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The Effects of Labor Market Characteristics on Women's Poverty in Korea

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Abstract: Background: Poverty in Korea is not gender neutral. Both male headed and female headed households experience poverty in distinct ways. This research discusses poverty and how it has evolved in Korea from a gender perspective. Methods: It describes the characteristics of poverty among the working population based on gender and other household attributes. It measures poverty relative to the mean and median incomes of the population in three ways: headcount, poverty gap, and poverty severity. The study uses the probit model to estimate the incidence of poverty and the Heckman sample selection model to analyze poverty's gap and severity. Our empirical results are based on an unbalanced household level panel covering the period 2006–2016. Results: Our results indicate that multiple factors including issues related to the labor market and demographic characteristics contribute to women's poverty. Within the working population, women are less likely to be poor than men because they share their partners' incomes. However, single female workers with children are the poorest demographic group. Conclusion: "Part-time jobs" are a critical factor in determining women's poverty status, while "work years" and "the quality of occupation" have a crucial impact on the incidence and severity of poverty.

Keywords: poverty; feminization of poverty; gender poverty; gender poverty gap; single mother; female household head; Korea

JEL Classification: E20; I30; I32; I38; J10; N35

1. Introduction

South Korea has experienced unprecedented economic growth in the past few decades because of improvements in the country's educational and organizational standards. Education and human capital have been the most important factors in its economic growth. The quality of education is related to economic outcomes, which in turn lead to economic development (Hanushek and Wößmann 2007). Well-educated workers have brought in higher levels of labor productivity and higher returns on investments. An educated and productive labor force has developed capabilities for facilitating the adoption of new technologies and innovations. A relatively low paid and good quality disciplined labor force has also facilitated Korea's successful development strategy (Kim et al. 2016).

On the flip side, Korean society has been suffering from socioeconomic inequalities and poverty because of rapid economic growth and the government prioritizing manufacturing, conglomerates, and highly urbanized regions in allocating the capital generated. This has led to a gap between industries, businesses, regions, and social classes. The 1997 Asian financial crisis and the 2008 global economic crisis also worsened income inequalities and poverty in the country. The Korean economy has recovered after these financial crises, but inequalities and poverty still remain high. In fact, the average income of the top 0.01% of the population was 167-times that of the average adult population (over 20 years) in 2010 (Kim 2012). According to the Organization for Economic Co-operation and Development (OECD),

Korea's poverty rate was 16.5% in 2012, far above the OECD average of 11.3%. This means that 165 out of 1000 people earned less than 10.68 million won (equivalent of $9500 U.S.) annually.

Some groups have experienced more income inequalities and poverty than others. The elderly and women are the most vulnerable groups in Korea: 48.6% of Korean elderly were in poverty in 2012, the highest level among the 34 OECD countries. The poverty rate among female householders was similar or higher than that of the elderly. Since most elderly fall behind in the labor market because of their physical weaknesses and because they are retired, high poverty rates among the elderly seem obvious. However, women in the working age population are poorer than men even though their educational levels are not significantly different from the men. This contradicts the expectation that a good quality education leads to a higher level of labor productivity and improvements in living standards.

The gender gap in educational attainments like enrollments in secondary and tertiary education in Korea has reduced. However, women's remarkable achievements in education have yet to lead to their improved performance in the labor market. There is only about 10% of women in management positions (about one-third the OECD average). In other words, while women's educational levels have improved along with those for men, a gender gap still exists in the labor market. Despite progress in education and skills, women's contributions are not expected to increase much in the near future. Thus, the problem of women's poverty is not only due to individual characteristics, but also structural problems or gender inequalities such as wage disparities.

Thus, the purpose of this study is identifying and analyzing the factors that make female workers poorer as compared to their male counterparts. A female worker living with her partner is less poor because she shares her partner's income. However, single female workers have become more impoverished as they have to accept part-time jobs or work in less stable and low paid occupations. This paper considers two basic hypotheses. First, female workers who have children, but do not have spouses are among the poorest working groups in Korea. Second, labor-related variables such as job security and employment sustainability and demographic factors including family type have an absolute impact on single working mothers' poverty status. Thus, this study contributes to the literature by emphasizing the living and working conditions of single mothers in Korea. These characteristics effect females' poverty status. This study sheds light on the characteristics of the gender poverty gap in Korea and will help policymakers design progressive welfare policies targeting the weakest in society: single mothers.

The rest of this paper is organized as follows. The next section reviews related literature and discusses poverty and its evolution in Korea. The data and methodology are described in Sections 3 and 4. Section 5 gives the results of the analysis, and Section 6 gives the conclusion and recommendations.

2. Literature Review

Researchers have studied various issues concerning the relationship between poverty and gender (Bastos et al. 2009). Studies on the gender poverty gap start by finding out why women in poverty are increasing despite their higher educational levels and increasing entry rates into the labor market. Pearce's (1978) analysis of women in the U.S. led to an accumulation of empirical and theoretical analyses of the gender gap. She described a correlation between gender and poverty, but did not provide a clear explanation about the trend in the data. According to her study, which coined the term "feminization of poverty", more than 70% of the elderly and more than half of the poor households in the U.S. were headed by women in the 1970s. She maintained that since the 1950s, women's economic activities in the U.S. have increased in number, but labor market discrimination and a patriarchal attitude in welfare policies have not helped them address poverty (Pearce 1978). Pearce's study focused on finding poverty rates for both the genders by their individual characteristics. Other follow-up studies on women's poverty have been done globally, which used various methodologies.

