INCOME DIVERSIFICATION OF HOUSEHOLDS
The Case of the Mekong Delta

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Income diversification is an important livelihood strategy of households, especially the poor and rural ones. This research employs data from Vietnam Household Living Standards Survey 2008 to identify factors that affect household income and its impacts on decisions to diversify the income by households in the Mekong Delta. Analyses show that householder's characteristics, such as age and schooling years, have positive effects on the household income. Meanwhile, households that are large and in urban areas enjoy more opportunities to improve and diversify their income than rural and small households. More importantly, diversifying the income through migration is considered as a livelihood strategy for poor households. Finally, income gaps also drive households to diversify their income by seeking jobs outside their home districts.

Keywords: household, estimated income, income diversification

1. Introduction

Income diversification – mostly from farming to non-farming businesses – has long been a concern for many families, especially the poor and rural ones. Diversification is evident in increases in income-generating activities and the importance of these activities. For example, a two-income household is considered as more diversified than a one-income one (Joshi, Gulati, Birthal, & Twari, 2003).

Besides farming business, workers can engage in income-generating non-farming activities inside or outside their home districts. Income diversification has long been considered as an important livelihood strategy to stabilize the income in changing situations such as urbanization, industrialization, influence of climate change, and income gap between agricultural and manufacturing sectors, etc. (Ellis, 1998; Huỳnh Trường Huy, Nghiêm, & Nam, 2008; and Yang & An, 2002). Statistics from many countries show that income diversification by non-farming activities plays an increasingly important role in family life, accounting for 42% of total household income in Africa; 40% in Latin America and 32% in Asia (Reardon, Berdegué, Barrett, & Stamoulis, 2006).

In the Mekong Delta, some 70% of its population of 17.2 million live in rural areas on farming business (GSO, 2009b). Along with changes in the structure of economic sectors of the nation, the share of agriculture in the gross output of the Delta fell considerably, from 51% in 2000 to 39% in 2008 (GSO, 2008). Apparently, changes in the structure of economic sectors have affected labor structure in recent years.

Table 1: Changes in structure of economic sectors and labor in the Mekong Delta in 2000 – 2008 (%)

	Changes in gross output	Changes in labor structure
Zone 1	- 12	- 7.0
Zone 2	+ 7	+ 3.5
Zone 3	+ 5	+ 3.5

Source: VCCI – Cần Thơ

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Workers from rural areas adopt various non-farming activities, from small family businesses (grocery, motorbike repair and wash, and transport of goods) to industrial jobs. Although data about labor movement towards non-farming sectors are not comprehensive enough, it is apparent that the flow of migrant workers from the Mekong Delta is swelling. The GSO Survey of Population and Family Planning shows that the migration rate – ratio of migrant to 1,000 residents – rose from 2.3‰ in 2003 to 7.9‰ in 2007 (GSO 2007). The most recent statistics from the GSO 2009 Population and Housing Survey show that the highest migration rate was found in the Mekong Delta (46‰), followed by Coastal Central Vietnam (45‰) (GSO, 2009a).

Many researchers agree that migration could be seen as one of income diversifying strategies that help households, especially the poor ones, deal with financial and resource difficulties and stabilize their sources of income (Haas, 2006; Scoones, 2009; Stark, 1991).

In recent years, researches on income diversification in the Mekong Delta have been limited and narrowed. Lê T. Nghiêm (2003) used the Simpson index to measure the income diversification among farming households in Tân Phú Thạnh Commun, Châu Thành A District, Hậu Giang Province. The same method was employed by the author to measure the income diversification among households in four provinces with different economic and ecological characteristics – An Giang, Cần Thơ, Tiền Giang and Sóc Trăng (Huỳnh T. Huy, Lê T. Nghiêm, & M.V. Nam, 2008).

We can see that previous researches focus mostly on estimation of diversification degree and its effects on household income. Meanwhile, income diversification through migration has become more common and has not been analyzed properly. This research, therefore, aims at identifying factors that determine income diversification through migration and its effects on household income. Specific objectives are as follows:

(i) Working out a model of decisions on income diversification of households;

(ii) Measuring the factors affecting household income; and

(iii) Estimating impacts of income on diversification decisions.

Expected results of the research will lead to better understanding of the strategy to diversify household income through labor migration, and provide further evidence of this incident in the Mekong Delta.

This paper includes the following main contents: Part 2 introduces a theoretical model of decisions on income diversification through labor migration. Part 3 presents and describes data used for the research. Part 4 discusses estimation results, and Part 5 provides some important conclusions.

