UP School of Economics
Discussion Papers

Discussion Paper No. 0815 November 2008

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Abstract

This paper deals with the supply of male and female labor in Philippine industry. Using unit record data from the Philippine survey of manufactures of 2005, a supply equation in which labor by sex of workers is estimated with the wage rate used as the explanatory variable. The results confirm the finding of this author's other study of labor supply that the supply of labor is within the zones of *unlimited* and *abundant* labor supply as described in that paper. The wage rate – whether it is the wage bill as size indicator for the firm or that of wage rates for either male or female labor – is not a significant explanatory variable. External and institutional conditions are more important in indicating the level of wages that firms accept when they hire labor in industry. In the few situations where the wage rate helps to explain the supply of labor, its influence is of negligible impact. For male labor, there is a (weak) indication that female labor is more complementary as a labor factor. Male labor receives a higher average rate of pay compared to that of women, but the supply of male labor appears to be more directly related to the female wage. As female wages rise even by the smallest change, so would the rise in the supply of male labor. In the case of female labor, the presence of male labor appears more like a (weak) competitive presence so that there is a negative rate associated with female labor. Firms within specific size groups hire labor according to their labor requirements but the wage rate is not a significant determinant. Specific industry that requires large numbers of workers for their operations such as those in export manufacturing and those that produce wage are partly but not substantially affected by variations in the wage rate. The study also points out those industry groups that tend to favor male or female workers in their workforce.

Key words: Labor market, Female Labor, Male Labor, Philippine economy, Supply of labor.

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I. Rationale for the study: Men and Women in the Workplace

Men and women are together in the labor force. The dynamics of their presence in the work place depend on the customary division of labor within the family. Traditionally, the woman is part of an overall hierarchical structure of family authority, with the woman's place pinned down to the home. In this role, the woman (as wife) takes care of home provision, care of the children, support of house duties that makes the family function as a unit. This observation depends on many factors – the income of the household, the income of the main wage earner which, in the traditional family, is the function of the man.

In a developing society this role is subject to change. Women may become more empowered by education, or by shifting home dynamics brought about by change and modernization itself. For instance, poverty (or low income of the main support) and the changing needs of the household (birth, growth, and education of children), empowerment of women (sexual politics leading to liberalization of the woman, voting rights, etc.) are all important in this relationship between man and woman. The study of what determines labor force participation of women is an important issue that requires study.

* Professor of Economics Emeritus, University of the Philippines School of Economics. I am grateful to Rose Edillon and Sharon Faye Piza of the Asia Pacific Policy Center for re-instilling my interest in labor market issues and for introducing me to the large set of economic data that they have shared with me.

This study does not deal with these basic and important questions. The study takes as given the steady labor force participation of women as currently exists in the Philippines. The focus of the study is to delineate a supply of female labor as distinct from that of male labor. This study uses the extensive set of data involving male and female labor as contributors to productive activity. They work together in the firm and the economy. Male and female labor are hired at wage rates that are likely to be seen as guiding the amount of labor that is supplied to the firms. Firms employ men and women in the work place often as complementary factors and sometimes as competitive inputs in the workplace.

This paper is an extension of this author's study of Philippine labor supply abundance (see Sicat, 2008) to the subject of male and female supply of labor. The major conclusion of the early labor supply study supports the hypothesis of unlimited and certainly quite abundant labor supply. This is a condition in which labor supply is made available in the workplace without causing any pressure on the level of wages. The relative abundance of labor – indeed its unlimited supply – makes the market wage rate irrelevant as a major determinant of labor supply.

II. Statistical Hypotheses for the Supply of Male and of Female Labor

In the previous labor supply study, labor is treated as single factor, where all units of labor, whether female or male, are treated as homogeneous. The following functional relationship was used:

$$Labor_i = g(Wage_i, a\ vector\ of\ X_{ij}, e_i)$$

where *labor* is total labor (measured in man-years of employed labor) in the firm *i*, *wage* the average wage rate of the firm, and *e* the usual stochastic error term. A corresponding vector of attributes X_{ij} associated with the firms that form the data sample within the industry, is added, where *j* is the indicator of the specific characteristic.

From a gender point of view, the total labor supply is made up of male and female labor that the firm hires for its use. If firms are gender blind in their search for labor, there would be no need to make any distinction of whether the labor that is hired is male or female. But of course it is well-known that there are types of industries in which male labor is more often used than that of women. On the other hand, in other types of industries, female labor is preferred. The supply of male and female laborers is a question involving separate supplies classified by their gender attributes.

An economic proposition about the supply of labor is that it is explained by the wage rate. This applies whether the worker is male or female. Of course, there could be separate wage rates that are relevant to the particular male and female labor. If different wage rates are applicable to each type of labor, then a representation of the same relationship is that the supply of labor for male labor would depend on the male wage rate and also on the wage rate of female labor, especially if the firm uses both for the same line of work. A similar proposition can be advanced for female labor, with male wage rates also acting as an explanatory variable along with the own-female wage rate. As a

general proposition, this is a testable proposition for estimating the supply of male and of female labor in industry.

A parallel presentation of the supply of labor by gender is patterned after the supply of labor when labor is treated simply as homogeneous and therefore gender-less. For the supply of labor of particular gender, the same type of regression model is used, with the exception that the wage rate as an independent variable comes in two variables, the wage rate for male labor and for female, respectively. In particular, for male laborers, the regression model is framed in two statistical models attempting to estimate the supply of labor behavior.

For Model I:

$Labor\_male_i = g(Wage\_bill_i, Wage\_rate\_male_i, Wage\_rate\_female_i, a\ vector\ of\ X_{ij}, e_i)$.

For *Model II*, the wage_bill is dropped, hence:

$Labor\_male_i = g(Wage\_rate\_male_i, Wage\_rate\_female_i, a\ vector\ of\ X_{ij}, e_i)$.

The vector of X_{ij} refers to the vector of firm attributes that are used (as in the earlier study). In the first instance, it is the size of the firm by labor employment. In the second instance, it is the specific industry grouping to which the firm belongs.

In the case of female labor, *Model I* is:

$Labor\_female_i = g(Wage\_bill_i, Wage\_rate\_female_i, Wage\_rate\_male_i, a\ vector\ of\ X_{ij}, e_i)$.

Model II for female labor is correspondingly:

$Labor\_female_i = g(Wage\_rate\_female_i, Wage\_rate\_male_i, a\ vector\ of\ X_{ij}, e_i)$.

Male and female labor is measured in man-years and the wage bill as well as average wage rates are measured in PhP1,000 units. All the estimates of the slope coefficients for the wage variables and their standard error terms appear only on one side of the equation and they could be interpreted as *unit*-peso by moving the estimates three decimal places to the left. The coefficients for the specific vector attributes do not need to change for they affect only the constant of regression which refers to the labor units – male or female as the case may be. These are the units of the regression constant since that estimate refers to the dependent variable when the wage units are at zero value (arithmetically).

