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Underemployment in the Agricultural Sector of Vietnam: A Production Function Approach

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This paper investigates the existence of underemployment in the agricultural sector of Vietnam, which leads to a low relative income in the sector. The investigation is conducted by comparing the estimates of marginal productivity of labor and the wage rate. The marginal productivity of labor for farm households and for the nation as a whole are obtained by estimating the production function, using a Living Standards Survey conducted in 1993. The empirical results suggest that the marginal productivity of labor in the agricultural sector is far less than its wage rate, which implies the existence of underemployment. Moreover, the estimation indicated that about 77% of the agricultural labor force is found to be underemployed. Reducing underemployment in the agricultural sector should therefore be one of the most important policy targets in Vietnam.

Key words: Vietnam, agricultural sector, underemployment, production function.

1. Introduction

This paper investigates the existence of underemployment in the agricultural sector of Vietnam, which leads to a low relative income in the sector. The investigation is conducted by comparing the estimates of marginal productivity of labor and the wage rate.

The economic gains in Vietnam have been remarkable in recent years following the Vietnamese reform efforts known as Doi Moi. According to the World Bank [17], the nation, which had a population of 73.5 million, had a US $240 per capita GNP in 1995 and a 12.8% annual compound growth rate of GDP from 1990 to 1995. The average corresponding numbers for the low-income countries classified by the World Bank, excluding China and India, are US $290 per capita GNP and 1.8% annual compound growth rate of GDP. Vietnam's economy outperformed most low-income countries during this period.

The Gini coefficient of Vietnam was 0.357 in 1993,[1] compared with 0.415 in China (1995), 0.317 in Indonesia (1993), 0.484 in Malaysia (1989), 0.407 in the Philippines (1988), and 0.462 in Thailand (1992). The smaller Gini coefficient of Vietnam implies less income inequality than that of neighboring countries. However, the income in Vietnam's urban regions exceeds that of rural regions. The income in Vietnam's nonagricultural sector, however, is larger than that of the agricultural sector. According to Kuzunets [7], these income differentials are expected to expand with economic development. In terms of national income distribution, the adjustment of the agricultural-sector income should be an important policy target for the government of Vietnam.

A major cause of low income in the agricultural sector is the underemployment in the agricultural sector during the economic development process. Underemployment in a sector occurs when the wage rate of one sector is determined by institutional factors rather than

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Table 1. Changes of GDP by sector in Vietnam (1986-95)

(1989 constant price)

		Primary	Secondary	Tertiary	Total
Real number (unit: billion VND)	1986	10,705	5,769	7,957	24,431
	1987	10,649	6,297	8,375	25,321
	1988	11,069	6,630	9,136	26,835
	1989	11,818	6,444	9,831	28,093
	1990	12,003	6,629	10,894	29,526
	1991	12,264	7,228	11,794	31,286
	1992	13,132	8,242	12,617	33,991
	1993	13,634	9,324	13,777	36,735
	1994	14,169	10,631	15,182	39,982
	1995	14,892	12,113	16,792	43,797
Composition ratio (%)	1986	43.8	23.6	32.6	100.0
	1987	42.1	24.9	33.1	100.0
	1988	41.2	24.7	34.0	100.0
	1989	42.1	22.9	35.0	100.0
	1990	40.7	22.5	36.9	100.0
	1991	39.2	23.1	37.7	100.0
	1992	38.6	24.2	37.1	100.0
	1993	37.1	25.4	37.5	100.0
	1994	35.4	26.6	38.0	100.0
	1995	34.0	27.7	38.3	100.0
Growth rate (%)	1986-1990	2.9	3.5	8.2	4.8
		(25.3)	(16.8)	(58.5)	(100.0)
	1990-1995	4.4	12.8	9.0	8.2
		(20.1)	(39.1)	(41.4)	(100.0)
	1986-1995	3.7	8.6	8.7	6.7
		(21.7)	(32.9)	(45.8)	(100.0)

Sources: General Statistical Office. *Impetus and Present Situation of Vietnam Society and Economy after Ten Years of Doi Moi,* 1996, General Statistical Office. *Statistical Yearbook 1996,* 1997.