Smith and Ward (1989) analyzed why American women were poorer although their wages continued to rise as compared to men's wages in the 1960s, 1970s, and 1980s. Their data came from the 1950 to 1980 decennial censuses and the Current Population Survey. The authors used a mover-stayer model of labor force transition combined with other models to distinguish workers and non-workers' work experience. They also used a wage model to predict wages and explained that the main reason for the increased wage gap was because women could not move to high skilled professions. They argued that for analyzing women's poverty, researchers should investigate the differences between women's roles in the labor market and the actual rate of women's poverty and to what extent the factors associated with the labor market contribute to the difference. They found that the most critical factors that influenced the poverty gap among working women were whether a job was part-time or not and women's labor market experience.

Hoynes et al. (2006) showed that the tremendous economic growth over the last 45 years has not reduced the high poverty rates among women in the U.S. They used data from the Census Bureau and the Current Population Surveys' from 1968 to 2004. Their sample had a working age population and its cross-sectional variations at the regional level using the nine divisions defined by the Census Bureau. They estimated four factors that determined a change in the poverty rate using the ordinary least squares method: labor market opportunities, changes in family structure, the government's anti-poverty programs, and immigration. They demonstrated and explained the gap between economic growth and the poverty rate through labor market opportunities such as median wages, unemployment rates, and inequalities. Their results showed that when all other conditions were equal, an increase in women's labor supply decreased the poverty rate, while an increase in the number of female household heads resulted in a higher poverty rate.

Based on these studies from around the world, over the last few decades, an empirical and theoretical tradition has been developed for studying female poverty. The main focus of this tradition is analyzing the relationship between the labor market and poverty. However, most studies on Korean women's poverty analyze the economic vulnerabilities of female headed households apart from traditional male centric family structures in Korean society. Thus, when it comes to Korean women's poverty, previous studies mostly focused on female household heads' poverty, rather than women's poverty as a whole. We now review selected Korean studies on women's poverty.

Yeo (2003) tried to find out how female householders are at greater risk of poverty compared to male householders. She used the Korean Labor and Income Panel Study (2000) survey data for an analysis of adults aged 25 years or older. She specified the logistic regression model and decomposed the gender poverty gap in her empirical analysis. Then, she assessed whether this gap was a result of the differences in a poverty decision mechanism or in the demographic composition by gender. She found that higher poverty rates among female householders were because of a low accumulation of their human resources and a gender discriminatory labor market structure, which did not adequately compensate them for their human capital.

Seok (2004) analyzed the phenomena of the feminization of poverty and the gender poverty gap in Korea using a survey of urban households (1996–2002) and a survey of household consumption (1996, 2000) from the Korea National Statistics Office. His data analysis using a logistic regression showed that female householders were 2.6-times poorer than male householders. He also analyzed the gender poverty gap before and after the economic crisis and found that there was a universalization of poverty between the genders at the peak of the economic crisis. Male headed households recovered relatively faster from the crisis, while female headed households' poverty rate increased. This led to a widening gender poverty gap in the process of recovering from the economic crisis. Seok argued that since gender is at the crossroads of factors affecting poverty, we cannot access the nature of poverty without considering gender.

Ku (2005) used the Korean Labor and Income Panel Study (KLIPS) data from 1998 to 2003 to analyze poverty duration and its associated factors. He obtained the duration and distribution of the poverty cycle and the probability of escaping from poverty using a life table analysis. He identified

factors related to the poverty duration by estimating a discrete-time hazard model. According to his findings, about three-quarters of the poor were able to get out of poverty within two years. However, long-term poverty of more than five and 10 years of duration accounted for 50 and 25% of the total poverty, respectively. The representative groups of long-term poverty were elderly households, followed by non-elderly female headed households. The economic crisis in the late 1990s led to an increase in both male and female workers becoming poor across the country. Ku claimed that most long-term poverty existed among female headed households and needed to be addressed. In a related study Ku et al. (2009) emphasis the relationship between poverty and childrens development. The issue of family health and welfare is also discussed in Korea Institute for Health and Social Affairs (KIHASA) (2015).

Chae and Heshmati (2017) investigated the effects of lifetime work experience on poverty among the elderly in Korea. They used KLIPS survey data for 2006, 2009, 2012, and 2015; their dataset included people over the age of 60. Their study analyzed poverty among the elderly and the impact of individual demographic characteristics and lifetime work experience on poverty. They used a logit model for estimating the incidence of poverty and the sample selection model to estimate the poverty gap and severity. The results of their analysis showed that a person's total work years and short gap years between jobs decreased the incidence of poverty. Their study found that female elderly had a lower poverty rate because they were more likely to live with their adult children than the male elderly. Jeong (2014) emphasized that the government needs to improve the social and gender policies.

Today, poverty is a universal social issue, and it exists even in the context of developed countries. Women are more likely to be vulnerable to poverty. Diana Pearce first used the term "feminization of poverty" to study why poverty among women occurred more often in the U.S. in the 1970s. According to her study, two-thirds of the poor were women, and her discussion on the feminization of poverty held that as a result of the recession, women were increasingly represented among the poor. Problems caused by high poverty rates among women were not limited to the U.S., but were also observed in many other European and Asian regions (Goldberg and Kremen 1990; UN ESCAP 2000).

One of the reasons why women are more impoverished is because of gender inequalities in the labor market. Korea has low levels of gender equality compared to the national economic level. According to the World Economic Forum's (WEF) Global Gender Gap Report, in 2017, Korea's gender gap index ranked 115th among 145 countries. In fact, there is no longer a gender gap in education and health, but there is still a significant gap in Korea's economy. Thus, gender inequalities in the labor market make Korean women poorer than men.

