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# ESTIMATION OF FAMILY LABOR SUPPLY: EVIDENCE FROM THE MEKONG RIVER DELTA IN VIET NAM

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**ABSTRACT**

*This article explores the data of 1,860 families living in the Mekong River Delta (MRD) from the Viet Nam Household Living Standards Survey in 2008 (VHLSS, 2008) to learn about their familial labor allocation in responding to changes of market wage. Theoretically, wage – one of the key factors influencing changes of family labor supply– is used to estimate a level of the shadow wage which is an exogenous factor in the labor supply function. Based on the survey data of 1,860 MRD families, findings showed that family labor supply is significantly sensitive to changes of both shadow wage and non-labor income. Family labor supply is being of a forward bending curve, while family tended to reduce its labor supply as a response of an increase of the non-labor income. Additionally, plot size was closely related to labor supply within a family. Consequently, results also indicate that IV estimation methodology is substantial to estimate impacts of changes of the economic opportunity (mainly wage) on family labor supply.*

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## 1 INTRODUCTION

This article is conducted to examine the hypothesis on the neoclassical theory of the family labor supply for households in a particular area in Vietnam, namely the Mekong River Delta region. Since the mid-1990s, the Vietnam's Government launched an economic innovation program aiming not only to shift to an industry-based economy from a traditional agrarian economy, but also liberalize the economy with a participation of foreign investors into most industries, especially labor-intensive industries. In such circumstance, an understanding of response of the family labor supply to changes in economic opportunities, for example wage rates, price fluctuation of agro-products, etcetera, is substantial to adjust development policies in developing countries, where the progress of economic renovation has taken place in recent decades.

As is widely known, in an emerging economy like Vietnam, leisure time of a laborer is being more expensive because the opportunity cost of that laborer seems to differ from zero. In other words, a competition on wage rate among industries on the market allows laborers to have more chances to decide to engage in what employment with a higher wage rate (Lewis, 1954). However, in recent decades, in their work titled "new economics of labor migration", Stark and Bloom (1985) highlight that individual's decision regarding his/her employment choice in the village or elsewhere is not solely made by himself/herself, but depended on other family members. On the other hands, most decisions on individuals' employment and livelihoods are primarily being of a great concern of family and these decisions are commonly made by a family unit, rather than by an individual.

In the microeconomic literature, modeling a response of family labor supply regarding changes of endogenous and exogenous factors has long been substantial and usually illustrated by a core relationship between the maximization in consumption (or income) utility and the labor allocation within a family. It can be argued that the work titled "A theory of the allocation of time" of Becker (1965), as one of the earliest works, is possible to formulate the labor allocation in a family with respect to gain an utility maximization. Later, some researchers have applied the Becker's model to examine static analyses regarding family labor supply in different contexts in different locations. Rosenzweig (1980), Renaud and Siegers (1984), Blundell and MaCurdy (1999), Devereux (2004) are, for example, striking among those.

It is argued that the model of family labor supply has been a significant analytical tool in a case where a presence of kinds of markets including goods and labor is existent and freely tradable. On the other hands, any change from markets (e.g. wage regime, inflation, unemployment, and etcetera) certainly results in a variation in the total family income. In such case, a family would tend to reallocate its labor supply in order to look for another optimal utility.

Actually, employment choice by individuals or labor allocation within a family seems to regard a wage rate on the labor market with a comparison (Todaro, 1969). The family will reallocate its labor supply, as a response to the change of wage rate, by considering two kinds of effects: income effect and substitution effect. In other words, such consideration of these two effects is to seek a possible answer for the identical question on whether an increase in the wage rate does induce family to allocate more laborers in working or not. If a family tends to increase the labor supply as the wage rise, that household has a forward bending curve of labor supply. Otherwise, a backward bending curve of labor supply refers to a decline in labor supply as the wage rise (Renaud and Siegers, 1984).

Most empirical literatures regarding this theory have concentrated on investigating a core relationship between labor supply and consumption decisions within a family (Schultz, 1990; Abdulai and Regmi, 2000). In a study of the labor supply between husband and wife within Thai families, Schultz (1990) indicated that Thai women with having more bargaining power were likely to refer to increase their consumption of leisure or time in non-market activities (meaning that non-labor income). Also, these women seemed to spend their leisure time on child-raise. By later of 2000, Abdulai and Regmi (2000) applied the model of labor supply for their study in Nepal. Specifically, they used an instrumental variable to estimate the shadow wages dealt with labor supply decisions between men and women for Nepalese families. At consequence, they found that a labor supply due to the shadow wage rise for a member correlated to that for other members in a family.