Notes: 1) Growth rates are the annual compound rates. 2) Figures in parentheses are the relative contribution ratio to total GDP in percent.

the marginal productivity of labor, and when the marginal productivity of labor is less than the wage rate in that sector. Underemployment is not identical to an unlimited labor supply with a marginal productivity of labor equal to zero. As employment in the nonagricultural sectors continues to expand with the development of these sectors, the labor force continues to decrease in the agricultural sectors. Marginal productivity of labor continues to rise until it reaches the level of the wage rates. The condition required for underemployment in the agricultural sector corresponds to phase two in the Ranis-Fei model (see Ranis and Fei [12]). The point when the marginal productivity of labor equals the wage rate is called the "turning point." In Japan this occurred in the 1960s; for Taiwan, in the latter half of the 1960s; and for Korea, in the first half of the 1970s (see Minami [8], Chin [2], and Kim [6]). Many studies have discussed underemployment in Vietnam's agricultural sector. To the best of the author's knowledge, however, almost no attempts have been made to use marginal productivity of labor except for Stroup and Gift [15] in the South Vietnam era. For this reason, this study estimates marginal productivity of labor and underemployment labor, with the assumption that the cause of relatively low income in Vietnam's agricultural sector is underemployment in the sector.

This paper is organized as follows: Section 2 reviews the perspectives of economic development and the change of labor employment in Vietnam. Section 3 estimates the production function for the agricultural sector. Section 4 estimates the marginal productivity of labor

Table 2. Changes in the labor force by sector in Vietnam (1985-94)

		Primary	Secondary	Tertiary	Total
Real number (1,000 persons)	1985	18,979	3,632	3,410	26,020
	1990	21,889	4,210	4,187	30,286
	1991	22,483	4,214	4,277	30,974
	1992	23,208	4,275	4,332	31,815
	1993	23,898	4,370	4,450	32,718
	1994	24,511	4,575	4,578	33,664
Composition ratio (%)	1985	72.9	14.0	13.1	100.0
	1990	72.3	13.9	13.8	100.0
	1991	72.6	13.6	13.8	100.0
	1992	72.9	13.4	13.6	100.0
	1993	73.0	13.4	13.6	100.0
	1994	72.8	13.6	13.6	100.0
Growth rate (%)	1985-1990	2.9	3.0	4.2	3.1
		(68.2)	(13.5)	(18.3)	(100.0)
	1990-1994	2.9	2.1	2.3	2.7
		(77.7)	(10.8)	(11.6)	(100.0)
	1985-1994	2.9	2.6	3.3	2.9
		(72.4)	(12.3)	(15.3)	(100.0)

Sources: 1985: Dang Duc Dam. *Vietnam's Economy 1986-1995,* Hanoi: the Gioi Publishers, 1995, p. 130. 1990-1994: General Statistical Office. *Statistical Yearbook 1995,* 1997, p. 29.

Notes: 1) Growth rates are the annual compound rates. 2) Figures in parentheses are the relative contribution ratio to total labor force in percent.

for the agricultural sector, confirms the existence of underemployment in the agricultural sector, and estimates the quantity of underemployed in the agricultural sector. Section 5 summarizes this paper.

2. Economic Development and Changes in Labor Employment

The economic conditions in Vietnam after Doi Moi are summarized as follows. In 1989's constant prices, the GDP grew at an annual compound rate of about 6.7%, from 24.431 trillion Don in 1986 to 43.797 trillion in 1995, as shown in Table 1.[2] During the same period, the annual compound GDP growth rate for the agricultural sector, including farming, forestry, and fisheries, was only 3.7%. The GDP growth rate for secondary industry, including manufacturing and construction, was 8.6%. The GDP growth rate for tertiary industry was 8.7%. The agricultural sector had a lower GDP growth rate than the nonagricultural sectors for the same period.