Another reason why there are more women among the poor is due to changes in household structures such as an increase in one person and single parent households. In particular, the noticeable growth in female headed households is a main factor in the transition of the family structure in Korea. Increasing divorce rates and co-parenting outside marriage have contributed to the number of single female headed households. The economic crisis also contributed to family breakdowns and an increase in female headed households (Yi 2009). Male householders recovered from the financial crisis in a relatively shorter time, but women female householders lacked the financial means to escape from the crisis. Further, female breadwinners shoulder greater economic burden than men because they have to handle family livelihood opportunities and childcare. In the end, the changes in the family structure and the role that women play in their homes make it more likely for single female headed households to suffer from poverty.

In a number of recent studies the issues of female headed household poverty, wage gaps and married women continued particpation in the labor market after chidbirth are analyzed. A comparative analysis on the poverty of female headed householders in Korea is conducted in Kim (2008). In another study Kim (2017) analysis the wage gap among different generations and between genders of similar characteristics and their implications. Kim (2018) also investigated the married women's continued participation in the labor market and child birth. Kim identifies relevant factors and discuss their policy implications.

Most studies on Korean women's poverty compare poverty between female and male breadwinners. However, there are also other particular groups that are vulnerable to poverty, and older adults and female householders are representative examples of these. Discrimination against women in the Korean patriarchal society or in the labor market is making it harder for them to live economically independent lives. It is necessary to understand and analyze why women are more frequently exposed to poverty. Given this background, the objective of this paper is assessing how poverty is different among working females and working males.

3. Data

3.1. The Sample

Data for the empirical part of this research were obtained from the Korean Labor and Income Panel Study (KLIPS) for selected years from 2006 to 2016. KLIPS data are nationally representative longitudinal survey data of individuals 15 years and older collected from 5000 urban households. KLIPS provides detailed information on individuals and their households' economic activities, labor-related background, income or consumption activities, education, and demographic characteristics. The data have the advantage of providing a picture of the long-term transition of individuals or households' labor by demographic characteristics.

We chose the working age population for a sub-sample, which was also representative of the population, to analyze how labor-related variables affected women and men's poverty status. The sub-sample had individuals aged between 18 and 64 years who were currently working. The dataset was unbalanced panel data. The data were yearly and emphasized a job and whether it was a main job or not. The sub-sample consisted of 74,372 observations.

3.2. Measuring Poverty

In our analysis, the key dependent variables were "poverty incidence", "poverty gap", and "poverty severity'". These are commonly used measures of poverty in the empirical literature (Atkinson 1987). All three are used in parallel for measuring one's poverty status and its intensity. Measurement of poverty is basically computed based on per capita households' pooled disposable incomes. We adapted the OECD equivalence scale, which divides total household disposable income by the square root of household size. Disposable income and other monetarily measured variables were all expressed in real 2015 values using the consumer price index for their real value transformation.

Our research defined poverty using the OECD standards. Poverty measures the fraction of individuals with incomes below half of the median per capita household income of the total population, namely a relative poverty line. That is, a person is considered poor if his/her total per capita family income is below the relative per capita poverty line. Poverty status can change over time. The relative poverty line was adjusted each year by using the 2015 consumer price index.

The poverty incidence had a value of 1 if a person's annual income was less than the relative poverty line. We used the poverty gap to measure the extent to which individuals' incomes fell below the poverty line. Further, we can measure the intensity of poverty from the squared poverty gap, known as poverty severity. By squaring all poverty gap data, the measure puts more weight on the further a poor person's observed income falls below the poverty line. The squared poverty gap is one form of a weighted sum of poverty gaps, with the weights proportionate to the poverty gap (Foster et al. 1984). All three poverty measures were observation specific.

Income based variables in this study were all previous year's real annual income. Total household income consisted of earned labor income, financial income, real estate income, social insurance, transfer income, and other sources of income. Subsidies from the government or social community were included in transfer income. Other sources of income covered private insurance, severance pay, and donated or inherited property. To improve the accuracy of the analysis, the lower and upper bounds of annual income (1 and 99 percentiles) were censored.

3.3. Definitions of Variables

Determinants of levels and variations in the three measures of poverty were identified based on a review of the empirical literature and data availability (Danziger et al. 1982). The explanatory variables used in the poverty model's specifications can be largely divided into two groups: labor-related and demographic variables. For labor-related variables, how economic activities have an impact on a person's poverty status was analyzed by considering total work years, the total number of jobs, the last occupation, and whether the job was part-time or irregular. A person's total earned income was the sum of earned income from the main job and from sideline jobs.

This study used total work years for estimating the impact of work years on incidence, gap, and severity of poverty. Job start year and job end year from the work history data were used for calculating the number of working years. If there was a case in which the total of the work years was less than one year, it was considered as the individual having never worked; 53 years of work was the longest case. The number of jobs in a lifetime was included for labor-related variables to analyze how job turnover affects poverty. An average individual had an average of about three main jobs; the largest number was 26 jobs. The variables "part-time" and "irregular" are proxies for a condition of employment. Most of the main jobs were closer to regular work and were more likely to be full-time.

To estimate how part-time and irregular variables affected women's poverty, we added the interaction terms of the part-time/irregular, gender, and birth variables to the analysis assuming that single mothers were the most vulnerable to poverty. The variable "occupation", or the last occupation that the individual had in his/her lifetime, was also used to estimate the relationship between job quality and an individual's poverty status. The higher the number of occupations, the more specialized and higher paying the employment.