III. Data analysis

Manufacturing data from the Survey of Business and Industry 2005 are part of an integrated survey of economic operations of establishments. Reports of these surveys are summarized in Philippine economic statistical reports, for instance, in the annual Philippine Statistical Yearbook. The surveys provide useful information on other economic issues and activities.

The data consist of unit records from the survey of manufacturing establishments. A large sample of respondents provides greater analytical flexibility in the use and grouping of the data. The unit records are those of business establishments which could

be a branch, a factory unit or main office of a business unit. Most establishments are simply firms operating as individual business units so that reference to "firms" rather than establishments is mainly used in this paper.

An important piece of information in the survey is the data on labor employed that is distinguished by gender. To derive an economically meaningful behavioral relationship from this data, the wage rate that provides information on the relationship of work effort and wage income is needed. Unfortunately this is not available directly. An indirect imputation of this is possible. The survey asks the respondent firm the amount of gross salaries and wages that the firm pays its employees during the survey year. The gross salaries and wages "refer to payments in cash or in kind prior to any deductions for employee's contributions" to social security, tax etc. Such a definition include total basic pay, overtime pay for extra hours worked, vacation and leave benefits pay, bonuses, food and other cost of living allowances, commissions for salaried employees, commutable transportation and representation allowances, and other gratuities, including separation pay. In short, it is a comprehensive wage bill. Although gross wage bills are reported, there is no directly available figure about the wage rates of workers by gender. This has to be derived indirectly.

But the wage bill as reported by the firm is in the aggregate. It is not broken down by male and female workers. A host of estimation problems are linked with any effort to divide the wage bill among male and female workers. Such is the case with wage differentials among the various occupational tracks of workers within the firm. Another problem is the inequality arising from executive pay and worker's pay. Other kinds of statistical issues are therefore likely to interfere in constructing the wage numbers for male and female workers in each firm. The choice of bravely using assumptions about the division of the wage bill or discarding the project is clear. A simple approach is used to deal with this issue. The wage bill is allocated by prorating it in accordance with the number of male and female workers in the firm. Although this sounds simple enough, the issue posed is which pro-rating weights are to be used.

Three alternative distribution weights could be used for this exercise. The first is to apportion the weights of male and female workers according to the proportion of male and female workers in the firm's total employment. The second is to use the proportion of workers among production workers. Production workers composed of male and female workers are reported as part of the total employment in the firm. However, this kind of data is not returned by the respondent firms in the same manner that they complied with information on total employment. A third possibility is to use the man-hours statistics of male and female employment. Again, in this case, such alternative measurement of the labor input while provided is not as universal as total employment data.

For this reason, the distribution weights between male and female workers are derived from the data on total employment of male and female laborers. The average distribution weights derived from the three options is shown in the attached table.

Male-female distribution weights:

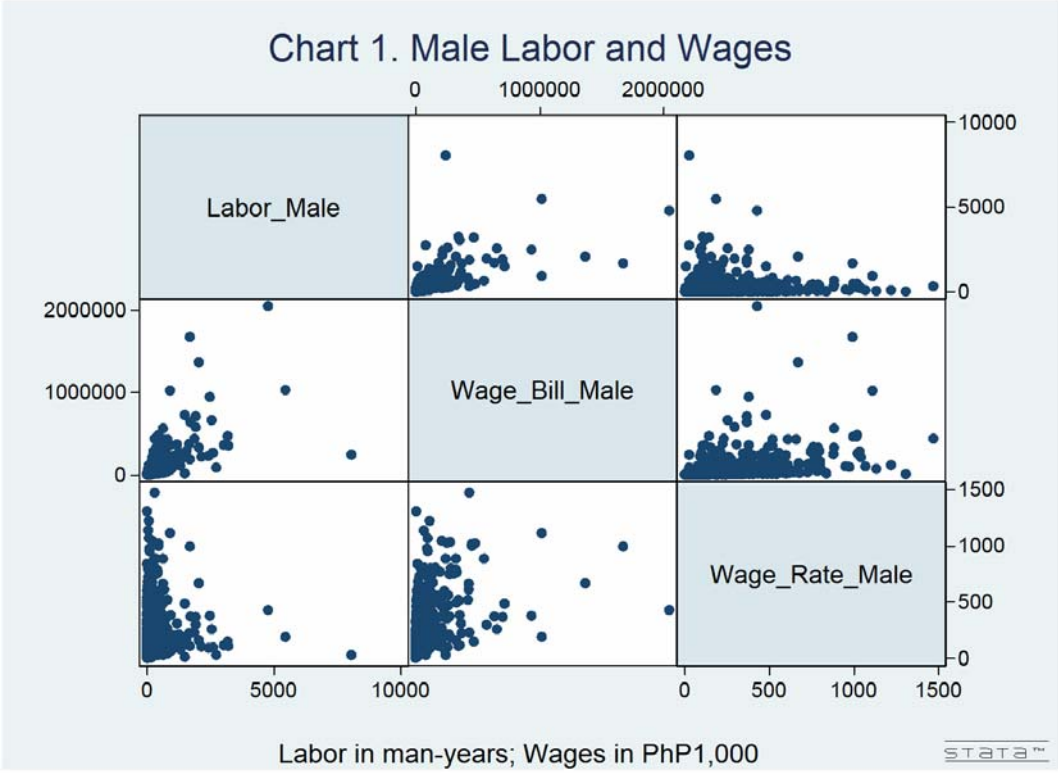
Labor	Obs.	Mean	Std.Dev.	Min	Max
Total Workers:					
Male	4463	0.62992	0.25939	0	1
Female:	4463	0.3008	0.25939	0	1
Production Workers:					
Male	3828	0.66511	0.30784	0	1
Female	3828	0.33448	0.30784	0	1
Total Man-Hours:					
Male	3731	0.65687	0.30694	0	1
Female	3731	0.34312	0.30694	0	1