The composition of ratios of the total GDP in each sector changed from 1986 to 1995: to 34.0%, from 43.8%, in the primary industry, to 27.7%, from 23.6%, in the secondary industry, and to 38.3%, from 32.6%, in the tertiary industry. The relative contribution ratio to GDP growth by the primary industry decreased to 20.1% in 1990-95, from 25.3% in 1986-90. The same ratio for the tertiary industry decreased to 41.4% in 1990-95, from 58.5% in 1986-90. In contrast, the ratio for the secondary industry increased to 39.1% in 1990-95, from 16.8% in 1986-90. Although Vietnam's industrialization was significant in the 1990s, the share of the secondary industry in the 1995 GDP was lowest among the three sectors. The primary industry represented a third of GDP in 1995, suggesting the importance of this industry for Vietnam. The share of the tertiary industry increased and had became the largest sector by 1995.

The employment of labor in Vietnam has grown at an annual average compound rate of about 2.9% to 33.66 million in 1994, from 26.02 million in 1985, as shown in Table 2. Growth rates of labor employment for the same period were 2.9% in the primary industry, 2.6% in the secondary industry, and 3.3% in the tertiary industry.

Although differences in the growth rate of labor employment existed in each sector for

Table 3. Annual per capita income by sources of income and by region (1992-93)

Region	Northern uplands	Red River delta	North central	Central coast	Central highlands	South-east	Mekong delta	Whole country
Real figure (unit: 1,000 VND)								
Agricultural and forestry activity	505.4	437.6	358.4	180.7	550.0	213.2	515.1	401.1
Nonfarm self-employment	158.3	400.2	260.5	390.7	122.4	958.8	424.4	407.1
Wage	89.3	181.8	93.3	239.2	170.0	619.4	290.0	240.6
Pension, subsidies, and scholarship	44.8	67.5	46.9	28.4	6.2	19.5	13.5	36.4
Other	3.1	8.7	3.9	14.4	0.4	81.4	22.7	19.8
Total	800.9	1,095.8	762.9	853.4	851.9	1,892.3	1,265.7	1,105.1
Composition ratio (unit: %)								
Agricultural and forestry activities	63.1	39.9	47.0	21.2	64.6	11.3	40.7	36.3
Nonfarm self-employment	19.8	36.5	34.1	45.8	14.4	50.7	33.5	36.8
Wage	11.1	16.6	12.2	28.0	20.0	32.7	22.9	21.8
Pension, subsidies, and scholarship	5.6	6.2	6.1	3.3	0.7	1.0	1.1	3.3
Other	0.4	0.8	0.5	1.7	0.0	4.3	1.8	1.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: State Planning Committee, General Statistical Office. *Vietnam Living Standards Survey: 1992-1993,* 1994, Table 7.1.3.

Table 4. Distribution of population by per capita income (1992-93)

(Unit: %)

	Type of area		Type of household		
Income class	Rural area	Urban area	Farm	Nonfarm	Total
0.5 or less	32.6	11.6	32.2	9.9	28.4
Over 0.5 to 0.75	21.9	10.9	21.6	10.2	19.7
Over 0.75 to 1.0	16.4	10.8	16.5	9.5	15.3
Over 1.0 to 1.5	15.4	21.2	15.9	20.0	16.6
Over 1.5 to 2.0	6.1	17.2	6.5	17.1	8.3
Over 2.0 to 3.0	4.6	13.7	4.7	15.1	6.4
Over 3.0 to 5.0	2.4	9.4	2.1	12.1	3.8
Over 5.0	0.7	5.1	0.7	6.1	1.6
Total	100.0	100.0	100.0	100.0	100.0

Source: State Planning Committee, General Statistical Office. *Vietnam Living Standards Survey 1992-1993,* 1994, Table 7.6.1 and Table.7.6.4.
Note: The unit of income class is the 1 million VND.

the 10 years from 1985 to 1994, the composition ratios of labor employment in each sector to total labor employment have not changed much, as shown in Table 2. The primary industry's relative contribution in the total labor employment growth increased to 77.7% in 1990-94, from 68.2% for the period 1985-90. In contrast, during the same period the relative contribution decreased in the secondary industry and tertiary industries, to 10.8%, from 13.5%, and to 11.6%, from 18.3%, respectively. In 1995, the primary industry employed 72.8% of the total labor force, but this sector earned only 34.0% of GDP.