Gender, marital status, birth, age, education level, and the province of residence were among the demographic variables used in this study. Gender equaled 1 if the individual was a female. To estimate the impact of marriage and having a partner on poverty, we included the "single" variable (single refers to cases who never married or were separated, divorced, or the spouse had passed away). The mean and the dispersion of singles showed that there were more people living with their spouses than those who were single. The variable "birth" was also added to analyze how the presence of children in a household affected its poverty status. The variable "single parent" is included as a demographic variable in the model; this is an interaction term between the "single" variable and the "birth" variable with a value of 1 if the number of children was positive, else 0. This was also included to show how poverty differed by marital status and childbirth regardless of gender.

The variable "single mother" was also included in the model. It was created by an interaction between "gender", "single", and "birth" variables. This variable was expected to capture how poverty was different between single mothers and those with partners. A person's age was used as a demographic variable. This variable determined how poverty varied by age. The data also included education level to see how the level of education affected poverty. In all, there were five levels of education ranging from middle school or below to master's or doctorate degrees.

The region, or the province of a person's residence, was also included as a demographic variable because poverty was determined not only by individual or household characteristics. But also by the region of residence. In South Korea, most of the enterprises' activities and administrative work is concentrated in the capital Seoul. Thus, the economic disparities between the capital and other cities are still wide. Lee and Baek (2008) decomposed the poverty gap between the metropolitan areas and the less urbanized areas in Korea. Their results showed that almost 70% of this gap was explained by the region effect. Therefore, Seoul took a value of 1, highly urbanized areas a value of 2, and less urbanized areas a value of 3 in our analysis. Most survey respondents lived in highly urbanized regions.

The definitions of the variables are given in Table 1. Table 2 presents the summary statistics and the correlation between the dependent and independent variables. There was no evidence of collinearity between the explanatory variables.

Table 1. Definitions of the variables.

Variable	Definition
I Dependent variables	
Poverty incidence	1 if Income < relative poverty line; 0 otherwise
Poverty gap	(Relative poverty line − income)/relative poverty line if poverty incidence = 1; 0 otherwise
Poverty severity	Squared term of poverty gap
II Independent variables	
Female	1 if female, 0 if male
Single	1 if single, 0 if married with spouse
Birth	1 if have children, 0 have no children
Part-time	1 if part-time job, 0 full-time job
Irregular	1 if irregular job; 0 if regular job
Number of jobs	Total number of jobs the individual has had in the lifetime
Work year	Total years the individual has worked in the lifetime
Occupation	Occupation the individual has had in the lifetime
Occupation 1	Laborers
Occupation 2	Agricultural, forestry, fishery workers, craftsmen, operatives' occupation
Occupation 3	Sales, service occupation
Occupation 4	Clerical occupation
Occupation 5	Professional or managerial occupation
Education	Education level
Education 1	Graduates from middle school or below
Education 2	Graduates from high school
Education 3	Achieves college diploma
Education 4	Achieves bachelor's degree
Education 5	Achieves master's or PhD degree
Age	Age
Age^2	Squared term of age
Region	Province of residence
Capital	Seoul
Highly urbanized	Metropolitan city and Gyeonggi-do
Less urbanized	Others

Table 2. Summary and correlation matrix.

Variables	Mean	Std. Dev.	Incidence	Gap	Female	Single	Birth	Part-Time	Irregular	Number of Jobs	Work Years	Occupation	Education	Age
Poverty Incidence	0.113	0.316	1											
Poverty Gap	0.268	0.189	0.390 *	1										
Female	0.402	0.490	0.037 *	-0.002	1									
Single	0.271	0.445	0.090 *	0.040 *	0.077 *	1								
Birth	0.662	0.034	0.056 *	0.135 *	0.242 *	0.022 *	1							
Part-time	0.073	0.260	0.111 *	0.082 *	0.212 *	0.036 *	0.175 *	1						
Irregular	0.234	0.424	0.158 *	0.156 *	0.126 *	0.048 *	0.143 *	0.300 *	1					
Number of Jobs	3.473	2.389	0.078 *	0.146 *	−0.011 *	−0.023 *	−0.063 *	0.029 *	0.169 *	1				
Work Years	8.361	8.231	−0.055 *	−0.087 *	−0.119 *	−0.230 *	−0.265 *	−0.148 *	−0.154 *	−0.331 *	1			
Occupation	3.132	1.315	−0.161 *	−0.245 *	0.101 *	0.052 *	−0.095 *	−0.084 *	−0.261 *	−0.192 *	−0.050 *	1		
Education	2.531	1.151	−0.171 *	−0.261 *	−0.112 *	0.037 *	−0.166 *	−0.108 *	−0.269 *	−0.198 *	−0.102 *	0.577 *	1	
Age	43.052	10.859	0.081 *	0.062 *	−0.031 *	−0.376 *	0.245 *	0.023 *	0.169 *	0.214 *	0.417 *	−0.338 *	−0.408 *	1

Note: * for $p < 0.01$.

4. Model Specification and Estimation

The literature analyzes the incidence of poverty based on income, which could suffer from sample selection bias problems. Hoynes et al. (2006) analyzed the persistence of poverty and found that there were big differences in the persistence of poverty by gender, race, education level of the family head, and family structure. For instance, a one-year-old black child living in a female household who had less than a high school education had about a 90% chance of being in poverty in five or more of the next 10 years. In other words, poverty is likely to be determined by the demographic environment if it is analyzed with income. Therefore, we used the Heckman sample selection model for estimating the poverty gap and severity to avoid the problems of the sample selection bias. The model used a probabilistic choice model to describe the self-selection decision in the first stage and then adjusted for self-selection in the second stage by incorporating the inverse Mills ratio.