So, the main purpose of this article is to investigate how the labor supply of Vietnamese families in the Mekong River Delta region does respond to changes of economic opportunities in the market. Hereafter, specific objectives of this article are followings:

– Reviewing theoretical perspectives of the family labor supply.

– Providing measures of comparative static analysis regarding the relationship between the labor supply and the labor-related income.

Results are expected not only to provide empirical evidences on the application of the neoclassical theory of labor supply for households, and also give a deeper visibility of the relationship between labor supply and labor-related income for Vietnamese families in the Mekong River Delta region.

The following content of this study is organized as follows: Section 2 presents a theoretical literature of family supply labor model. Section 3 describes the data source and the model specifications. Section 4 provides empirical findings and tests the hypothesis underlying the model estimations. Section 5 summarizes main points of findings.

## 2 LITERATURE REVIEW

A model of the family labor supply is performed as a function to show how a family does allocate its labor supply to seek a maximization of the utility underlying restrictions. Usually, such function is simply specified by:

$$\text{MaxU} = \text{U(C, L)} \qquad (1)$$

*where:*

*U*: Utility of the family depending on an allocation between consumption and leisure time; *C:* Consumption (or net disposal income of the family) derived both from labor and non-labor income sources; *L*: Leisure time possible to be allocated in

among activities within the family and it is nonnegative.

A principle of the consumer theory generally shows that the utility function is satisfied with a subject to the budget constraint, which is described, as follows.

$$C = Q + Y \quad (2)$$

*where:*

*Q*: Labor-related income[1]; *Y*: Non-labor income of a family.

In mathematical optimization, an application of the Lagrange condition is generally to solve the equation (1) corresponding to the constraint of the equation (2) and it specifies by that:

$$\Lambda = U(C, L) + \lambda[C - (Q + Y)] \quad (3)$$

Following the first-order Kuhn-Tucker condition for the equation (3), we yield values of the labor allocation within a family, as follows:

$$\frac{\partial U(C,L)}{\partial C} = -\lambda \quad (4)$$

*where,* $\lambda$ is a Lagrange multiplier explained as the marginal utility of consumption (or income)

$$\frac{\partial U(C,L)}{\partial L} = \lambda * \frac{\partial Q}{\partial L} \quad (5)$$

*where*, $\frac{\partial Q}{\partial L}$ is the value of the marginal productivity for the labor force, so-called the wage rate (W).

In addition, the labor supply for each individual or family may be generally described by the following function:

$$L = L(W, Y) \quad (6)$$

A key point of the neoclassical theory of a family labor supply is to investigate potential effects of a wage rate on the family labor supply. On the other hands, estimating the income effect and the substitution effect, popularly known as the Slutsky decomposition, is derived from any change in the wage rate made by labor market. So, the equation (6) is primarily solved with partial derivatives to estimate effects of a variation in the wage rate and non-labor income (e.g. a wage rise) on the labor supply within a family.

$$\frac{\partial L}{\partial W} = \left(\frac{\partial L}{\partial W}\right)_S + \left(\frac{\partial L}{\partial W}\right)_Y = S + L * \frac{\partial L}{\partial Y} \quad (7)$$

*where*, *S*: Substitution effect and restricted to be positive, as follows.

$$S > 0 \quad (8)$$

A positive value of the substitution effect refers to the case which an income compensated increase due to the wage rate induces family members to have more efforts to work. Otherwise, an increase in non-labor income is likely to allow these members to less work as the compensation due to the full income effect. This second case is specified by that.

$$\frac{\partial L}{\partial Y} < 0 \quad (9)$$

A combination of the equation (8) and (9), we obtain an estimated value of the impact of changes in wage rate on the family labor supply, as a marginal effect of the wage rate, $\partial L/\partial W$, which may present in either positive or negative effect. In case of positive effect, $\partial L/\partial W > 0$, it is called a forward bending labor supply function. Otherwise, the marginal effect is less than zero, $\partial L/\partial W < 0$, which refers to a backward bending labor supply function.

## 3 DATA AND MODEL SPECIFICATION

The data used in this article derives from the Vietnam household living standard survey (VHLSS) in 2008. This survey was conducted in every two years by the General Statistical Office of Viet Nam and the World Bank. In this study, a sample of 1,860 families in the MRD region is extracted from the VHLSS (2008) to examine a change of the family labor supply caused by market opportunities.