Tables 1 and 2 imply that the average labor productivity in the agricultural sector in Vietnam is lowest among the three sectors The relatively low average labor productivity in the agricultural sector is one cause for the low income in the agricultural sector and a genuine sign of the existence of underemployment in the agricultural sector.

Table 5. Profile of average farm household by region in Vietnam (1992-93)

Region	Northern uplands	Red River delta	North central	Central coast	Central highlands	South-east	Mekong delta	Whole country
Agricultural output value (1,000 VND)	3,783	3,820	2,952	3,097	5,071	5,250	6,942	4,365
Paddy output (kg)	1,192	1,638	1,375	1,596	946	2,406	4,456	2,071
Value of product of husbandry (1,000 VND)	1,455	1,483	1,128	1,320	860	1,795	1,685	1,451
No. of household members (persons)	4.9	4.1	4.5	4.9	5.7	5.0	5.2	4.8
Persons of labor participation age	2.0	2.2	2.6	2.5	2.4	2.5	2.4	2.4
Agricultural and forestry land (ha)	0.737	0.280	0.399	0.422	1.128	0.930	1.105	0.638
Annual crop land (ha)	0.483	0.243	0.312	0.372	0.710	0.611	0.907	0.486
Production equipment (1,000 VND)	362	236	348	549	3,410	1,995	1,637	803
Value of animals owned (1,000 VND)	828	597	916	949	638	1,295	732	800
Crop cultivation expenses (1,000 VND)	378	605	525	743	918	1,607	2,095	934
Husbandry current expenses (1,000 VND)	172	333	280	485	302	921	638	409

Source: State Planning Committee, General Statistical Office. *Vietnam Living Standards Survey: 1992-1993*, 1994.

Table 3 shows the sources of per capita annual income as reported in *Vietnam Living Standards Survey 1992-1993* (referred to hereafter as VLSS), conducted by the State Planning Committee and General Statistical Office [14] in 1993 in Vietnam. The Southeast region, which includes Ho Chi Minh City, reports the maximum per capita annual income at about 2.5 times higher than that of the North Central region, the lowest income region. It should be remarked that the low-income regions report a greater share of agricultural activity than the Southeast, where wages are higher and the share of income from nonfarm self-employment activities is greater. Table 4 shows the distribution of population by income class, based on VLSS. The rural area has a lower average per capita income than the urban area does, and the average per capita income of the farm household is lower than the nonfarm household's.

The microlevel findings of tables 3 and 4 confirm the macro level evidence implied in tables 1 and 2 that the income of the agricultural sector is low in comparison with other sectors. As a next step, the existence of underemployment in the agricultural sector in Vietnam should be investigated. For this purpose, the production function of the agricultural sector and the marginal productivity of labor in that sector must be estimated.

3. Estimation of the Production Function in the Agricultural Sector

In assessing the marginal productivity of labor, the first step is to estimate the production function. Data on the input and output of the agricultural sector in Vietnam required to estimate the production function can be obtained from the General Statistical Office [4]. However, a disadvantage in using this data is the lack of data on current input. Fortunately, rich information about agricultural input-output of farm households is available in VLSS. Therefore these survey data are used in this study to estimate the production function. Relying on VLSS to obtain information about agricultural production may seem unorthodox. This survey includes 4,800 total samples, however, 3,791 of which are related to agricultural production.[3] Furthermore, data on agricultural input-output by region and by expenditure quintile are available.