The first stage in the Heckman sample selection model (Heckman 1979) is using the probit model to analyze whether people are poor or not. The OLS estimation with robust standard errors of how explanatory variables affect the levels of poverty gap and severity among poor people was used in the second stage. Since poverty gap and poverty severity only target those who are considered poor, they had a value 0 if one's poverty incidence equaled 0 in the probit model.

In our study, we used the probit model to analyze the effect of the explanatory variables on the incidence of poverty. The explanatory variable vector X_{it} in Equation (1) included all labor-related and demographic variables. To see the different marginal effects of age at various levels, the squared term of age was also used in the explanatory variable vector. This allowed for the non-linearity of the model.

In the probit model, the dependent variable, poverty incidence pi_{it}, is a binary variable with a value of 0 or 1. If the latent variable pi'_{it} is greater than 0, then the outcome variable pi_{it} has a value of 1. In our analysis, the outcome variable had a value of 1 if one's real annual income was lower than the relative poverty line. The estimated coefficient vector of the explanatory variable, $\hat{\beta}_i$, represents the sign and significance of the effects. The poverty incidence model is specified as:

$$pi'_{it} = X_{it}\,\beta_i + \varepsilon_{it} \tag{1}$$

$$pi_{it} = \begin{cases} 1 \text{ if } pi'_{it} > 0 \\ 0 \text{ if } pi'_{it} \leq 0 \end{cases} \tag{2}$$

Equations (3) and (4) represent the second stage of the Heckman two-stage model, the poverty gap and poverty severity models using the ordinary least squares estimations. $\hat{\beta}_g$ and $\hat{\beta}_s$ are the estimated coefficient vectors of the explanatory variables of poverty gap and poverty severity. In this case, the dependent variables are continuous and conditional on each being classified as poor:

$$pg_{it} = X_{it}\,\beta_g + \lambda_g\,\Lambda(X_{it}\hat{\beta}_i) + u_{it}, \tag{3}$$

where $\Lambda(X_{it}\hat{\beta}_i) = \frac{f(X_{it}\hat{\beta}_i)}{\mathrm{F}(X_{it}\hat{\beta}_i)}$ is the inverse Mills ratio.

$$ps_{it} = X_{it}\,\beta_s + \lambda_s\,\Lambda(X_{it}\hat{\beta}_i) + u_{it}, \tag{4}$$

where $\Lambda(X_{it}\hat{\beta}_i) = \frac{f(X_{it}\hat{\beta}_i)}{\mathrm{F}(X_{it}\hat{\beta}_i)}$ is the inverse Mills ratio.

The inverse Mills ratio $\Lambda(x_{it}\hat{\beta}_i)$ in Equations (3) and (4) was obtained from the probit model and defined as the ratio of the probability density function, $f(x_{it}\hat{\beta}_i)$, to the cumulative distribution function, $\mathrm{F}(x_{it}\hat{\beta}_i)$, of a standard normal distribution function evaluated at the predicted outcome $x_{it}\hat{\beta}_i$. If the estimated coefficient of the inverse Mills ratio was insignificant and its inclusion in the model did not significantly change the other estimated coefficients, then we could conclude that self-selection did not affect the results (Mesquita et al. 2008). On the other hand, if the inverted MR was statistically

significant, not accounting for it would result in biased estimates and over- or under-estimation of the effects due to differences in the probability of being poor or non-poor.

5. An Analysis of the Results

Table 3 presents the frequency distribution of the variables for females and males. The first row and second column of Table 3, which are frequency distributions of the variables, show that the proportion of single parent households among women was 31% higher than among male households. In addition, the first row and fourth column of Table 3A show 17.84% of single mothers being in poverty, and Table 3B shows 14.35% of single fathers in poverty. This means that single mother households are about 3.5% poorer than single father households.

Table 3. (A) Frequency distribution of variables for females. (B) Frequency distribution of variables for males.

Part A						
Characteristics	**N**	**%**	**Poverty Incidence**	**Poverty Ratio**	**Poverty Gap**	**Poverty Severity**
Household structure:						
Single parent	9377	31.34	1673	17.84	0.286	0.117
Parent with spouse	20,541	68.66	2133	10.38	0.274	0.110
Part-time work:						
Part-time job	3002	13.97	637	21.23	0.306	0.132
Full-time job	18,487	86.03	2090	11.31	0.269	0.105
Irregular jobs:						
Irregular job	6428	29.91	1254	19.51	0.287	0.118
Regular job	15,065	70.09	1473	9.78	0.270	0.107
Occupation types:						
Occupation 1	3215	10.80	829	26.10	0.297	0.123
Occupation 2	4523	15.20	809	17.89	0.292	0.121
Occupation 3	9484	31.87	1383	14.58	0.276	0.111
Occupation 4	5381	18.08	319	5.93	0.260	0.101
Occupation 5	7160	24.06	436	6.09	0.250	0.098
Number of jobs:						
1	6676	22.31	757	11.34	0.281	0.114
2	5961	19.92	628	10.54	0.275	0.111
3 ≤ number ≤5	12,115	40.49	1535	12.67	0.287	0.119
number ≥ 6	5166	17.26	886	17.15	0.268	0.105
Work years:						
1 ≤ year ≤ 5	17,438	58.31	2509	14.39	0.290	0.120
6 ≤ year ≤ 10	6128	20.49	625	10.20	0.251	0.094
11 ≤ year ≤ 15	2816	9.42	235	8.35	0.256	0.098
16 ≤ year ≤ 20	1398	4.67	128	9.16	0.262	0.105
year ≥ 21	2127	7.11	309	14.53	0.280	0.111
Age intervals:						
18 ≤ age ≤ 25	2235	7.47	257	11.50	0.288	0.120
26 ≤ age ≤ 30	3175	10.61	206	6..49	0.278	0.116
31 ≤ age ≤ 35	3506	11.72	231	6.59	0.249	0.098
36 ≤ age ≤ 45	8129	27.17	935	11.50	0.271	0.108
46 ≤ age ≤ 55	8344	27.89	1142	13.69	0.278	0.113
Age ≥ 56	4529	15.14	1035	22.85	0.293	0.120
Education level:						
Education 1	7238	24.20	1600	22.11	0.288	0.117
Education 2	11,665	39.00	1607	13.78	0.274	0.109
Education 3	4420	14.78	275	6.22	0.260	0.103
Education 4	5753	19.23	282	4.90	0.283	0.120
Education 5	836	2.79	41	4.90	0.300	0.135
Region of location:						
Capital	6115	20.44	871	14.24	0.282	0.115
Highly urbanized	14,871	49.71	1623	10.91	0.271	0.108
Less urbanized	8932	29.85	1312	14.69	0.288	0.119
Total number of observations	29,918					