The survey consists of family's characteristics such as human, physical and financial capital. Table 1 statistically presents main family characteristics. Among variables in the table, wage is an average wage earned by all family labors. Non-labor income refers to income received by various sources such as social subsidies, disaster-related aids, leasing assets, and so on. Land refers to plot size of the family devoted to annual crop cultivation. Additionally, a dummy variable received a value of 1 or 0 for geographic location in urban area or rural area, respectively is incorporated in the model as an exploratory factor.

[1] This income source may be illustrated by a basic production function, for example Q = (L, K)

As widely known, a well-educated person perhaps performs better his/her works in terms of technical efficiency improvement. Usually, educational level is specified by number of schooling years that is a productive variable in production or income function (Mincer, 1974). In addition, age is an important factor that implies labor experience both in life and in working. This variable in associating with educational level is therefore usually used to show individually managerial knowledge.

**Table 1: Statistical description of variables used in the estimation**

| Variable | Description of variables | Mean | Std. Deviation |
|---|---|---|---|
| Head's age | Age of family head | 51.5 | 13.8 |
| Head's education | Schooling years of the head (in years) | 5.4 | 3.7 |
| Wage[a] | Average wage of family (1,000 VND a year) | 79,917 | 182,055 |
| Non-labor income | Non-labor income (1,000 VND a year) | 6,087 | 14,525 |
| Land | Plot size in 1,000m$^2$ | 8.1 | 15.3 |
| Labor | Family labor force (in persons) | 4.2 | 1.6 |
| Urban | Dummy: 1 if living in the urban area; 0 if living in rural area | 0.2 | 0.4 |

[a] *the local currency of Vietnam, with an exchange rate of 1 USD: 19,500 as of October 2010*

*Source: The VHLSS (2008) and author calculation*

Based on the literature review and the data availability, an estimation of the family labor supply regarding any change of economic opportunities is represented by the following econometric model.

$$L_i = f(W_i, Y_i, X_i, e_i) \qquad (10)$$

*where,*

$W_i$: Average amount of wage for $i^{th}$ family; $Y_i$: Non-labor income for $i^{th}$ family; $X_i$: A vector of basic characteristics for $i^{th}$ family, including age and schooling years of the family head, land, and geographic location; $e_i$: Error terms regarding effects of omitted variables.

Given the equation (10), an endogeneity of explanatory variables may appear and the estimates from the equation (10) by OLS methodology could be biased. So, the Instrumental Variable (IV) methodology is introduced as an alternative in order to obtain a consistent estimation in this case. Following Gujarati (2003), the obtained result of testing on the endogeneity problem for equation (10) shows that the wage variable is an endogenous factor relating to the error term (see appendix 1). Hence, this variable, which could be derived from instrumental variables, is used as a shadow wage in the equation (10).

Hereafter, an estimation of the family labor supply with the Instrumental Variable (IV) methodology can be represented by:

Estimated coefficients displayed in table 2 show that the labor supply of families in the Mekong River Delta region is a forward bending curve. An increase of the labor supply takes in parallel with the wage rise in the labor market. By contrast, a family has a preference to spend less time in working as an increase in the non-labor income. This reduction is seen as compensation from the income effect due to a wage rise.

$$L_i = f(\widehat{W}_i, Y_i, X_i, v_i) \qquad (11)$$

*where,* $\widehat{W}_i$ is the predicted value[2] of the average wage (W), $v_i$ is error terms.

## 4 EMPIRICAL RESULTS

Table 2 presents estimated coefficients of the family labor supply equation underlying two methodologies, including the OLS and the IV estimation. These coefficients and their effects are generally significantly associated with the family labor supply, consistent with above theoretical literature review. Coefficients of the explanatory variables refer to estimates of the elasticity of the labor supply corresponding changes in these input variables.

The coefficient of the land variable has both sides effect on the labor supply, but its negative effect in the OLS model is not significant on the family labor supply. The coefficient of this variable in the IV model is fairly relevant to explain its effect on the labor supply. Based on GSO statistical data in 2008, more than 70% of total population in the Mekong River Delta region lives in rural areas where their livelihood definitely relates to farm

[2] Predicted values of the average wage are derived by the estimation of the Mincer-typed wage model that wage regresses on conventional variables including age, schooling years and square of schooling years of the family head

production. As a result, a relationship between labor allocation and land endowment in a family is substantial.