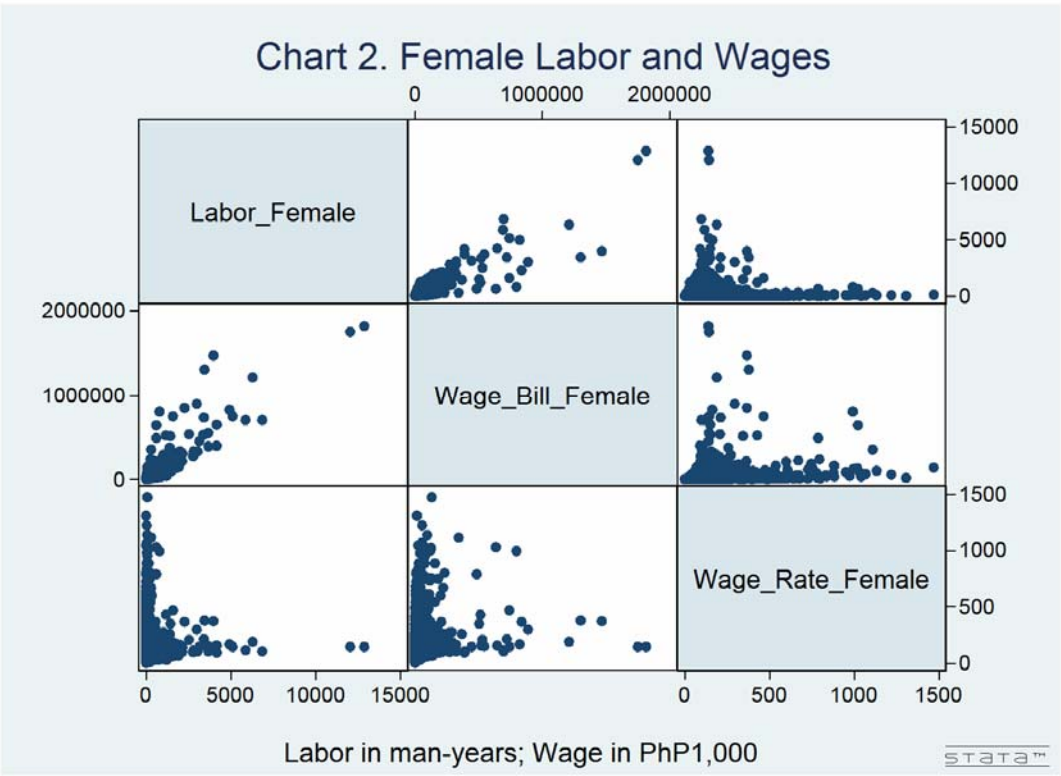
To generate the wage bill per set of workers by gender, the percentage proportion of workers within the firm for male and female labor is multiplied with the reported total wage bill for the firm *i*. For any total employment record of male and female workers of firm *i*, the proportion of male workers is w_male_i and for female workers w_female_i. Then, the total wage bill of the firm *i* yields wage unit variables for male as follows: $w\_male_i \times total\_wage\_bill_i$. For female laborers and for each unit record *i*, it is $w\_female_i \times total\_wage\_bill_i$. As already explained, the wage variables are entered as data in PhP1,000 units.

The wage rates for male and female workers are derived in a straightforward manner for each firm *i*. The average wage rate is derived for male workers in firm *i* by dividing the male wage bill by the total number of male workers in the firm. Correspondingly, the annual wage bill for female workers is derived by dividing the female wage bill by the total number of female workers in the firm. All units for labor are measured in man-years of employment. *For purposes of ease of calculation, the wage units employed are measured in PhP1,000 units. The regression models therefore involve calculating the man-years of labor supply offered by gender on wage units that are measured in PhP1,000 units.*

Plots and diagnostics

The plots of data give ominous indications. Chart 1 shows male labor against the male wage bill and annual wage rates for male workers. Chart 2 correspondingly does the same for female workers. These plots of data do not give good patterns of relationships between labor supplied and wages. It appears better in relation to the wage bill but the pattern in relation to wage rates is not clear. It is hard to predict a pattern of relationships. The regression results ought to provide greater precision on these somewhat apparently weak relationships. Through a number of techniques to introduce specific characteristics of the firm samples, it is possible to find some regularity even in the pattern of weak relationships.





IV. The regression results

The results of the supply of labor regressions for male and for female labor are reported in the succeeding summary tables. For the purpose of the analysis, a simple view of the tables providing summary information on the significance level of the estimates is given. The lowest degree of significance levels (*) is reported at 5% probability level, at 1% (**) and the highest degree (***) at almost 0.1% probability level.

The discussion of the male labor supply is first undertaken, then that for female labor. There are important nuances in the estimates and the main framework of discussion is to bring out such differences.

Supply of male labor in industry

Table 1 shows the regression estimate for the supply of male labor, both for *Model I* and *Model II*. Model 1 uses the total wage bill as an explanatory variable. The wage bill as an explanatory variable provides an immediate indication of firm size. Firms with high wage bill have relatively high employment. But does this translate in terms of higher wage bill aside from just indicating a rising size in the number of workers?

Table 1. – SUPPLY OF MEN (with Women) at Work in Philippine Industry -- Summary of Estimates

Dependent variable: Labor_male (in man-years)

Variable	Model I	Model II
Wage bill	0.0014101***	
	0.00002552	
	0.0000	
Wage rate_male	0	0
	0	0
	.	.
Wage rate_female	-0.18603***	0.45637***
	.027705	0.032966
	0.0000	0.0000
_Constant	72.618***	46.494***
	4.2069	5.4801
	0.0000	0.0000
R^2 *adjusted*	0.44312	0.04295
rmse	197.37	258.74

legend: b-coefficient/standard error/probability
significance level: * p<0.05; ** p<0.01; *** p<0.001

In *Model I*, the total wage bill is highly significant, positive but very small. As an indicator of the size of the firm, firms with high wage bills hire large amounts of labor in the market. Despite the highly significant estimate of this positive wage bill coefficient, in actuality, it only has a very low value so that if at all, any increase in male employment only causes an increase of the wage bill in a negligible way. Recall that the wage bill is entered in the regression in units of PhP1,000. The actual impact of this in terms of peso units of increments in the wage bill per man-year of labor is a coefficient that still has to be calibrated to the proper unit if the reader thinks in terms of peso units. The proper calibration is to divide the coefficient by 1,000. In such a case, the wage bill coefficient that is estimated is really is only 0.0000014 (!) which is of course almost close to zero.

The next important finding is the negative value of the annual wage rate coefficient. In terms of the supply estimate for male labor, the own-wage rate for men is virtually zero and is dropped as an explanatory variable. This is probably the result of the high collinearity between male and female wage rates. The effects on the wage rate are therefore on the annual wage rate for women. This coefficient for female annual wage rate is highly significant but is also very tiny in value. (Its actual value is -0.00018 after calibrating the slope estimate coefficient to the unit peso value from PhP1,000.) The economic explanation for this is that the large firms could hire labor in the market at wage rates that are essentially determined by the going market wage rate – a condition that is not directly attributed to the fact that the firm's requirements of labor do not yet cause any scarcity of the labor factor as there are more applicants available for the same jobs. This is the typical situation of abundant labor. At the going wage rate there is a large amount of unemployed waiting in line to be employed. Firms can hire as much

labor as they want to hire, without creating any adjustment of the supply of labor since it is quite abundant.

In *Model II* where the effects of size – as measured by the wage bill – is absent, the burden of explaining the variation in the supply of labor offered for hire is only the wage rate. In terms of this model of separate supplies of male and female labor, the annual wage rates for male and female labor are used as the explanatory variables.