2. Model of decisions on income diversification

a. Theoretical model:

Households, especially farming ones, in developing countries exist in an environment full of risks and upheavals, such as lack of insurance for farm products, changing prices of imported materials, and influences of natural conditions, etc. To deal with such challenges, farming households usually diversify their income by re-allocating their labor resource. In other words, they consider moving some family members to non-farming activities. In fact, such decisions always aim at increasing the household income.

Contribution by Becker (1965) in his *The New Home Economics Model* is important to the theory of labor allocation in households. They tend to consider transferring some family members to non-farming activities when such opportunities do exist in order to maximize the household income. This relation is expressed in the following utility function:

(1) $MaxU = U(Y, L)$

where U is the utility function of households; Y total spending limited to household income; and L household labor force that can engage in

farming (L_n) and non-farming (L_p) activities. The equation (1) is constrained by the following equations:

(2) $Y = P*Q(L_n) + R(L_p) = P*Q(L_n) + \varphi*w*L_p$

(3) $L = L_n + L_p$, with L_n and L_p not negative.

where $P*Q(L_n)$ is income from farming business; $R(L_p)$ income from non-farming activities remitted by migrant workers; φ fraction of income from migrant workers; and w income of migrant workers.

Thus, the household decision on income diversification is based on maximizing equation (1) with two constraints of equations (2) and (3). Lagrange function applied to equation (1) is as follows:

(4)

$$\Lambda = U(Y,L) + \lambda(Y - P*Q(L_n) - \varphi*w*L_p)$$

where λ is Lagrange multiplier relating to the two constraints.

Based on Kuhn-Tucker simple derivative from the equation (4), distribution of labor between two activities is expressed as follows:

(5) $$\frac{\partial\Lambda}{\partial Y} = \frac{\partial U}{\partial Y} + \lambda = 0$$

(6) $$\frac{\partial\Lambda}{\partial L_n} = \frac{\partial U}{\partial L} - \lambda*P*\frac{\partial Q(L_n)}{\partial L_n} = 0$$

(7) $$\frac{\partial\Lambda}{\partial L_p} = \frac{\partial U}{\partial L} - \lambda*\varphi*w = 0$$

Combining equations (6) and (7), we have:

(8) $$P*\frac{\partial Q(L_n)}{\partial L_n} = \varphi*w \Leftrightarrow VMP_{L_n} = \varphi*w$$

where VMP_{L_n} is value of marginal productivity of agricultural labor.

By combining (5) and (6) and replacing with (7), we get:

(9) $MRS = -\frac{dY}{dL} = VMP_{L_n} = \varphi*w$, where MRS is marginal rate of substitution of labor between two activities.

In short, decisions on income diversification are determined by allocation of labor between two activities to the extent where conditions of equation (9) are satisfied. Figure 1 expresses decision on labor allocation in the household.

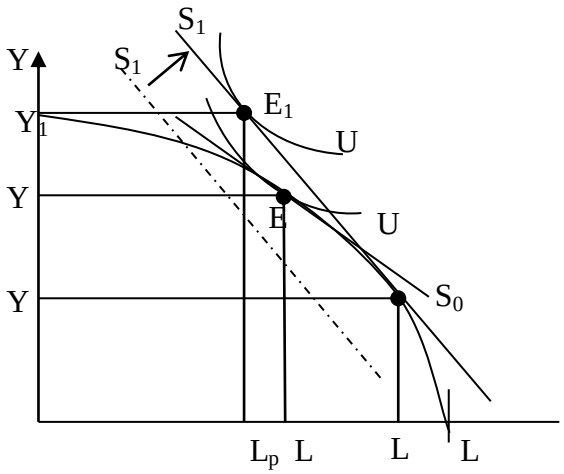

Figure 1: Maximization of income and labor allocation

Expressions Ys on the vertical axis express spending (or income) while expressions Ls on horizontal axis that move leftwards from L show the labor allocated to different activities. Firstly, labor is allocated to farming business at (L_n) with an income of Y_n when non-farming activities have not come into existence. The household gains utility at E_0 where utility curve (U_0) touches labor productivity line (S_0) and wage is equal to value of marginal productivity (VMP_{Ln}).

