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Evaluation of Factors Affecting Income of Female Workers in Industrial Enterprises

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Abstract: *Female workers in industrial enterprises in Vietnam account for a relatively high proportion and tend to increase yearly. Low income, low education, and low labor productivity are listed as main reasons of low life quality. Evaluation living standard of female workers, especially income and affecting factors is the key to find solutions to improve the quality of their life. This paper presents results of the study on income assessment to built a model to identify factors affecting income of female workers in industrial enterprises in Thai Nguyen province, Vietnam. Working grade, number of training time per year, productivity, and position are found affecting factors on their income. The results of this empirical work are suggestions for policy makers to find possible solutions to improve living standard of female workers through income policy.*

Keywords: *Female Workers, Income, Industrial Enterprises, Living Standard*

I. Introduction

Thai Nguyen is a province in the Northeast region of Vietnam. It is a mountainous, midland province with a natural land area of 3534.45 square kilometers and a population of about 1.1 million people [1]. Its multi-ethnic society is composed of eight ethnic groups [2]. The economy of the province is largely dictated by its capital city, Thai Nguyen, which is the fastest growing city of North Vietnam. The city is the gateway to northwest Vietnam. The city is also the center of heavy industries of northern Vietnam. Thai Nguyen Iron and Steel Company (TISCO), which is located in Thai Nguyen city, is one of Vietnam's top 20 state-owned companies, and has made a sizable contribution to Vietnam's economy. There are 234,586 people in work in the industrial sector, accounting for 30.94% of the total number of employed labors, of which female workers account for 50.3% [3]. Female workers working in industrial enterprises in the province account for a relatively high proportion. However, the standard of living of female workers is rather low. They regularly have to work overtime, nevertheless income is not commensurate with the actual labor intensity. Many female workers have no stable place to stay. Facing with limited living conditions, they get many difficulties in reproducing labor power and increasing labor productivity. The unstable female labor resource is affecting the business efficiency of industrial enterprises. In addition, these factors negatively affect the health, material and spiritual life of female workers, leading to potential problems and social problems. Assessing living standard of female workers, especially income and affecting factors is the key to find solutions to improve the quality of life of female workers in industrial enterprises. The objective of this study is to evaluate the affecting of influence factors on income of female workers in industrial enterprises in Thai Nguyen province, Vietnam to proffer suggestions on the basis of the findings in the study.

II. Literature Review

There have been many researchers studying about factors affecting income of workers. Mincer (1974) showed that education and training increase the productivity of workers by increasing their skills and knowledge and resulting in an increase in income [4]. Since then, he modeled income as a function of education and experience:

$$Logy = logy_0 + rS + \beta_1 X + \beta_2 X^2$$

where y_0 is the income of workers not taking into account the impact of education and income, S is the number of years of schooling, X is the experience of the workers.

Lihui Wang and Junyi Shen (2017) argued that education, gender, age, marriage, and position significantly affect the income of residents in many cities in China [5]. The income model is formed as given:

$$Lny_{it} = \propto_0 + \propto_1 Edu_{it} + \beta X_{it} + \gamma T_{it} + \varepsilon_{it}$$

where Y is an annual income, Edu is education, X is a vector of explanatory variables, including gender, age, type of residence permit, T is a dummy year. Using ordinary least squares (OLS) regression, the authors have shown that gender and age are two factors that affect income. The result of the research has shown that male workers get higher income than female workers. In terms of age, the highest income workers are the group of people aged 46 to 50. Household size and seniority are not found as influence factors on income.

Keshab Bhattarai (2017) assumed that variations in the individual's offered logarithmic wages are explained by the following equation [6]:

$$Logw_i = \beta_0 + \beta_1 S_i + \beta_2 Age_i + \beta_3 Age_i^2 + \beta_4 VC_i + \beta_5 Sex_i + \beta_6 E2L_i + \beta_7 RGSC_i + \beta_8 Region_i + \varepsilon_i^w = X_i^w \beta + \varepsilon_i^w$$

where S_i denotes years of schooling, Age_i proxies labour market experience, VC_i is a dichotomous variable taking positive value if considered individual experienced vocational training, Sex_i is a gender dummy (1 for Male), $E2L_i$ takes a value of 1 if respondent's first language is not English, 0 otherwise, $RGSC_i$ is a vector of 7 dummies representing RG social class on the most recent job, $Region_i$ is a vector of 19 regional dichotomous variables, and ε_i^w denotes the disturbance term. He concluded that the income of workers is affected by factors related to the labor market such as gender, marital status, qualification, English proficiency and regional characteristics.