Table 3. *Cont.*

Part B						
Characteristics	**N**	**%**	**Poverty Incidence**	**Poverty ratio**	**Poverty Gap**	**Poverty Severity**
Household structure:						
Single parent	10,807	24.31	1551	14.35	0.291	0.122
Parent with spouse	33,644	75.69	3041	9.04	0.242	0.093
Part-time work:						
Part-time job	878	2.74	274	31.21	0.311	0.136
Full-time job	31,119	97.26	2898	9.31	0.250	0.097
Irregular jobs:						
Irregular job	6101	19.06	1249	20.47	0.269	0.108
Regular job	25,910	80.94	1927	7.44	0.246	0.095
Occupation types:						
Occupation 1	3867	8.76	971	25.11	0.275	0.111
Occupation 2	17,040	38.61	2007	11.78	0.254	0.099
Occupation 3	7124	16.14	716	10.05	0.250	0.099
Occupation 4	6409	14.52	311	4.85	0.249	0.100
Occupation 5	9694	21.96	546	5.63	0.263	0.107
Number of jobs:						
1	10,110	22.74	760	7.52	0.271	0.111
2	8937	20.10	806	9.02	0.268	0.111
3 ≤ number ≤ 5	17,401	39.15	1886	10.84	0.254	0.010
number ≥ 6	8004	18.01	1140	14.24	0.250	0.095
Work years:						
1 ≤ year ≤ 5	20,172	51.44	2853	14.14	0.273	0.112
6 ≤ year ≤ 10	10,059	25.65	770	7.65	0.219	0.077
11 ≤ year ≤ 15	5634	14.37	339	6.01	0.232	0.090
16 ≤ year ≤ 20	3353	7.55	208	6.20	0.225	0.083
year ≥ 21	5195	11.70	418	8.05	0.269	0.105
Age intervals:						
18 ≤ Age ≤ 25	1291	2.90	212	16.42	0.310	0.139
26 ≤ Age ≤ 30	3985	8.96	372	9.34	0.289	0.124
31 ≤ Age ≤ 35	6466	14.55	518	8.01	0.232	0.088
36 ≤ Age ≤ 45	14,171	31.88	1258	8.88	0.242	0.093
46 ≤ Age ≤ 55	11,607	26.11	1285	11.07	0.256	0.010
Age ≥ 56	6932	15.59	947	13.66	0.273	0.110
Education levels:						
Education 1	6824	15.36	1407	20.62	0.268	0.106
Education 2	17,888	40.25	2085	11.66	0.251	0.098
Education 3	6552	14.74	446	6.81	0.260	0.106
Education 4	10,941	24.62	528	4.83	0.263	0.108
Education 5	2236	5.03	126	5.64	0.248	0.098
Region of location:						
Capital	8516	19.16	905	10.63	0.267	-
Highly urbanized	23,332	52.49	2151	9.22	0.250	-
Less urbanized	12,604	28.35	1536	12.19	0.264	-
Total number of observations:	44,452					

The estimation results and marginal effects for poverty incidence, gaps, and severity are reported in Table 4. Both the poverty gap and poverty severity models measured by income levels might have the selection bias problem. Hence, we included the inverse Mills ratio that we calculated in the first-stage probit model in the second-stage least squares regression model. In the estimation of the second stage, we controlled for group heterogeneity and time effects, and the model was estimated with robust standard errors.

The most important result is that women who worked were not poorer than men. The marginal effect value of the female variable in the first row of Table 4 shows that if the gender variable changed from zero to one (male to female), the probability of the variable "poverty incidence" taking the value of one decreased by about 1.7%. However, a parent and someone who did not have a spouse regardless of gender were more likely to be poor than the others. The marginal effect value for the second row was 0.019, suggesting that the probability of the variable "poverty incidence" taking the value of one (single parent) increased by 1.9%. Women who were single parents were found to be more vulnerable to poverty. In the third row of Table 4, the marginal effect value of a single mother was 0.026, which increased her chances of being poor by 2.6%. This can be explained by the fact that the reason why women were less

poor was due to their husbands' complementary incomes. A single mother household was found to be poorer than male households, so women were less poor than men when they had spouses.