If non-farming employment opportunities exist in labor market and workers can move freely between sectors, the householder will decide to allocate part of labor force to the non-farming sector when opportunity cost in this sector is higher than the value of marginal productivity of agricultural labor, or $w_p > \frac{\partial Q(L_n)}{\partial L_n}$, as expressed by the line S_1. In other words, the householder allocates labor to farming activity to the level L_n, and allocate the rest to non-farming activities at L_p. Thus, labor will be allocated to non-farming activities until conditions of equation (9) are satisfied, that is, moving the line S_1 rightwards. In this case, the household gains utility at E_1 – higher than E_0 -

where utility curve U_1 touches new productivity line $S_{1'}$ (steeper than S_0). At the new point of utility, the household gains an income Y_1 higher than the previous Y_n.

b. Estimating model:

(1) Estimating the income:

Based on Stark and Bloom in "New Economics of Labor Migration" (1985), Taylor, Rozelle and Brauw (2003) develop an econometric model for estimating household income diversified by labor migration:

(10) $Y_i = f(N_i, P_i, X_i, H_i) = f(Z_i)$

where Y_i is household income expressed in logarithmic form, $log(Y_i)$; f(.) is a function including groups of factors that explain changes in the income (Y_i); N_i is proportion of income from farming activity; P_i is proportion of income from non-farming activities; X_i is a vector including household characteristics; and H_i is a vector including householder's characteristics.

The following models of income for two groups of households – diversified (d) and non-diversified (m) – can be developed from (10):

(11a) $Y_i^d = \beta_0^d + \sum_{j=1}^{J} \beta_{ji}^d Z_{ji}^d + \varepsilon_i^d$

(11b) $Y_i^m = \beta_0^m + \sum_{j=1}^{J} \beta_{ji}^m Z_{ji}^m + \varepsilon_i^m$

However, process of estimating equations (11a) and (11b) separately may be erroneous because samples from two groups of households are non-randomly selected, and the OLS estimators could be biased. An alternative approach that has become increasingly popular is the two-stage estimation method developed by Heckman (1979). In some subsequent studies, this method is used for estimating the income of migrant and non-migrant laborers (Konseiga, 2007; Perloff, Lynch, & Gabbard, 1998; Tsegai, 2007; and Zhu, 2002).

This method aims at checking and correcting estimating results affected by selection bias problems and comprises the following stages:

- Stage 1: Building a probability model for identifying factors affecting decisions on diversification: It may be as follows:

(12) $\Pi_i^* = \delta_0 + \sum_{k=1}^{K} \delta_{ki} Z_{ki} + u_i$

where Π_i^* is the probability drawn from the equation (12) corresponding to observed value of Π_i^* which equals 1 for diversified household and 0 otherwise; Z_i is the matrix of explanatory factors related to probability of decisions on diversification; and δ is estimated parameter. From equation (12), we work out lambda ($\lambda_i = \frac{f(Z)}{F(Z)}$), also known as Inverse Mill's Ratio (IMR).

- Stage 2: Coefficient λ is added to equations (11a) and (11b) as an explanatory variable in income equation. Thus, rewritten equations (11a, 11b) are as follows:

(13a) $Y_i^d = \beta_i^d + \sum_{j=1}^{J} \beta_{ji}^d Z_{ji}^d + \gamma_i^d \lambda_i^d + v_i^d$

(13b) $Y_i^m = \beta_i^m + \sum_{j=1}^{J} \beta_{ji}^m Z_{ji}^m + \gamma_i^m \lambda_i^m + v_i^m$

It is worth noting that when the parameter γ has a statistical significance level of 5%, bias in selection of samples from the two groups of households does exist. This means that OLS method is not suitable.

(2) Estimating the decision on diversification:

From estimation results of equations (13a) and (13b), we work out an estimate income gap between two groups of households and use it to evaluate its effects on decisions on diversification. The income gap is expressed in the following equation:

(14) $\Delta Y = \log \hat{Y}_i^d - \log \hat{Y}_i^m = \log\left(\frac{\hat{Y}_i^d}{\hat{Y}_i^m}\right)$

Estimating equation (14), however, also causes a problem: the increase in income gap caused by: (i) increased income of diversified household; and (ii) decreased income of non-diversified households.

In the model for estimating the diversification decision, therefore, the income gap is expressed in the following forms:

(15a)

$$\Pi_i^* = \delta_0 + \delta_1 \log \hat{Y}_i^d + \delta_2 \log \hat{Y}_i^m + \sum_{k=3}^{K} \delta_{ki} Z_{ki} + u_i$$

(15b)

$$\Pi_i^* = \delta_0' + \delta' \log\left(\frac{\hat{Y}_i^d}{\hat{Y}_i^m}\right) + \sum_{k=3}^{K} \delta_{ki}' Z_{ki} + u_i'$$

where X_i is the matrix of factors that explain probability of deciding to diversify; β is estimation parameter; and u is estimation error.