Doing similar study, Burki & Abbas (1991), Bhattarai & Wisniewski (2002), Vernon (2002), Lee & Lee (2006), Dohmen & Lehmann (2008) and Bhatti (2013) found that personal characteristic such as the number of years of schooling, gender and working experience are main influencing factors on worker income [7] [8] [9] [10] [11] [12]. Petersen et al. (2006) mentioned professional and working time while Brunello et al. (2000), Campos & Jolliffe (2002), and Bhatti (2013) indicated economic sector and regional characteristics are significant [13] [14] [15].

Tong Quoc Bao (2015) carried out a research analyzing factors affecting worker income in the service sector in Vietnam. He found that the number of years of schooling, experience, average working time, gender, region and position have positive impacts on the income of workers [16].

III. Method

A survey of female workers working in industrial enterprises was conducted in Thai Nguyen province, using questionnaires to collect information. Female workers were chosen in industrial enterprises in both urban and rural areas. Glonics Vietnam Co., Ltd (GLONICS) and Thai Nguyen Iron and Steel corporation (TISCO) located in Thai Nguyen city and Thainguyen Investment and Trading Joint Stock Company (TNG) located in Phu Binh district were chosen since these enterprises are three largest enterprises in Thai Nguyen province and more than half of employees are female, especially in Glonics and TNG where young female workers account for a large amount of employees.

Incorporated in 2012, GLONICS is a 100% foreign-owned company engaging in manufacturing of headsets and earphones for mobiles and other electronics components. Headquartered in Thai Nguyen, the company is a half-owned subsidiary of Bujeon Electronics Co., Ltd, which is based in Korea and specializes in production of audio components. The firm contributes to the completion of the parent company's supply chain, selling its products to the subsidies situated in China of Bujeon Electronics Co., Ltd. Currently, the company has 3 manufacturing plants located in the same address as its headquarter in Thai Nguyen Province with capacity of 500 million products/year. The company's registered charter capital is over VND 126 billion [17].

Established in 1959, TISCO, the cradle of the metallurgical industry of Vietnam is the first a unique metallurgical zone in Vietnam with an integrated production line from exploiting iron ore to making cast iron, steel billet and rolling steel. Over almost 50 years of operation and development, TISCO has been non-stop growing up in strength, with the rolling steel capacity currently of 550,000 tons per year, turn-over gained VND 4,000 billion, and the broad product distribution network nationwide [18].

TNG was established in 1979. The company has 12 garment factories with 233 production lines and auxiliary plants: Embroidery factory, wash industrial, manufacturing barrel bag, carton, factory cotton, quilted cotton. TNG is ranked in the "Top 500 largest enterprises in Vietnam" and "TOP 10 largest enterprises of textile industry of Vietnam". In 2017, the revenue of TNG was $115 million [19].

In total, 550 female workers from GLONICS, TISCO, TNG were randomly chosen for interview. Table 1 describes the distribution of the sample.

The study uses linear regression method to analyze the impact of independent variables on average income of female workers. The average income of female workers in industrial enterprises includes salaries, wages, allowances, and subsidies. The independent variables included in the model are defined in Table 2.

Table 1. Sample distribution

Region	Enterprise	Employees	%	Number of respondents
Thai Nguyen city	TISCO	4,467	31.53	174
	GLONICS	6,500	45.88	252
Phu Binh district	TNG	3,200	22.59	124
Total		14,167	100.00	550

Table 2. Independent variable definition

Variable	Definition	Direction of influence (+/-)
MAR	Dummy: Marital statue (1_Married, 0_Single)	+
EDU	Dummy: Education (1_Primary School, 2_Junior High School/High School, 3_College, 4_University)	+
WGR	Working grade (Level 1 to 7)	+
TRAIN	Number of training time per year	+
TECH	Dummy: Technology requirement (1_Yes, 0_ No)	+
EXP	Dummy: Experience requirement (1_Yes, 0_ No)	+
PROD	Dummy: Productivity (1_below output quota, 2_equal to output quota, 3_ exceed output quota)	+
POS	Dummy: Position (1_Worker, 2_Group leader, 3_Foreman, 4_others)	+

One of the necessary conditions for regression analysis is that the independent variable must be correlated with the dependent variable. Pearson correlation analysis was pretested to remove inappropriate variables out of regression analysis. The observed variables have significance at p_value > 0.05 were excluded from the model.