Examining the unit record data of respondents in the survey on wages within firms, the average wage rate for male labor exceeds the average for women. This could occur for many reasons – not necessarily intrinsically indicating any wage discrimination against female labor. One reason for this situation could simply be the joint supply and demand relationships in the labor market. There are relatively more women laborers in relation to overall demand for them compared to the male labor market. The result of this could be a higher annual wage rate for male workers than for women workers, with skills and other factors related to the nature of the job taken to be equal.

The result of *Model II* shows that the supply of male labor does not vary with the wage rate for men. As in the *Model I* case, the explanatory variable is dropped. The main burden of any movement in male employment is linked with the wage rate of female labor. Here, the slope coefficient corresponding to female labor is positive and, after calibrating the estimated coefficient with peso units of wages, it is equivalent to 0.000456 and highly significant but quite small in number. Such value of the slope coefficient implies that the amount of labor supplied to the firm does not influence any significant change of the wage rate. This finding provides strong support of the conclusion that most of the impact of the wage rate on the supply of labor is largely outside the direct labor supply offer market of male workers. The wage rate determining employment is outside the level of the firm in industry but on general factors or issues affecting the supply and demand in the labor market.

In such a case, the value of the estimated constant of regression becomes very crucial. The estimated constant determines in general how much labor is supplied to industry. Because the regression model is based on the estimates of means of the variables observed, such estimates could only be as good as the variation about the mean values of the observations, something that needs to be elaborated in much greater detail (to be done later in this study).

Model II has a very low explanatory power overall on the variation of male employment that is supplied to industry. This is shown by the very low value of the *adjusted* R^2.

Supply of female labor in industry

The statistical summary results of the regression estimates for the supply of female labor are given in Table 2. In general, except for the degree of differences in the statistical coefficients that are estimated from the data, the conclusions to be derived from the supply of female labor are the same as those for male labor.

Table 2. – WOMEN (with Men) at Work in Philippine Industry -- Summary of Estimates
Dependent variable: Labor_Female (man-years)

Variable	Model I	Model II
Wage bill_female	0.002607***	
	.000044	
	0.0000	
Wage rate_female	-0.0092983	0.90913***
	.064722	0.087757
	0.8858	0.0000
Wage rate_male	-0.79051***	-0.19344***
	.039897	0.053913
	0.0000	0.0003
_Constant	125.99***	74.708***
	7.6497	10.615
	0.0000	0.0000
R^2 *adjusted*	0.50157	0.02787
rmse	333.35	465.54

legend: b-coefficient/standard error/probability
significance level: * p<0.05; ** p<0.01; *** p<0.001

Model I results affirm the importance of the wage bill indicator as an explanatory variable for the amount of labor supplied to the industry. But this has the consequence that the size explains the variation of the labor offered. The variations in the wage rate of both male and female labor in this model are small and they exert a negative impact on the amount of labor supplied. In other words, large firms are able to take advantage of the easy availability of cheap labor that the economy offers. Other factors that determine the demand and supply for labor in an economy and the supply situation in industry are therefore but an aspect of the overall market picture. Still, the large supply of labor in the whole economy does not create the size of demand for labor in industry to make labor scarce. Market forces on the supply side of labor simply means that the supply of labor does not get tight and does not cause a rise of wages even as the size of industry expands.

The *Model I* estimates of female labor echo the results that are obtained for the supply of male labor. The own wage rate for female labor is a non-zero estimate; it is negative but is not significant. The wage rate of male labor has a negative coefficient and is highly significant. When calibrated to peso units, this estimate becomes -0.00079, a very low value as in the case of the slope coefficient for the male labor supply regression discussed earlier.

Using *Model II*, the own-wage slope coefficient for female wage rate is highly significant and positive. This means that the variation of female labor is in the main explained by the wage rate of female labor. On the other hand, the slope coefficient for the wage rate of male labor is negative. In both instances, the appropriate calibration of

the estimates of the slope coefficients will make the values of the estimated coefficients 1000^{th} smaller to conform to peso units in relation to the supply of labor. Thus, the estimates are so much smaller. In the case of female labor, the wage of male labor exerts some competitive pressure on the amount of female labor hired when the male wage rate rises. This is the meaning of the negative slope coefficient estimate for male wage rate in relation to the supply of female labor.

The regression constant for female supply of labor is highly significant and positive. The amount of variation in the supply of female labor however is much higher than can be explained by this regression. Unlike the case of *Model I* which has a high *adjusted* R^2 that explains at least one-half of the variation in employment offered, the wage rates of both male and female labor explains only a very small fraction of the variation in female labor supply.

Further work is needed to grapple with the analysis of the supply of male and female labor. Two routes are explored to understand better the nature of the labor supply estimates. The first route is by way of using the size groupings of the firms and how this affects the supply of male or female labor to them. The second route is by examining the industry characteristics of the firms via a restriction of the sample size of the firms in the regression sample.

Supply of male and female labor and the firm size

Table 3 and Table 4 present, respectively, the summary tables showing the statistical significance of the supply of labor, respectively, for male labor supply introducing the firm size as dummy variables. The supply equations are adjusted for the characteristics of the various firms according to their employment sizes. The surveyed firms are grouped according to 10 major groupings, with group 0 being used as the base grouping. These groupings are as follows:

Size 0 – Firms with up to 10 workers (number of observations =534)
Size 1 – Firms with more than 10 and up to 20 workers (467)
Size 2 – Firms with more than 20 and up to 50 workers (1,305)
Size 3 – Firms with more than 50 and up to 100 workers (717)
Size 4 – Firms with more than 100 and up to 200 workers (525)
Size 5 – Firms with more than 200 and up to 300 workers (306)
Size 6 – Firms with more than 300 and up to 400 workers (164)
Size 7 – Firms with more than 400 and up to 500 workers (98)
Size 8 – Firms with more than 500 and up to 600 workers (134)
Size 9 – Firms with more than 600 and up to 700 workers (95)
Size 10 – Firms with more than 700 workers (149).

These groupings are utilized as dummy variables. If the firm in question meets the characteristic of a particular size grouping of firms, then the variable is assigned a value equal to 1, otherwise, it is zero. The benchmark group used is the smallest size of firms, Size 0 which refer to firms with up to 10 workers. Although these numbers in parentheses are the total number of firms in each group, as it turned out the actual firms included in the regressions depended on the actual number of firms that satisfied the joint availability of data to be entered in the regressions. The smallest firms tended to have fewer of these

firms, due perhaps to less attention to the details of male-female labor reporting in the survey. In any case, the reduction in the sample size as a result of this is not substantial and is on average way below 10 percent of the sample of firms in each class. Hence, there were still quite a number of observations made available for the regression calculations to be made.