Concerning a dummy variable of urban location, the result suggests that families living in urban area have more preferences to spend time in working than others in the rural area, possible due to two main reasons. At first, employment opportunities in urban areas seem to be more diversified. Second, leisure cost in urban area seems to be more expensive than that in rural area and that is a part of pressures of the urban life.

**Table 2: Estimating the family labor supply**

| Variable | OLS | IV |
|---|---|---|
| Log wage | 0.104*** | 0.017 |
| Log non-labor income | -0.003 | -0.012** |
| Log land | -0.001 | 0.009** |
| Urban | 0.027 | 0.080** |
| Constant | 0.391*** | 1.294*** |
| Sample | 1,860 | 1,860 |
| $R^2$ | 0.202 | 0.077 |
| Prob > F | 0.000 | 0.000 |

*Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$*

**Table 3: Wu-Hausman test for OLS and IV model**

| Variable | IV (b) | OLS (B) | Difference (b-B) |
|---|---|---|---|
| Log wage | 0.017 | 0.104 | -0.087 |
| Log non-labor income | -0.012 | -0.003 | -0.009 |
| Log land | 0.009 | -0.001 | 0.008 |
| Urban | 0.080 | 0.027 | 0.053 |
| Constant | 1.294 | 0.391 | 0.903 |

*$\chi^2 = 15.17$; Prob> $\chi^2 = 0.0001$*

In addition, values of the Wu-Hausman test relating to a null hypothesis – the wage variable as an exogenous factor in the equation (10) - displayed in table 3 suggest that instruments (i.e. age, schooling) can be considered as exogenous factors in the family labor supply. The computed $\chi^2$ value of 15.2 suggesting a rejection of the null hypothesis. It can argue that the IV model has been proven a more appropriate tool to estimate the family labor supply function.

However, to give a more insight into the wage variable, a simple application of the OLS model to investigate relationship between the shadow wage and the observed wage is fairly important in this analysis. Specifically, such relationship is expressed by:

$$\widehat{W}_i = \alpha_0 + \alpha_1 W_i + \varepsilon_i \qquad (12)$$

*where:* wage variables are measured in logarithm, α are unknown parameters, and ε is error term.

The estimated result of the equation (12) given in appendix 2 shows that changes in the shadow wage can be interpreted by a variation of the observed wage. However, a relatively small effect was recordedaround 5%. While, other factors including age, schooling and omitted elements play important roles in explaining changes of shadow wage. This result also suggests a fact that using the shadow wage to estimate the family labor supply function is very significant.

## 5 CONCLUSION

In a circumstance of the market liberalization including the labor market in Vietnam, families have better chances of their labor allocation in order to seek a maximization of their income utility. This study examines the effects of market wage changes on the labor supply function of 1,860 families in the Mekong River Delta of Vietnam.

The empirical findings suggested that the family labor supply in this region is expressed by a forward bending function thus meaning an increase in the labor supply is close associated with the market wage rise. In contrast, financial sources from the non-labor income were being of a compensation for the labor reduction.

Finally, the methodology used in this analysis gave important evidences of using the shadow wage to estimate the family labor supply throughout the IV model. Specifically, the wage importantly correlates to two conventional factors such as age and schooling years. In short, empirical findings from this study provide an essential insight into influences of the economic opportunity (i.e. wage regime) on the family labor supply.

## APPENDICES

**Appendices 1: Detection of the endogeneity of the wage variable in the equation (10)**

| Log labor | Coef. | Std.Err. | t | P>\|t\| |
|---|---|---|---|---|
| Log wage | 0.156 | 0.008 | 19.77 | 0.000 |
| Log non-labor income | -0.003 | 0.003 | -1.05 | 0.295 |
| Log land | -0.001 | 0.001 | -1.19 | 0.233 |
| Urban | 0.002 | 0.019 | 0.11 | 0.910 |
| Residual of wage (e) | 0.009 | 0.001 | 9.00 | 0.000 |
| Constant | -0.172 | 0.087 | -1.96 | 0.050 |

*N = 1,860; $R^2$ = 0.237; Prob>F = 0.000.*

**Appendices 2: Test for the shadow and observed wage**

| Log fitted wage | Coef. | Std.Err. | t | P>\|t\| |
|---|---|---|---|---|
| Log wage | 0.055 | 0.005 | 10.38 | 0.000 |
| Constant | 9.959 | 0.056 | 176.84 | 0.000 |

*N = 1,860; $R^2$ = 0.055; Prob>F = 0.000.*

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