The multicollinearity phenomenon violates the assumption of the classical linear regression model that independent variables do not have a linear relationship with each other. If the magnification coefficient VIF (variance inflation factor) is greater than 2, then there are signs of multicollinearity, so it is necessary to remove these variables.

The income model is formed as given:

$$Lny_i = \beta_0 + \beta_1 MAR_i + \beta_2 EDU_i + \beta_3 WGR_i + \beta_4 TRAIN_i + \beta_5 TECH_i + \beta_6 EXP_i + \beta_7 PROD_i + \beta_8 POS_i + \underline{\varepsilon}_i$$

where y_i is average income and $\underline{\varepsilon}_i$ denotes the disturbance term.

IV. Results And Discussion

Among 550 responses of the survey, 496 responses (90,2%) were useable for analysis. The general characteristic of interviewed female workers is summarized in Table 3.

The results show that the female workers have an average age of 30.8 years. Single female workers are 153 people, accounting for 30.8% and married female workers are 343 people, accounting for 69.2%. In terms of education, junior high school/high school comprise 41.3%, following with college, university, and primary school with 31.7%, 25.8%, and 1.2% particularly. Regarding the working grade, the average grade is 2.79. The average working time of female workers is 6.7 years, of which the shortest is less than 1 year and the longest is 32 years. The apprenticeship time is about 3 months before they start their job officially. Annually, they take part in one to two training courses organized by their companies to meet the requirement of their job.

Regarding the level of complexity in the work, survey data shows that the work of female workers in industrial enterprises requires technological knowledge at 49%, working grade at 54%, experience at 64%, working skill at 60%. In addition, 74% of the total are working with machine, 62% are required to work overtime, and 39% are working in polluted condition. In terms of income, female workers have the lowest income of VND 2.8 million/month and the highest VND 30 million/month. On average, female workers earn 5.6 VND million/month. The income obtained in this research is compatible with the average income of female in Thai Nguyen and many other provinces in Vietnam [3].

As mention earlier, one of the necessary conditions for regression analysis is that the independent variable must be correlated with the dependent variable. Pearson correlation analysis was pretested to remove inappropriate

variables out of regression analysis. Independent variables that correlate with the dependent variable are: AGE, MAR, EDU, WGR, WTI (working time), TRAIN, TECH, EXP, PROD, POS. The pre-test regression analysis shows that the AGE variable has VIF of 3,097 and the WTI variable has VIF of 2,828. These two variables were removed from the model. The remaining variables MAR, EDU, WGR, TRAIN, TECH, EXP, PROD, and POS were retained for the final regression analysis.

Table 3. Statistical Description

	Min.	Max.	Mean	Std. Dev.
Age (years old)	17	55	30.80	8.74
Marital statue (Single/Married)	0	1	0.69	0.46
Education (Level 1 to 4)	1	4	2.83	0.82
Working grade (Level 1 to 7)	1	7	2.97	1.63
Working time (year)	0	32	6.68	6.82
Apprenticeship time (month)	0	36.5	3.24	4.64
Number of training time per year	0	10	1.51	1.00
Technology knowledge requirement (Yes/No)	0	1	0.49	0.50
Working grade requirement (Yes/No)	0	1	0.54	0.50
Experience requirement (Yes/No)	0	1	0.64	0.48
Working skill requirement (Yes/No)	0	1	0.60	0.49
Overtime working (Yes/No)	0	1	0.62	0.49
Working in polluted environment (Yes/No)	0	1	0.39	0.49
Working with machine (Yes/No)	0	1	0.74	0.44
Income (VND million/ month)	2.8	30.0	5.60	2.14
N = 496				

Table 4 presents the results of linear regression.