Table 3. – SUPPLY OF MEN (with Women) at Work in Philippine industry: Firm Size Characteristics

Dependent variable: Labor_male (in man-years)

Variable	Model I	Model II
Wage bill_total	0.00094888***	
	0.00002936	
	0.0000	
Wage rate_male	0	0
	0	0
	.	.
Wage rate_female	-0.18278***	0.17995***
	0.026823	0.027196
	0.0000	0.0000
Size 1	11.577	1.3863
	12.912	14.41
	0.3700	0.9234
Size 2	24.917*	9.1922
	10.967	12.231
	0.0231	0.4524
Size 3	48.826***	30.277*
	11.921	13.292
	0.0000	0.0228
Size 4	87.247***	69.824***
	12.714	14.18
	0.0000	0.0000
Size 5	125.14***	117.44***
	14.495	16.179
	0.0000	0.0000
Size 6	165.69***	175.09***
	17.397	19.418
	0.0000	0.0000
Size 7	175.5***	201.13***
	20.865	23.276
	0.0000	0.0000
Size 8	210.11***	260.56***
	18.653	20.75
	0.0000	0.0000
Size 9	233.83***	324.93***

	| 21.296	**23.564**
	| 0.0000	**0.0000**
Size 10	**| 512.58*****	**865.48*****
	| 20.944	**19.951**
	| 0.0000	**0.0000**
_Constant	**| 10.994**	**-3.9546**
	| 9.7258	**10.845**
	| 0.2584	**0.7154**
R^2 adjusted	**| 0.53835**	**0.42468**
rmse	**| 179.7**	**200.61**

legend: b-coefficient/standard error/probability
significance level: * p<0.05; ** p<0.01; *** p<0.001

Table 4. -- WOMEN (with Men) at Work in Philippine Industry – With Firm Size Characteristics

Dependent variable: Labor_female (in man-years)

Variable	Model I	Model II
Wage bill_total	**0.0018115*****	
	0.00005001	
	0.0000	
Wage rate_female	**-0.1669****	**0.18633****
	.060975	**0.070089**
	0.0062	**0.0079**
Wage rate_male	**-.61496*****	**-0.18305*****
	.037483	**0.04138**
	0.0000	**0.0000**
Size 1	**17.32**	**4.0093**
	24.589	**28.629**
	0.4812	**0.8886**
Size 2	**40.391**	**13.593**
	21.003	**24.442**
	0.0545	**0.5781**
Size 3	**58.727****	**28.587**
	22.551	**26.241**
	0.0092	**0.2761**
Size 4	**87.03*****	**57.494***
	23.67	**27.547**
	0.0002	**0.0369**
Size 5	**117.16*****	**104.89*****
	26.742	**31.137**
	0.0000	**0.0008**

Size 6	**131.7***	**153.64***
	31.517	**36.693**
	0.0000	**0.0000**
Size 7	**172.25***	**222.25***
	36.783	**42.802**
	0.0000	**0.0000**
Size 8	**219.13***	**320.71***
	33.31	**38.651**
	0.0000	**0.0000**
Size 9	**321.67***	**486.76***
	37.994	**43.923**
	0.0000	**0.0000**
Size 10	**910.55***	**1576.6***
	37.003	**37.391**
	0.0000	**0.0000**
_Constant	**40.42***	**7.7265**
	18.842	**21.916**
	0.0320	**0.7244**
R^2 adjusted	**0.58538**	**0.43779**
rmse	**304.03**	**354.03**

legend: b-coefficient/standard error/probability
significance level: * p<0.05; ** p<0.01; *** p<0.001

The resulting estimates of the coefficients for firm size represent an adjustment of the magnitude of the regression constant. In all the regressions, the only sizes that did not yield any significant statistical coefficients are the small firms. These are *Size 1* and *Size 2* firms, both of which cover those firms with 21 to 50 workers, and sometimes *Size 3* firms, with 50 to 100 workers. These sizes of firms represent the plurality of the firms in industry. They have the characteristics of family enterprises and they cover a wide variety of industries in the industrial sector. Most of these small enterprises are also likely to be engaged in wage goods industries or in the provision of goods and services that are designed to meet the needs of small industries and households, oftentimes mainly in the communities where they are located. With their large variety of composition, they also cluster together in a less predictable manner than many firms of large size.

A look at the plots (shown earlier in Figure 1 and 2) signifies that these are the firms with very high average wage rates, indicating a distortion of the wage rate patterns in the industrial sector. These firms do not conform with the pattern of overall wages. This might be due to factors that could be explored for future research. Several possibilities could explain this phenomenon. One hypothesis is that these are governed by family enterprises and that the wage patterns calculated for them were unrepresentative. The wage bill represents high wages for owners and family workers that are included with the wage bill for the more common workforce in the firm.[1]

[1] One subset of these types of enterprises is the cottage industry. These are likely to be small firms where manufacturing operations are often done in the home or on sub-contract arrangements. But cottage industries are likely to have low average wage rates, not high. If the firms report high wages, it could only

A second hypothesis is that these are highly protected industries with also a high wage pattern for some members of its work force. On account of their protected position in industry, it would not be surprising that these types of firms form a subset of enterprises that could be explained with the case of family enterprises.

A third hypothesis is that these types of firms are highly capital intensive enterprises where there is a premium for a very high wage work force. This could very well be true for highly specialized enterprises that serve specific clientele within the country or which have niche export services to the rest of the world.

Supply of male and female labor and specific industry characteristics

Tables 5 (for male labor) and 6 (for female labor) summarize the regression results that show the impact of introducing specific industry characteristics of the many firms in the sample. Under this hypothesis, the variation of labor supply depends on the characteristics of the particular industries to which the firms belong. Thus, industry grouping matters. The aggregation of industry groups uses the same approach in the supply of labor study (Sicat 2008), where details of data discussion are made. Some of the industry groups are specific 3-digit industry. Other industries are agglomerations of 3-digit industries that form a subset of the 2-digit level of aggregation. Seventeen such industry groups are identified, of which five are specific groupings of food industries. These groupings include a good range of wage goods industries, some import substituting domestic industries, some capital goods industries, and a number of prominent and principally export industries. In short, there is a good range of industries serving both the domestic and the export market.

The regression estimates analyzed and reported rely on *Model II*: the supply of labor of male and of female workers is postulated on dependence on either the wage rate of both male and female laborers. The report of regression results contains estimates for all the firms in the sample and three other regression estimates based on different and reduced sample of firms. For the latter purpose, the grouping of firms is much wider than the use of the different firm sizes in the previous section.

In summary therefore, Tables 5 and 6 use the following groupings of firms:

- All the firms (or a total of 4550 firms); "*A*" in short.
- Firms with more than 50 employees but not more than 200 (number = 717), which will be referred to as *small and medium sized firms*, or "*SM*" in short.
- Firms with more than 200 employees but not more than 500 firms (n = 306), or *large firms*, or "*L*" in short; and
- Firms with more than 500 workers (n = 134), referred to as *very large firms*, or "*VL*".