Table 4. Estimation result of poverty incidence, gap, and severity.

	Probit Poverty Incidence	Marginal Effect	Least Squares Poverty Gap	Least Squares Poverty Severity
Female	−0.189 ***	−0.017	−0.029	−0.030
	(0.044)		(0.019)	(0.013)
Single-parent	0.210 ***	0.019	0.117 ***	0.081 ***
	(0.044)		(0.021)	(0.014)
Single mother	0.284 ***	0.026	0.034 *	0.035*
	(0.066)		(0.029)	(0.019)
Single mother	0.292 ***	0.027	0.127 ***	0.095 ***
Part-time job	(0.079)		(0.029)	(0.019)
Single mother	0.076	0.007	0.032 ***	0.022 ***
Irregular job	(0.058)		(0.012)	(0.008)
Occupation 2	−0.427 ***	−0.052	−0.140 ***	−0.109 ***
	(0.044)		(0.040)	(0.026)
Occupation 3	−0.366 ***	−0.046	−0.117 ***	−0.090 ***
	(0.046)		(0.034)	(0.023)
Occupation 4	−0.661 ***	−0.070	−0.220 ***	−0.170 ***
	(0.054)		(0.064)	(0.042)
Occupation 5	−0.691 ***	−0.072	−0.240 ***	−0.183 ***
	(0.054)		(0.067)	(0.044)
Number of jobs	0.010	0.001	0.001	0.000
	(0.007)		(0.001)	(0.001)
Work year	−0.070 ***	−0.006	−0.025 ***	−0.019 ***
	(0.003)		(0.007)	(0.005)
Age	0.009	0.001	−0.001	0.000
	(0.010)		(0.002)	(0.001)
Age 2	0.000	0.000	0.000 ***	0.000 ***
	(0.000)		(0.000)	(0.000)
Education 2	−0.308 ***	−0.039	−0.091 ***	-0.073 ***
	(0.051)		(0.029)	(0.019)
Education 3	−0.683 ***	−0.069	−0.185 ***	−0.150 ***
	(0.067)		(0.067)	(0.044)
Education 4	−0.842 ***	−0.078	−0.234 ***	−0.188 ***
	(0.067)		(0.082)	(0.055)
Education 5	−0.788 ***	−0.075	−0.187 **	−0.159 ***
	(0.107)		(0.078)	(0.052)
Highly urbanized	−0.110 ***	−0.010	−0.050 ***	−0.037 ***
	(0.038)		(0.012)	(0.008)
Less urbanized	−0.010	−0.001	−0.008	−0.006
	(0.043)		(0.007)	(0.005)
2007	−0.027	−0.003	−0.005	−0.006
	(0.047)		(0.011)	(0.007)
2008	−0.044	−0.005	−0.033 ***	−0.018 **
	(0.047)		(0.012)	(0.007)
2009	−0.036	−0.004	0.001	0.003
	(0.046)		(0.011)	(0.007)
2010	−0.128 ***	−0.013	−0.045 ***	−0.034 ***
	(0.047)		(0.016)	(0.010)
2011	−0.153 ***	−0.015	−0.045 **	−0.035 ***
	(0.048)		(0.018)	(0.012)
2012	−0.155 ***	−0.015	−0.054 ***	−0.035 ***
	(0.048)		(0.019)	(0.012)
2013	−0.204 ***	−0.020	−0.068 ***	−0.047 ***
	(0.049)		(0.022)	(0.015)
2014	−0.228 ***	−0.022	−0.082 ***	−0.056 ***
	(0.050)		(0.024)	(0.016)
2015	−0.249 ***	−0.023	−0.107 ***	−0.075 ***
	(0.050)		(0.026)	(0.017)
2016	−0.282 ***	−0.026	−0.106 ***	−0.074 ***
	(0.051)		(0.029)	(0.019)
Inverted Mills Ratio	-	-	0.362 ***	0.285 ***
			(0.114)	(0.076)
Constant	−0.765 ***	-	−0.146 **	−0.226 **
	(0.217)	-	(0.156)	(0.103)
Observations	53,016			
R-squared				
Number of individuals	10,044			

Notes: robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, marginal effect = dy/dx.

The fourth row and the second column of Table 4 show that if a single mother's job was closer to a part-time job, the risk of her household being in poverty increased by 2.7%. However, in the fifth row and the first column of Table 4, whether a single mother's job was irregular or not did not have an impact on poverty statistically. Table 3 shows that about 14% of the women had part-time jobs, compared to only 3% of men. Therefore, the variable "part-time job" had a greater impact on the poverty status of single mothers who were more likely to have part-time jobs.

The estimated coefficients of occupation in Table 4 were all as compared to laborers and had a significant negative sign. A worker with a low paid job was more likely to be in poverty because the coefficients of the probit poverty incidence from Occupation 2 to 5 were all negative. Table 3 shows that women had a higher poverty rate in every occupation category, but there was a little gender poverty gap among laborers (Category 1), clerical workers (Category 4), and those in professional or managerial occupations (Category 5). This implies that women in high-paying professions were like their male counterparts. Given their own personal incomes in these categories, women would not be poor. Therefore, even a single mother would not be poor if she had a clerical or a professional job. However, a majority of the women working in sales and services (Category 3) had part-time jobs compared to other professions. Moreover, as shown in Table 3, women were 11% more likely to have a part-time job than men. At this time, if a woman were working in a low-income job and her income were below the relative poverty line, she would be considered not to be poor if she had additional income from her husband. Single mothers, however, were more likely to work in sales and services jobs than men and had no supplementary incomes from their ex-husbands, so single mothers' poverty rate was about 4.5% higher than male headed households in the sample occupation (in Table 3, the poverty ratio for women in occupation Category 3 was 14.58% while for men, it was 10.05%).