Table 5 shows the profile of farm household

samples of VLSS. The production pattern of the representative farm household as the average of the whole country in 1992-93 is as follows: The average household had 4.8 persons, 2.4 of which were of labor participation age. Household members of labor participation age are regarded as the labor force in this study. The annual agricultural products of 4,365 thousand Don per farm household were produced by using the labor force, the production equipment of 803 thousand Don, the livestock of 800 thousand Don, and the agricultural land of 0.64 hectare. Furthermore, the current input of 934 thousand Don was used for crop production, and 409 thousand Don was used for animal husbandry. Table 5 shows the variation of input-output levels among the regions. We can estimate the agricultural production function at the farm household level by using these data. Since the data in Table 5 are available for the seven regions and the expenditure quintile, the total number of observations totals 35.[4)]

In this study, the Cobb-Douglas production function is employed, since the assumption of the constant elasticity of input substitution is convenient for estimating the marginal productivity of labor. The Cobb-Douglas production function in logarithmic transformation is specified as follows:

$$\ln V_i = a_0 + a_1 \ln L_i + a_2 \ln A_i + a_3 \ln K_i + a_4 \ln M_i + \Sigma_j b_j X_{ji} + \Sigma_k c_k Z_{ki} + U_i \quad (1)$$

where V represents output; L, labor; A, land; K, capital; M, current input; U, error term; X_j, dummy variable indicating the productivity differential of the region j; Z_k, dummy variable indicating the productivity differential of the kth expenditure quintile; and a_0, a_1, a_2, a_3, a_4, b_j, and c_k are parameters to be estimated.

Each variable specified in the production function is defined as in VLSS: Output=value of agricultural output, labor=person of labor participation age, land=agricultural land area or crop land area, capital=total value of production equipment, and current input=crop cultivation expense. The suffix for the regional dummy stands as follows: (2)=Red River Delta, (3)=North Central, (4)=Central Coast, (5)=Central Highlands, (6)=Southeast, and (7)=Mekong Delta. The expenditure class dummy (Z_k) is suffixed from 2 to 5 for the second to the fifth quintiles. The data on the number of household members in labor participation age, not reported as is in VLSS, can be obtained from the data reported in VLSS on the agricultural land area per household and the agricultural land area per person of labor participation age. The capital used in this study does not include animals and plants, and the current inputs do not include those used in animal husbandry because of the nonavailability of data in VLSS. However, if the ratio of animal and plant capital stock to machinery capital stock were constant within each region, the regional dummy variables would take care of the differences in the animal and plant capital stock and would thus be for the current input.

Regressions (1) and (2) of Table 6 are the results of estimation for the production function by using the data by seven regions and by five expenditure quintile classes, and using the ordinary least squares method. In the case of regression (1), the agricultural land area was used as the land, and in the case of regression (2), the crop land, area was used as the land. According to regressions (1) and (2), the results of estimation seem to be satisfactory in terms of the level of statistical significance of the estimated coefficients, except for the small t value of coefficient of the labor and the capital; and the goodness of fit.

According to regressions (1) and (2) of Table 6, the sum of estimated production elasticity is not significantly different from unity, supporting the hypothesis that the estimated production functions are the constant returns to scale. Under the assumption of constant returns to scale, the Cobb-Douglas production function of Equation 1 can be modified as follows;

$$\ln(V/A)_i = a_0 + a_1 \ln(L/A)_i + a_3 \ln(K/A)_i + a_4 \ln(M/A)_i + \Sigma_j b_j X_{ji} + \Sigma_k c_k Z_{ki} + U_i \quad (2)$$

The modified land productivity function is estimated again by using the same data and the same method. The results of estimation are presented as regressions (3) and (4) in Table 6. Regression (3) is the case in which the agricultural land area was used as the land, and regression (4) is the case in which the crop land area was used as the land. The production elasticity of land estimated under the assumption of constant returns to scale is shown in Table 6. Regressions (3) and (4) give satisfactory results in terms of the level of statistical significance of the estimated coefficients and the