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happen if they are family enterprise with high residual wages for the owners reported as part of the wage bill. The cottage industry hypothesis is unlikely to explain the high average wages reported.

This presentation is motivated by the poor regression results using the all firm sample of industrial firms from the survey. Unlike in the case of the regressions reporting on the size characteristics of the firm in which the different size composition of firms brought improved and more reliable regression results, the introduction of industry characteristics did not improve the estimates as a whole.

Table 5 – MEN (with Women) at Work in Philippine industry: with Industry Characteristics within Firm Size Groups
Summary of Estimates -- *Model II*
Dependent variable: Labor_male (in man-years)

Variable	All_firms	Firms with 51 to 200 Workers	Firms with 200 to 500 workers	Firms with more than500 workers
Wage rate_male	0	0. 039891***	0	0
	0	0.008801	0	0
	.	0.0000	.	.
Wage rate_female	0.4383***	0	0.10268***	0.39543
	.033962	0	0.024303	0.23844
	0.0000	.	0.0000	0.0981
Food 1	36.039	-5.2647	1.1546	-2.3547
	19.291	4.5173	18.897	175.35
	0.0618	0.2441	0.9513	0.9893
Food 2	-22.756	-.96005	16.819	-474.54
	52.204	16.038	35.341	348.9
	0.6629	0.9523	0.6343	0.1746
Food 3	-36.032	-17.941	99.77	0
	35.48	16.039	83.085	0
	0.3099	0.2635	0.2303	.
Food 4	16.395	15.629*	33.645	-14.833
	27.654	6.5217	18.688	295.56
	0.5533	0.0167	0.0724	0.9600
Food 5	2.9792	3.679	44.433	-172.64
	30.574	6.9069	31.791	358.26
	0.9224	0.5944	0.1628	0.6302
Sugar	15.176	-12.466**	37.737*	104.43
	15.74	4.7493	15.11	187.97
	0.3350	0.0088	0.0128	0.5788
Textiles & garments	-3.5441	-31.2***	-80.632***	-374.38***
	11.678	3.089	10.025	103.13
	0.7615	0.0000	0.0000	0.0003
Tobacco	281.41***	-29.354	-61.304	26.222
	64.431	17.929	58.818	256.8
	0.0000	0.1018	0.2977	0.9187
Electric lightng & fixtures	68.367**	-4.3059	-55.77**	278.79
	23.754	5.3126	19.272	193.39

	0.0040	0.4178	0.0040	0.1503
Semiconductors	159.46***	-23.517**	-68.92***	-187.55
	22.992	7.5902	15.369	112.7
	0.0000	0.0020	0.0000	0.0969
Electronics	-18.362	-25.077**	-93.029**	-459.55*
	38.275	9.6575	29.802	215.24
	0.6315	0.0095	0.0019	0.0334
Automotive	87.55	10.168	8.8099	134.25
	46.462	11.389	58.823	322.78
	0.0596	0.3722	0.8810	0.6777
Shipbuilding & repair	5.8658	-5.6396	124.73***	0
	50.661	12.006	37.548	0
	0.9078	0.6386	0.0010	.
Motorcycle	22.99	20.805	13.243	-346.97
	51.652	17.924	41.763	358.5
	0.6563	0.2460	0.7513	0.3338
Woodprocessing	35.794	-2.0468	70.995*	478.1
	24.255	6.227	29.889	295.61
	0.1401	0.7424	0.0179	0.1067
Furniture_from wood	29.131	4.8966	18.912	-16.114
	19.893	4.6839	17.546	223.02
	0.1432	0.2961	0.2816	0.9424
Miscellaneous_mfg	-15.206	-21.711**	-94.761***	-231.36
	26.706	6.9181	20.868	321.21
	0.5691	0.0017	0.0000	0.4718
_Constant	35.978***	67.563***	175.01***	601.99***
	7.044	1.9172	7.1637	85.684
	0.0000	0.0000	0.0000	0.0000
R^2 *adjusted*	.057932	0.12145	0. 2538	0.059404
rmse	256.71	35.712	82.839	700.38

legend: b-coefficient/standard error/probability
significance level: * p<0.05; ** p<0.01; *** p<0.001

Table 6. – SUPPLY OF WOMEN (with Men) at Work in Philippine Industry: with Industry Characteristics for Firm Group Sizes – Summary Estimates – Model II
Dependent variable: Labor_female (in man-years)

Variable	All_firms	Firms with 51 to 200 Workers	Firms with 200 to 500 workers	Firms with more than500 workers
Wage rate_female	0.0205***	0	-0.099386***	-0.42901
	0.056547	0	0.024542	0.41716
	0.0004	.	0.0001	0.3044
Wage rate_male	0	-0.0023246	0	0
	0	0.0071234	0	0
	.	0.7442	.	.
Food 1	51.822	1.8969	4.2313	27.704
	32.12	3.66	19.083	306.78
	0.1067	0.6044	0.8246	0.9281
Food 2	-46.74	45.748***	12.1	-432.97
	86.92	13.091	35.689	610.4
	0.5908	0.0005	0.7347	0.4786
Food 3	-48.251	-12.865	-109.16	0
	59.074	13.091	83.903	0
	0.4141	0.3259	0.1938	.
Food 4	-60.575	-8.6694	-61.365**	-670.12
	46.043	5.3204	18.872	517.1
	0.1884	0.1035	0.0012	0.1958
Food 5	-43.407	-12.642*	-58.666	-755.78
	50.906	5.5419	32.104	626.79
	0.3939	0.0227	0.0682	0.2287
Sugar	-18.462	5.9083	-22.56	-508.49
	26.207	3.8455	15.258	328.87
	0.4812	0.1247	0.1398	0.1229
Textiles & garments	126.04***	31.564***	94.689***	5.5244
	19.444	2.5048	10.124	180.43
	0.0000	0.0000	0.0000	0.9756
Tobacco	142.22	32.993*	12.038	-466.96
	107.28	14.634	59.397	449.28
	0.1850	0.0243	0.8395	0.2993
Electriclighting&fixtures	188.47***	8.5431*	53.598**	956**
	39.551	4.2927	19.461	338.33
	0.0000	0.0468	0.0061	0.0050
Semiconductors	587.82***	43.149***	122.93**	415.45*
	38.282	6.1934	15.52	197.17
	0.0000	0.0000	0.0000	0.0358
Electronics	179.82**	44.566***	176.74***	-201.26
	63.729	7.8814	30.095	376.56
	0.0048	0.0000	0.0000	0.5934
Automotive	-44.384	-16.271	-28.861	-643.81