We then use F-test to test parameters related to income gap to compare the two models (Gujarati, 2004) with the following hypotheses:

$$H_0 : \delta_1 = \delta_2 = \delta'$$

$$H_1 : \delta_1 \neq \delta_2$$

In this estimation, Bootstrap method developed by Efron (1979) is used for estimating and separating bias from standard error, and moreover, reducing confidence interval of the estimation model. The Bootstrap method is carried out by iterating observations corresponding to 1,000 times (DiCiccio & Efron, 1996).

3. Data description

Data used for this research are extracted from the dataset gathered by the GSO in its Vietnam Household Living Standards Survey 2008 (VHLSS 2008). Compared with previous datasets, the VHLSS 2008 includes some important questions about migration for work by household members. From this dataset, the research employs only 1,860 observations (households) in the Mekong Delta and some necessary variables needed for analysis, such as householder's characteristics, and socioeconomic conditions of households and their districts.

Table 2 presents general data about householder's characteristics and socioeconomic conditions of two groups of households (diversified and non-diversified ones). Main factors are as follows.

The table shows that there are moderate differences at various levels of statistical significance in most factors related to characteristics of the two groups of households. The most important is the fact that large households have more opportunities to diversify

Table 2: Main factors of household in the Mekong Delta

Factor	Diversified (n = 265)	Non-diversified (n = 1,595)	t-statistics	P-value
Householder's characteristics				
Age	53.3	51.2	-2.24	**
Schooling years	4.9	5.5	2.46	**
Gender (male)	0.7	0.7	0.25	n.s
Household characteristics				
Member (person)	4.9	4.2	-6.32	***
Farming area (1,000m^2/person)	1.55	1.98	1.83	**
Poor household	0.18	0.12	-2.47	**
Ethnic group: Kinh	0.91	0.93	0.84	n.s
Urban area	0.12	0.23	4.03	***
Household economic condition (VND million)				
Total income	35.60	51.71	4.35	***
Income from farming activity	15.20	20.14	2.08	**
Income from wages	7.11	13.76	3.88	***
Income from non-farming activities	4.81	11.47	3.39	***
Others	8.48	6.34	-2.10	**
- Migrant remittance	6.01	-	-	-

Source: Author's calculations from VHLSS 2008 dataset

their income. In addition, smaller per capita farming area is also one of causes of decisions on diversification.

Moreover, poor households also show a strong tendency towards diversification, mostly through labor migration as mentioned in Part 2. that leads to decisions on labor migration as one of strategies to diversify the household income.

Table 3: Income-affecting factors (with sampling bias corrected)

Factors	Estimated coefficient		Probability of diversification
	Diversification	Non- diversification	
Householder's characteristics			
Age	0.005*	0.002	0.005
	(1.72)	(0.42)	(1.07)
Schooling years	0.033***	0.048***	0.013
	(2.80)	(2.79)	(0.59)
Gender (male)	0.094	-0.015	0.114
	(1.12)	(-0.10)	(0.67)
Household characteristics			
Member (person)	0.158***	0.304***	0.065
	(7.07)	(3.26)	(1.60)
Farming area	0.041***	0.033	-0.019
(1,000m^2/person)	(3.18)	(1.41)	(-0.81)
Income from wages (%)	0.004**	-0.004	-0.007**
	(2.33)	(-1.04)	(-2.41)
Income from	0.019***	-	-
diversification (%)	(3.90)		
Poor household	-0.593***	-0.216	0.595***
	(-5.95)	(-0.90)	(3.09)
Housing (not solidly built)	-0.252***	-0.192	-0.005
	(-3.22)	(-1.38)	(-0.03)
Other characteristics			
Urban area	0.217*	0.007	-0.095
	(1.90)	(0.03)	(-0.53)
Ethnic group: Kinh	-0.135	0.045	0.099
	(-1.11)	(0.21)	(0.37)
Constant	8.900***	9.513***	-2.645***
	(34.43)	(23.84)	(-5.45)
Lambda coefficient - IMR	0.185***	-2.284	-
(λ_i)	(4.35)	(-1.31)	
Observations	265	1,595	-
Wald χ^2	252.6	95.1	-
Prob > χ^2	0.000	0.000	-

Regarding the income, it is apparent that diversified households earn smaller income than non-diversified ones. In fact, financial difficulty has long been considered as an important factor

4. Estimation results

Results in Table 3 show that most estimated coefficients are statistically significant and as expected in the above theoretical model in which the statistical significance of coefficient lambda is different from zero. This means that probability of diversification between two groups of households has a significant effect on the household income. Thus, we can conclude that the use of Heckman's two-stage method in the income model is suitable.