Table 6. Estimation result of agricultural production function

Regression No.	(1)	(2)	(3)	(4)	Regression No.	(1)	(2)	(3)	(4)
Labor	0.291	0.224	0.292	0.286	Regional dummy X_6	-0.520	-0.477	-0.520	-0.488
	(0.803)	(0.648)	(2.933)	(3.240)		(-3.544)	(-3.373)	(-3.960)	(-3.886)
Land	0.294	0.333	0.295	0.331	X_7	-0.299	-0.332	-0.300	-0.344
	(2.201)	(2.879)				(-1.994)	(-2.474)	(-2.252)	(-2.931)
Capital	0.013	0.018	0.013	0.024	Class dummy Z_2	0.076	0.106	0.076	0.099
	(0.206)	(0.292)	(0.260)	(0.498)		(1.066)	(1.529)	(1.248)	(1.691)
Current input	0.400	0.358	0.400	0.359	Z_3	0.207	0.266	0.207	0.255
	(4.555)	(4.109)	(4.667)	(4.218)		(2.294)	(2.973)	(3.092)	(3.830)
Regional dummy X_2	0.148	0.111	0.149	0.122	Z_4	0.228	0.273	0.228	0.264
	(0.847)	(0.793)	(0.934)	(0.972)		(2.555)	(3.111)	(3.111)	(3.672)
X_3	-0.171	-0.197	-0.171	-0.195	Z_5	0.329	0.386	0.329	0.378
	(-1.306)	(-1.903)	(-1.349)	(-1.939)		(3.146)	(3.699)	(3.487)	(4.034)
X_4	-0.364	-0.424	-0.364	-0.430	Constant term	0.752	0.806	0.751	0.770
	(-2.539)	(-4.009)	(-2.682)	(-4.409)		(1.927)	(2.432)	(2.350)	(2.914)
X_5	-0.243	-0.235	-0.244	-0.249	D. Coef. $\bar{R}_2$	0.927	0.935	0.945	0.936
	(-1.729)	(-1.768)	(-2.165)	(-2.338)	Sum of elasticity	0.998	0.933	1.000	1.000
						(-0.004)	(-0.189)		

Note: 1) In Reg. No. (1) and (2), the Cobb-Douglas type of production functions were estimated. In Reg. No. (3) and (4), the productivity functions were estimated. These land productivity functions are equal to the Cobb-Douglas type production function under the assumption of constant return to scale. 2) The agricultural and forestry land was used as the land in Reg. No. (1) and (3). The cultivated land was used in Reg. No. (2) and (4). 3) Parentheses are t-values. The parentheses for the sum of elasticity are t-values for the test of constant return to scale.

goodness of fit.

Regression (3) is selected to represent the agricultural production function of Vietnam because the estimated coefficients are similar to those for other equations and the coefficient of determination is largest. The "representative" production elasticities are thus obtained as follows: 0.292 for labor, 0.295 for land, 0.013 for capital, and 0.400 for current input.[5] These estimates fall within the range of typical values for the estimated agricultural production functions of many other countries.[6]

Regression (3) shows that the coefficient estimates of regional dummy variables are all negative except for the Red River Delta. These regional dummies would represent various factors. But if we would assume that the coefficients of the regional dummy represent the regional differences of total factor productivity, the following interpretation could be made: The total factor productivity of the Northern Uplands region (the base region) with the lowest per capita annual income (Table 3) is higher than that of other regions, except for the Red River Delta; the total factor productivity of the Southeast region with the highest per capita annual income is the lowest of all regions. Although the agricultural input-output levels of southern regions are higher than the northern regions, the coefficients of regional dummies imply that the total factor productivity of the northern regions is higher than that of the southern regions.

Similarly, we assume that the coefficient of an expenditure-class dummy shows the class difference of total factor productivity. Our results imply that the total factor productivity increases as the expenditure quintile becomes higher.

4. Estimation of the Marginal Productivity of Labor and the Rate of Underemployment

This section shows the existence of underemployment in the agricultural sector in Vietnam by comparing the estimates of marginal productivity of labor and the wage rate. The marginal productivity of labor is estimated by using the estimate of elasticity determined in Section 3. This section also estimates the total underemployed labor in the agricultural sector.