	77.36	9.2954	59.402	564.71
	0.5662	0.0803	0.6273	0.2550
Shipbuilding & repair	-59.638	-26.962**	-59.046	0
	84.351	9.3034	37.918	0
	0.4796	0.0038	0.1200	.
Motorcycle	-27.427	1.5275	-59.241	-592.8
	86.001	14.631	42.175	627.2
	0.7498	0.9169	0.1607	0.3452
Woodprocessing	-25.97	-2.892	-79.498**	-536.07
	40.385	4.9497	30.184	517.18
	0.5202	0.5591	0.0087	0.3006
Furniture from wood	-14.814	-5.1669	-23.393	-533.7
	33.122	3.8191	17.719	390.19
	0.6547	0.1763	0.1873	0.1722
Miscellaneous mfg	10.732	13.994*	64.271**	-478.91
	44.465	5.6443	21.074	561.97
	0.8093	0.0133	0.0024	0.3947
_Constant	43.343***	31.155***	129.22***	919.87***
	11.728	1.5486	7.2342	149.91
	0.0002	0.0000	0.0000	0.0000
R^2 *adjusted*	0.067963	0.1839	0.32147	0.044664
rmse	427.42	29.152	83.654	1225.3

legend: b-coefficient/standard error/probability
significance level: * p<0.05; ** p<0.01; *** p<0.001

Only three of the specific industries produced statistically significant coefficient estimates in the equation for male labor (Table 5: tobacco, electrical manufacturing, semiconductors). All the rest failed the test of significance at the 5% level. Even relaxing the significance level further did not bring in some industries with significant coefficient estimates. In the case of the "all firms" supply of female labor regressions (Table 6), the same observations are found with only textiles & garments, electrical manufacturing, and semiconductors meeting the same level of statistical significance.

These poor estimates motivated a further regrouping of the firms by using firm size to restrict the sample size. First, the very small firms were eliminated from the group those firms with less than 50 workers. This group of firms is very large, accounting for 2,306 firms or 51.3% of the firms. Thus, three groups of relatively larger firms are regrouped into three sizes so that it is possible to track down separately the small and medium scale firms, large firms, and very large firms. Even with this regrouping, firms with 50 workers are still relatively small in size but as the firm size moves up to 200 workers they become medium sized. This procedure might eliminate from the sample firms those that are cottage industries and other firms likely to be classified as falling within the informal sector of industry.

There is no improvement in the overall statistical estimates from these sets of regressions. Examining the slope coefficients for the wage rate for either male or female labor, the wage coefficient is highly significant statistically in all the regressions with the exception of the very large firms where it is not significant. The other important element is the magnitude of the coefficient. It is smaller for the smaller group of firms, higher for the "all firms" estimates, which is to be expected. The value of the coefficient however is quite small. When calibrated to the peso unit, rather than the 1,000 peso units used for the wage rate statistics, the coefficient (for female labor) is 0.00043 only.

Finally, a summarization of the statistical estimates is placed in the context of the industry's inclination to use more male or more female workers as a matter of preference. One major gain of information concerns the industry group's intensity or inclination to use relatively more male or more female labor by examining the value of the regression estimates for the industry characteristics. The regression constant gives the average value of the labor supply of male or female labor (as the case may be) to the industry for all the firms included in the regression. But the magnitude and sign of the coefficient for the industry characteristics uniquely assigns an adjustment factor to the supply of that male or female labor as a consequence of the industry's presence.

Using the equation for the supply of female labor, for instance, a positive value of the coefficient for the industry group means that the female supply of labor has to be added to the constant term of the regression, implying a higher usage of female labor in the industry's requirements compared to men. But a negative estimate of the coefficient for the industry dummy variable means that the amount of labor used requires a reduction of so much female labor being deducted from the value of the constant term. In this latter case, more male labor is used by the firm. Of course, it could turn out that the coefficient is not statistically significant, in which case, there is little reliance that could be placed on the coefficient estimated. In this situation, reference to the size of the standard errors relative to the coefficient estimates would be useful. Relaxing the standards of the statistical test would probably show some tendencies that could be used to indicate these tendencies. In reporting these tables, the test of 5 percent level of significance is used. Such strict test would reject many of the regression results. But a more relaxed test of significant to 10 percent (which could be read from the probability limits below the standard errors measured) would include a larger number of results. The probability level shown in the tables of statistical estimates (like Tables 5 and 6) would indicate more admissible levels of statistical tests.

Is it sufficient to judge intensity or inclination to use male or female labor in an industry by just looking at one set of equations? In the following discussions, such an approach is utilized. The reader is forewarned that the equation for the supply of male labor is not the exactly the reverse image of the equation for the supply of female labor. The supplies of male and of female labor are different dependent variables. They have their own separate influences depending on the explanatory variables that govern their behavior on the left-hand side of the equation.

Table 7. Male or Female Labor Intensity of Industry and Firm Size Groups

Dependent Variable: Female Labor (in man-years) -- Estimation by Ordinary Least Squares

***Model II* --Restricted Groupings of Firms by Size**

Description of explanatory variables and industry groupings	All firms (*A)*	Firms with 51 to 200 workers (*SM*)	Firms with 201 to 500 workers (*L*)	Firms with more than 500 workers (*VL*)	Male-intensive labor industry	Gender neutral labor industry	Female-intensive labor industry
Wage rate per worker -- Male	0	-0.0023246	0	0			
Wage rate per worker -- Female	0.20235***	0	-0.099386***	-0.42901			
Food 1 (Processing & canning of meat, fish)	51.822	1.8969	4.2313	27.704			all female
Food 2 (Dairy processing)	-46.74	15.748***	12.1	-432.97	A		SM***, VL
Food 3 (Rice & corn milling)	-48.251	-12.865	-109.16	0	A,SM,L		
Food 4 (Grain milled products)	-60.575	-8.6694	-61.365**	-670.12	A,SM,L**,VL		
Food 5 (Wine and soft drinks)	-43.407	-12.642*	-58.666	-755.78	A-SM*, -l-vl		
Sugar industry, including sugar processing	-18.462	5.9083	-22.56	-508.49	A,L,VL	SM	
Textiles & garments industries	126.64***	31.564***	94.689***	5.5244		VL	A***,SM***, L***
Tobacco manufacturing -- cigar, cigarettes	142.22	32.993*	12.038	-466.95	VL		A,SM*,L
Electrical mfg: gadgets, switches, lighting	188.47***	8.5431	53.598	956**			A***, SM,L, VL**
Semiconductor industries	587.32***	43.149***	122.93***	415.45*			A***,SM***, L***,VL*
Electronics TV, electronics gadgets, and assembly	120.92**	44.566***	176.74***	-201.26	VL		A***,SM***, L***
Motor vehicles assembly and manufacture of parts	-44.384	-16.271	-28.861	-643.81	A,SM,L, VL		
Shipbuilding and shiprepair --	-59.038	-26.962**	-59.046	0	A,SM**,L		
Motorcycle mfg:engines, parts, including assembly	-27.427	1.5275	-59.241	-592.8	A,L,VL	SM	
Woodprocessing industries -- lumber, veneer, plywood	-25.97	-2.892	-79.498**	-536.07	A,L**,VL	SM	
Furniture making from wood	-14.814	-5.1669	-23.393	-533.7	A,SM,L,VL		
Miscellaneous manufacturing	10.732	13.994*	64.271**	-478.91	VL		A,SM*, L**
Regression Constant	43.343***	31.155***	129.22***	919.89***	***	***	***
R^2 *adjusted*	0.67936	0.1839	0.32147	0.44664			
rmse	427.42	29.152	83.654	1225.3			