Table 4. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	1.462**	0.638		2.292	0.022		
	MAR	0.260	0.230	0.054	1.127	0.260	0.849	1.177
	EDU	0.053	0.158	0.019	0.334	0.739	0.625	1.601
	WGR	0.265***	0.081	0.185	3.287	0.001	0.621	1.611
	TRAIN	0.452***	0.104	0.193	4.332	0.000	0.989	1.012
	TECH	0.197	0.247	0.043	0.798	0.425	0.662	1.512
	EXP	-0.156	0.247	-0.034	-0.631	0.528	0.683	1.465
	PROD	0.803***	0.259	0.140	3.106	0.002	0.960	1.042
	POS	0.508***	0.112	0.228	4.539	0.000	0.774	1.291
	R square		0.200					
	Adjusted R square		0.185					
	F		12.768					

a. Dependent Variable: INC

*** significant at p_value ≤ 0.01

** significant at p_value ≤ 0.05

At the 1% level, the coefficients of variables WGR, TRAIN, PROD, and POS are statistically significant. As shown in table 4, the income of female workers has positive relationship with working grade, number of training time a year, productivity, and working position. R square is 0.2 and the value of F is equal to 12,768 from the ANOVA variance analysis table with the significance level less than 0.01 indicates that the regression model is suitable and usable.

Thus, the regression model assesses the factors affecting the income of female workers in industrial enterprises in Thai Nguyen province is formed as:

INC = 1.462 + 0.265WGR + 0.452TRAIN + 0.803PROD + 0.508POS

All four coefficients of these variables are positive in relationship with income. Specifically, the higher the working grade, the higher the income is and vice versa, or in the other words, when the working grade increases by 1, the income will increase by VND 0.265 million. Similarly, the higher number of training time a year, the higher productivity, and the higher position in job decide the higher income and vice versa.

The affecting of four factors on the income of female workers are explained as following:

First, female worker with higher working grade get higher income. In Vietnam, enterprises use the salary system, which is the regime applicable to direct workers and pay according to the labor results regarding both quantity and quality. The quantity of labor is represented by the labor cost used to produce the product over a period of time. Labor quality reflects the professional of workers. A high level of working grade affirms high quality labor skills, experience, and productivity. The wage scale is the level of discrimination of working grade and is classified from low to high. Thus, when the working grade of female workers in industrial enterprises increases, their wage will increase, and their income will increase accordingly.

The second factor affecting the income of female workers in industrial enterprises in Thai Nguyen province is the number of training time in a year, in particular the number of training time in a year increases, the more income female workers get. This is explained as follows: Training at industrial enterprises includes training at the beginning of employment, training while working, and training for future jobs. When the number of training sessions in a year increases, female workers will be trained to improve their professional skills, update new techniques, thereby creating conditions for female workers to take a salary promotion or be converted to better positions. Hence the income of female workers will increase if the number of training time in a year increase.

The third factor affecting the income of female workers is the productivity. Higher productivity decides higher income and vice versa. Female workers with the output exceed the output quota of each labor position get higher payment compared to female workers with the output equal or below the output quota. The survey data confirms that 62% of female workers in these enterprises have to work overtime, particular in GLONICS and TNG where female workers regularly work for 10 to 12 hours a day. The payment depends on the number of products per hour they produce. This payment system is regularly implemented by industrial enterprises nationwide.

The fourth factor affecting the income of female workers is working position. The results show that 3% of the total surveyed female workers are foreman, 13% are group leaders, and 69% are workers. These results reflect the low average income of female workers at 5.6 VND million/month. It is clearly that the female workers with higher working position with higher quality get higher payment from the enterprises for their responsibility in work.

The findings of our study are in good agreement with studies of Lihui Wang and Junyi Shen (2017), Petersen et al. (2006) and Tong Quoc Bao (2015). We have addressed not only the factors affecting income of female workers in industrial enterprises but also reflected the overview of their working condition and job characteristics. The important implication of these findings is to help the managers recognize which is the most affecting factors on female workers income and find the most suitable income system to encourage and improve the working efficiency of female workers.

V.Conclusion

From the research that has been carried out, it is possible to conclude that the factors affecting the income of female workers in industrial enterprises in Thainguyen province in Vietnam are working grade, number of training time per year, productivity, and working position. The results of the study are the basis for proposing solutions to increase income and improve living standard for female workers. First, industrial enterprises need to improve the quality of labor through training. Second, female workers should get regular and stable jobs. Third, right employees should be organized for the right jobs, creating conditions for female workers to change their positions when having all necessary conditions on professional qualifications and experience. Fourth, female workers themselves need to improve skills and professional qualifications to get opportunity to upgrade salaries and better positions, facilitating income growth and improving living standard.

The results of this research proposed method can be readily used in practice. This approach can be successfully used for a number of applications practically. The next stage of our research is to find the answer for the question how to improve life quality of female workers by improving not only income but also education, health care, environment, and social benefits.

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