Table 7 shows the estimate of marginal productivity of labor by region, using the per-farm- household data in VLSS. The production

Table 7. Estimation of underemployment labor ratio (1992-93)

Region	Northern uplands	Red River delta	North central	Central coast	Central highlands	South-east	Mekong delta	Whole country
Agricultural output value (1,000 VND)	3,783	3,820	2,952	3,097	5,071	5,250	6,942	4,365
Population of labor participation age (persons)	2.0	2.2	2.6	2.5	2.4	2.5	2.4	2.4
Average labor productivity (1,000 VND/person)	1,847	1,708	1,142	1,257	2,124	2,062	2,941	1,849
Marginal labor productibity (1,000 VND/person)	536	495	331	364	616	598	853	536
Male wage (1,000 VND/year)	718	895	731	1,252	1,446	2,205	1,337	1,175
Female wage (1,000 VND/year)	582	641	579	989	986	1,339	778	814
Wages of male and female (1,000 VND/year)	650	768	655	1,120	1,216	1,772	1,057	995
Equilibrium labor (persons)	0.8	0.6	0.5	0.3	0.5	0.3	0.8	0.5
Underemployment labor (persons)	1.2	1.6	2.1	2.1	1.9	2.2	1.6	1.8
Underemployment labor ratio (%)	59.8	71.2	80.4	86.8	78.8	86.7	65.8	77.2

elasticity of labor used for all regions is 0.29, as estimated in the previous section. Table 7 shows the annual wage earnings by sex, obtained by multiplying 12 by the average monthly wage earnings in the rural areas reported in VLSS, and the simple average of the annual wage for both sexes. These annual wages are significantly higher than the estimated marginal productivity of labor per year in all seven regions. These results support the hypothesis that an underemployment of labor exists in farm households of all regions.

Next let us try to estimate the extent of underemployment in farm households and in the agricultural sector. The estimation is based on the equilibrium condition that the marginal productivity of labor be equal to the wage rate: The equilibrium labor force L^* with the wage rate W is estimated from the following equation.

$$L^* = a_L V/W \qquad (3)$$

whereas a_L represents the production elasticity of labor and V is output. The difference between the real labor force L and the equilibrium labor force L^* is the estimate of underemployed labor.

The estimates of the equilibrium labor force with the wage rate and the extent of underemployed labor are shown in Table 7. The ratio of the underemployed labor is the percentage of underemployed labor force in the total labor force. As shown in line 10 of Table 7, the national average ratio of underemployed labor is as high as 77.2%. The ratio ranges from 59.8% for the Northern Uplands region to 86.8% for the Central Coast. Although the marginal productivity of labor in the Mekong Delta is highest among the seven regions, the medium level of the annual wage rate in the region makes the underemployed ratio low. Despite the medium level of the marginal productivity of labor in Southeast, the high annual wage rate makes the ratio for the region highest. Because the data on the total labor force are not available in VLSS, the number of persons in labor participation age is used in Table 7. Therefore the ratio of underemployment may somehow be overestimated, because some persons who do not participate in the labor market are included in the persons in the labor participation age category.

Table 8 shows the underemployment ratio by industry and by region, based on the data from a labor employment survey in 1996 (Ministry of Labor Invalids and Social Affairs [8]). Those who work less than 40 hours in one week are defined as underemployed labor in the survey. According to Table 8, the underemployment ratio of the agricultural sector for the whole country was 26.9%, and ranges from 17.5% in the Northern Uplands to 34.6% in the Mekong Delta. In any event, the underemploy-

Table 8. Underemployed labor ratio from survey of labor employment (1996)

(Unit: 1,000 persons, %)