Among factors that can explain changes in household income, householder's characteristics, such as age and education, have positive effects on income improvements. This result is rather appropriate to the model of human capital and income suggested by J. Mincer (1974). In addition, economic characteristics are also explanatorily related to the household income. Specifically, income from wage and diversification improves the income of household with diversification while such impacts are not found in households that fail to carry out diversification.

Poverty level of the household is also one of causes of decreases in its income because it has no financial sources to invest in farming business or diversification (engaging in small trading businesses, or looking for jobs outside the home district, etc.). Moreover, results of estimation show that households in urban districts enjoy more chances to improve their income than their rural counterparts do because employment opportunities are usually more available in urban areas. Generally, estimated coefficients offer a more panoramic view on relations between income and household resources and socioeconomic characteristics.

The next section discusses impacts of income gaps from decisions on diversification.

more opportunities to diversify while poor households tend to diversify their income by labor migration because as we know, this is one of the best ways to escape poverty. Unlike their rural counterparts, urban households do not worry much about income diversification. In other words, they are not forced to look for jobs in other provinces.

Concerning income, the results show that income gap [in equation (15a)] is one of important factors that affect decisions on diversification. Considering the income in equation (15b), we see that increases in income of diversified households encourage them to diversify. The income rise can be seen as an achievement of diversification. Meanwhile,

Table 4 : Factors affecting decisions on diversification

Factors	Equation (15a)		Equation (15b)	
	Coefficient	Bias	Coefficient	Bias
Household member	0.366***	0.0038	0.181***	0.0014
	(7.51)		(2.72)	
Urban area	-1.058***	-0.0105	-1.224***	-0.0225
	(-4.88)		(-5.41)	
Poor household	0.660***	0.0005	1.276***	0.0155
	(3.65)		(4.98)	
Income gap (ΔY)	1.152***	0.0006	-	-
	(4.71)			
Income of diversified households ($\widehat{Y}^d$)	-	-	1.712***	0.0079
			(5.50)	
Income of non-diversified households ($\widehat{Y}^m$)	-	-	-0.841***	-0.0011
			(-3.48)	
Constant	-2.141***	-0.0205	-10.473***	-0.0860
	(-9.26)		(-4.31)	
Wald $\div^2$	74.6		84.1	
Prob > $\div^2$	0.000		0.000	
Sum of variance (u_i^2)	1,833.9		1,836.8	

Note: ***, **, and * denote 1%, 5% and 10% significant levels, respectively; and t-stat value is in brackets

Results of estimation presented in Table 4 show that estimated coefficients of explanatory factors and their signs are as expected in theory and practice. Specifically, large households have decreased income among non-diversified households may drive them to diversify. This result supports the theory of strategy to diversify the income by households in an effort to improve their living standards.

Based on value of sum of variance (u_i^2) provided by equations (15a) and (15b), value of F-test is 0.708, higher than the significant level of 0.5. This means that we fail to reject hypothesis H_0 ($\delta_1 = \delta_2 = \delta'$). Thus, we can use either equation (15a) or (15b) to estimate the probability of making decisions on diversification by households.

5. Conclusion

The research aims at identifying factors that affect the income and its impacts on income-diversification decisions through migration made by households in the Mekong Delta. There are several important remarks drawn from the results:

- The household economics as presented by G.S. Becker is helpful in analyzing relations between decisions on income diversification and allocation of labor resources of households in the Mekong Delta.

- Householder's demographic characteristics and human resource have an important and positive role in producing changes in the household income while other factors, such as size and economic situation of the household, also help explain changes in household income.

- As theoretically expected, the income gap is an important factor that explains possibility of deciding the income diversification. More specifically, improvements in household income brought about by diversification will encourage more diversification. Falls in income among households that lack diversification will drive them to diversify their sources of income.

In brief, this research not only provides a theoretical model of relations between income diversification and household resources but also presents empirical evidence of factors that affect the income of two groups of households (with and without diversification) and impacts of income on their decisions on diversification■

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