legend: * p<0.05; ** p<0.01; *** p<0.001

Table 7 provides a summary of results regarding inclination of labor use of the specific industry groups studied taken from Tables 6 (for female labor regressions). The first of these is for the "all firms" in the sample regressions, while the succeeding columns report the resulting coefficients derived from the three different restricted

sample sizes of firms – small and medium, large, and very large. Three additional columns summarize the implications of the regression results: whether the industry uses male or female labor more intensively or they tend to be neutral as to labor use between male and female labor. The statistical significance (reported in terms of number of asterisks) of the coefficients provides strong confirmation. The relative values without any reference to their statistical significance show only an inclination to use male or female labor or neutrality in labor use as to gender.

For ease of reading, three columns are used: one to group "male intensiveness" of the labor force in the industry; "neutral"; and "female intensiveness." Judging neutrality can be tricky. A zero or near zero estimate of the industry characteristics is an indication of neutrality but small values of the coefficient can also be accepted as an indication of neutrality. The value however should be related to the size of the constant term. It would be neutral if the value of the coefficient is not a large value relative to the size of the estimated constant term. In this table, those industry characteristics that had coefficient values of *plus* 6 or *minus* 6 are deemed relatively neutral in their requirements.

In interpreting the entries in the table on intensiveness of male or female labor, the symbols *A* (for all firms), *SM* (for small and medium sized firms), *L* (for large firms) and *VL* (for very large firms) are used. The symbols with an attached asterisk superscript indicate that the coefficient is statistically significant at the appropriate level (depending on the number of asterisks). The entries without asterisks are not statistically significant according to the criteria used. In this case the magnitude of the indicator might indicate only an inclination toward the use of male or female labor although less reliable.

It is clear from this table that the following industry types tend to be male intensive: *food 2* (rice and corn milling), *food 4* (grain milled products), *food 5* (wine and soft-drinks), *sugar, automotive, shipbuilding, wood processing, furniture from wood, motorcycle,* and *shipbuilding & repair*.

The industries where female labor is used intensively include the following: *food 2* (dairy processing), *textiles & garments*, *tobacco manufacturing*, *electric lighting and gadgets, semiconductors, electronics,* and *miscellaneous manufacturing* (doll making, gloves, etc.).

The details of these findings indicate that such findings are robust especially when the coefficients are statistically significant. However, there are cases where the estimates, however large in magnitude, are not significant. In this connection, the basis of the judgment is in relation to the estimates in place. However, such estimates are more uncertain.

What is apparent from this pattern of male or female labor employment is that many of the industries that have great importance as wage goods tend to be dominated by labor involving male and female labor. What seems to allocate the dominance or preference for male workers relates to the nature of the work. Those industries that require heavy lifting of weights or work with mechanical parts that require strength tend to be dominated by male workers. Those types of work which require less handling of heavy weights, which often utilize manual dexterity in work requirements that do not involve heavy lifting, become dominated by women.

V. Concluding remarks

This study of male and female labor supply extends the inquiry on the supply of aggregate labor in Philippine industry to the gender dimension of the labor market. The findings support the conclusions of that paper. Labor supply, whether of male or of female workers, is within the zones of *unlimited* and *abundant* labor supply as described in that paper. The wage rate – whether it is the wage bill as size indicator for the firm or that of wage rates for either male or female labor – is not a large factor in determining the supply of labor to industry. The variability of the supply of labor – aggregate or the disaggregated version by gender, that of male or female labor – is not explained satisfactorily by the variation in the wage rate. And in situations where the wage rate helps to explain the supply of labor, its influence is quite minor.

As description of the supply of labor, this finding indicates that labor supply is offered at a wage rate that is determined by institutional and other factors outside of the demand and supply pressures of the labor market. This means that firms usually access their labor requirements utilizing the going institutional wage rate which is likely to be anchored on the minimum and some variations over that anchor to take into account its perceived skill differentiations of the labor being employed. This explains the lack of strong evidence of the wage rate as the determinant of the amount of labor supply to the firm. Such wage rates are determined more by other factors like the minimum wage. The minimum wage is the floor indicator for much of the wage rates for unskilled labor and other labor requiring limited skills. The supply of labor within the macro-economy is just sufficiently abundant in relation to the overall demand arising from productive activity. The labor market depends therefore on factors that firms find to be in line with labor regulations. They make whatever adjustments they might find that are more in line with perceived wage differentials that they find suitable that are anchored on the minimum and other wage regulatory considerations. In this setting, the minimum wage serves as the floor wage by which to gauge unskilled labor. Moreover, women's wages are relatively lower than that of men so that as a group, their wage rates tend to be closer to the minimum wage than that for men.

For male labor, there is a (weak) indication that female labor is more complementary as a labor factor. Male labor receives a higher average rate compared to that of women, but the supply of male labor appears to be more directly related to the female wage. In other words, as female wages rise even by the smallest margins, so would the rise in the supply of male labor. In the case of female labor, the presence of male labor appears more like a (weak) competitive presence so that there is a negative rate associated with female labor. But all this is of very small magnitude and could be ignored, at least with the current state of affairs of the supply of labor.

The estimates of the labor supply of male and female labor improve when the size characteristics of the individual firms are taken into account. This is not as evident when the industry characteristics are taken into account. The supply estimates are less reliable when the industry characteristics are introduced. The poor estimates of the supply functions for male and female labor do not improve much. But what comes out from introducing the industry characteristics as explanatory variables is to help accentuate the intensiveness with which male or female labor is defined within the specific industry. Here patterns of labor intensiveness for the use of male or female labor become evident.

This study represents one venture into gender characteristics of the labor force. It is a very promising field of research with interesting possibilities. More important studies of labor market along the aspects of gender differences concern the factors that determine labor force participation. Here, the importance of women in the labor force is of great interest. This study has scarcely scratched the surface. More work is needed to provide greater information on what determines the labor force participation of women. But this would depend on the use of more micro data involving the household and of women at work. Such studies will involve much more elaborate information about the household – the income of the main wage earner, the number of children in the family, the education of the man and wife, and many other factors, including even the social and economic milieu in which the household is thriving. That kind of data can be produced from information in pension file data, in company data. For now, such studies are missing.

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November 15, 2008