Region	Northern uplands	Red River delta	North central	Central coast	Central highlands	South-east	Mekong delta	Whole country
Agriculture								
Employed labor	5,408.2	5,312.1	3,641.2	2,520.7	1,142.2	1,406.0	4,936.3	24,366.7
Underemployed labor	946.5	1,620.3	975.4	703.6	277.3	323.8	1,709.4	6,556.3
Underemployed labor ratio	17.5	30.5	26.8	27.9	24.3	23.0	34.6	26.9
Industry & Construction								
Employed labor	306.1	688.9	311.8	385.4	81.0	1,158.9	749.8	3,682.1
Underemployed labor	56.1	143.9	81.4	83.7	24.4	159.6	154.4	703.6
Underemployed labor ratio	18.3	20.9	26.1	21.7	30.1	13.8	20.6	19.1
Service								
Employed labor	630.6	1,199.5	595.7	776.8	202.8	1,621.3	1,832.2	6,858.8
Underemployed labor	127.5	182.2	131.4	150.4	31.5	235.8	274.1	1,132.8
Underemployed labor ratio	20.2	15.2	22.1	19.4	15.5	14.5	15.0	16.5
Total								
Employed labor	6,345.0	7,200.4	4,548.7	3,682.9	1,426.0	4,186.2	7,518.3	34,907.7
Underemployed labor	1,130.1	1,946.5	1,188.2	937.7	333.1	719.2	2,137.8	8,392.6
Underemployed labor ratio	17.8	27.0	26.1	25.5	23.4	17.2	28.4	24.0

Source: Ministry of Labour Invalids and Social Affairs. *Status of Labour-Employment in Vietnam 1996*, Statistical Publishing House, 1997, Table B2.1 and Table B4.2.01.

ment ratio estimated from the labor employment survey is much smaller than the ratios estimated in this study.

According to the traditional definition of underemployment, the ratio should be obtained by the production function approach adopted in this study. In contrast, the use of the ratio obtained from a labor employment survey is misleading. Based on this study, we can conclude that more than half the labor in the agricultural sector is underemployed and that the underemployment of labor is the primary reason for the existing income differential between the agricultural sector and the nonagricultural sector.

5. Summary

This study attempts to confirm the existence of an underemployment of an labor in the agricultural sector in Vietnam by comparing the marginal productivity of labor with the wage rate.

The Cobb-Douglas production function was estimated, using the data on agricultural input-output by region and by expenditure quintile in the Living Standards Survey conducted in 1993. The results of estimation were satisfactory in terms of the level of statistical significance of the estimated coefficients and the goodness of fit to data.

The marginal productivity of labor for farm households was estimated for 1993. The results show that the marginal productivity of labor was far less than the wage rate in the agricultural sector. This finding suggests the existence of underemployment in the agricultural sector in Vietnam.

At the farm household level, it is estimated that 1.8 persons of 2.4 in the labor force, or 77.2%, were underemployed in 1993. Therefore a reduction of underemployment in the agricultural sector should be one of the most important policy targets in Vietnam. A promotion of labor-incentive industries in rural areas can be considered as one method to solve the underemployment problem based the experiences of Japan, Taiwan, and Korea.

1) The Gini coefficient in Vietnam and neighboring countries was quoted from Table 5 of the world development indicators from the World Bank [17].
2) The GDP data was obtained from the General Statistical Office [3] for 1986-90 and the General Statistical Office [5] for 1991-95.
3) The State Planning Committee and the General Statistical Office conducted this survey to provide nationwide information for an analysis of socio-economic policy. The World Bank provided technical advice for the survey. The survey samples were selected by the three-level stratified random sampling method.

4) The livestock value and the current input for husbandry are not available for the seven-region cross table or for the expenditure quintile in VLSS.
5) These estimates should be checked out with earlier studies of production functions in Vietnam, but an examination of estimates is omitted here because enough information about the estimates of agricultural production functions in Vietnam was unavailable. To the author's knowledge, only a few studies used the production function for the agricultural sector in Vietnam. The estimates of production functions had been published in Brown and Salkin [1], Pingali and Xuan [11], Stroup and Gift [15], and Tuan [11, Appendix 1]. However, with exception of Brown and Salkin's study, the reported parameter values are inconsistent with economic theory and therefore are inappropriate to be used for the comparison. The estimated production functions of South Vietnam's rice production farm in 1971 by Brown and Salkin support the results of this study.
6) See chapter 4 of Shintani [13] on agricultural production functions in each country of the world during the period from 1950 to 1970. The result for agricultural production functions in Japan is also reported in Shintani [13].

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