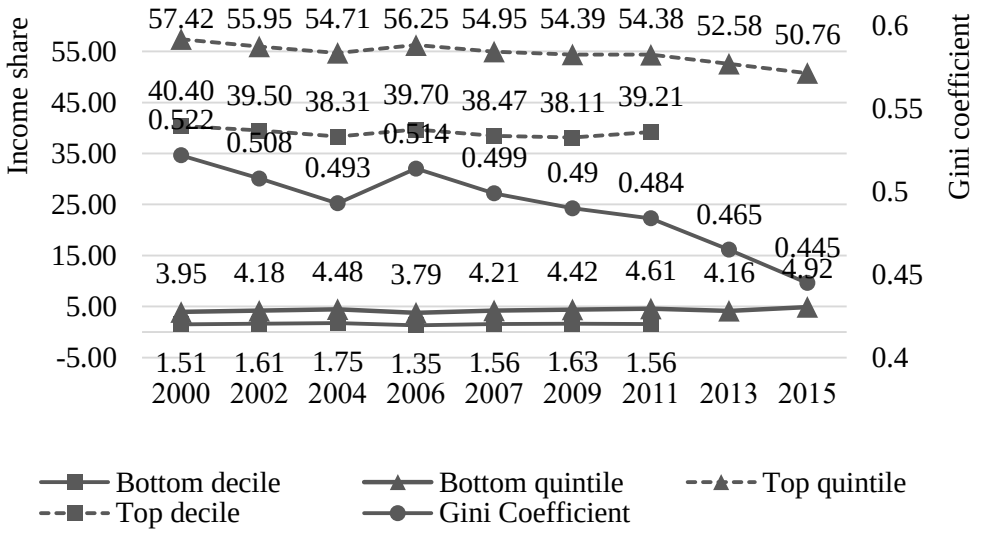
Figure A.1: Number, Proportion of the Poor and Poverty Line by Year



Source: National Economic and Social Development Board

[3] Poverty line has been criticized for its capability to justify the least expenses for living. Stagnant poverty line in 2015 may be caused by oil price drop and deflation in Thailand. As a result, number of the poor plummeted at a great deal.

Figure A.2: Share of Income by Decile and Quintile, Income Gini Coefficients



Source: National Economic and Social Development Board, Pan Ananaphibut, et. al. (2014)

In response to these problems, many supportive welfare measures have been provided. However, most of such measures do not target beneficiaries based on their needs. Table A.1 lists the major welfare schemes from 2010 to 2013. Schemes are ranked from the most expensive down. They are all conditional schemes, one way or another, based on age group or occupation.

Universal Health Coverage Scheme covers every Thai citizen if they are not covered by other mandatory schemes: such as the Civil Servant Medical Benefit Scheme and Social Security. Elderly allowance is a monthly allowance for everyone aged more than 60: 600 Baht for 60-69, 700 Baht for 70-79, 800 Baht for 80-89, and 1,000 Baht for 90 and above. Basic Education Subsidy benefits every studying child. Agricultural Product Subsidy supports people within a group of occupations. Lastly, Student Loan is aimed at students who are in need of a low-interest-rate loan.

As a result, without means testing to help distinguish the poor, proportions of beneficiaries who are poor are smaller than 20 percent for every program. Even worse, some of the beneficiaries are rich. Efficiency and limited budgets represent reasons for Thai authorities leaning towards a means testing scheme.

Table A.1: Welfare Scheme, Public Expenditure, Proportion of Beneficiary Classified as Poor

Welfare scheme	Public expenditure				% of beneficiaries who are poor (2012)
	2010	2011	2012	2013	
1.Universal Health Coverage Scheme	89,385	101,058	107,814	108,744	16
2.Elder Allowance	21,264	36,008	50,449	54,214	17.6
3.Basic Education Subsidy	78,220	79,908	42,553	41,893	-
4.Agricultural Product Subsidy	10,497	13,462	47,484	39,939	14.8
5.Government Student Loan	20,059	18,000	9,500	12,000	2.7
Government budget	1,700,000	2,169,968	2,380,000	2,400,000	

Source: Adapted from Ananapibut, et. al. (2014)