Since the marginal effect of the work year variable in Table 4 was −0.006, an increase in a person's work years by one unit reduced his/her poverty incidence by 0.6%. If you look at the 16th to the 20th rows of the frequency in Table 3, those who had just started working, regardless of gender, were the poorest, and their poverty rate gradually decreased for longer work years and increased again after 16 years. If people worked for more than 21 years, women's poverty rate was about 6% higher than men's. In other words, people in their 40 s to 50 s, which is the most active period of work, faced the least poverty, and they faced a higher probability of becoming poor as they got older, although they worked for a long time.

Among the demographic characteristics, age did not have an impact on one's poverty status. Table 3 shows that working men were poorer than working women when they were between 18 and 35 years of age. However, after 35 years, women's poverty rate surpassed that of men, and the ratio of poor women was 10% higher than that of men when they were 56 years (22.85% versus 13.66%). When it comes to the effect of age on a person's poverty, women who worked before marriage and childbirth were less poor than men. However, after women got married and started raising their children, their poverty rate was significantly higher than that of men, and the poverty gap in middle-aged people was the largest.

Table 4 gives the results of the poverty gap and severity estimation using the second stage of the sample selection model. The coefficients of the inverse Mills ratio in the poverty gap and severity models were statistically significant. Thus, there would have been a selection bias if we did not use the selection model. In the poverty gap and severity models, labor-related variables had the same sign of estimated coefficients as in an analysis of poverty incidence.

As shown in Table 4, gender had no statistically significant impact on poverty gap and severity, but single parent households and single mother households had a greater gap and more severity in poverty. The single mother variable made the poverty gap worse by 3.4%. This means that the closer a household type is to a single mother household, the greater the income level needed to escape poverty. Table 4 also suggests that among the poor, single mothers doing part-time jobs raised the poverty gap by 12.7% and poverty severity by 9.5%, the highest rate of increase among all the variables that worsened a person's poverty gap and severity. It also showed that the effect of a single mother with an

irregular job on poverty gap and severity was statistically significant, and it increased the poverty gap by 3.2% and poverty severity by 2.2%.

6. Conclusions and Recommendations

This study analyzed how poverty varies among women and men who work, with the level depending on their labor supply and demographic characteristics. The results of this study showed that single mother householders were among the poorest workers in Korea. A working woman was not poorer than a working man if she received a complementary income from her spouse. Another finding of this study was that single part-time working mothers were the most impoverished of all Korean workers. This means job security and sustainability have a significant impact on a person's poverty status. The impact of career breaks and discontinuity in work years also contributed to single mothers' poverty status.

The results also showed that women were not poorer than men when one analyzes the whole working population. This was due to the extra income that a woman obtains when living with her partner in a household. Because a household is considered a unit of poverty, even if a working woman's income is small, the household is not considered poor if her spouse's per capita household income exceeds the relative poverty line. However, when there is no additional income in single mother households, the single mother's income serves as the only measure of poverty. Therefore, single mothers who are more likely to have part-time jobs tend to be poorer due to their low incomes. In addition, a single mother is responsible for childcare by herself, which leads to career breaks, and she remains trapped in the lower income group. Furthermore, a single mother's work years are shorter than those for others, which exposes women to poverty to a large extent. As a result, poverty among single mothers, who have to bring up their children alone, has become a natural phenomenon in Korean patriarchal society. Thus, escaping a situation in which single mothers are presumed to be poor will require concerted efforts to reduce the gender wage gap. In addition, sensible solutions are needed to improve women's poverty levels due to changes in the family structure.

In conclusion, our results confirmed that for improving poverty levels among single working mothers, the state should come up with ways that prevent them from being left out of the labor market due to childbirth and limited childcare capacities. A single mother's poverty can be explained by her job quality and is not necessarily attributable to educational levels and the hours worked. Therefore, the government and enterprises should ensure that single mothers are treated the same way as men in the labor market if their skills and performance are the same.

An appropriate welfare system and service provisions that are similar to those provided by other developed countries for single working mothers need to be developed in Korea. Many European countries have implemented policies to convert unpaid family care labor into paid labor through social cash compensations. Their governments are also responsible for the minimum cost of childcare and payment of child allowances so that women do not lose their financial power because of limited child support and limited support from former partners. The Korean government should also guarantee childcare services and flexible working hours that allow women to complete both labor market work and housework. The government should also actively support the re-employment of women who discontinue their careers due to childbirth. In addition, job training should be expanded to enable single mothers to return to their pre-motherhood jobs when they are re-employed (Budig and England 2001). Since this study did not discuss the implementation of these reforms and suggestions specifically, additional studies on their feasibility need to be done.

It should be noted that pooling men and women together may not seem to be the best course of action for identifying the gender-related differentiated impacts of socioeconomic variables on female poverty. Despite controlling for gender, the pooled model by construction set the effects of the covariates to be the same for both men and women. Equality of the effects defeats the purpose of a gender related poverty analysis. Thus, it would be preferable to run separate regressions for men and women and then compare the coefficients to identify key differences. An alternative approach is that

all variables should be interacted with the female dummy separating the common and gender specific effects. These aspects are interesting topics for future research. Another extension is conducting a systematic review of the literature on feminizing poverty and using the data to better justify why this possible relationship between female headed households and poverty is important. This will help find out working conditions for single mothers, institutional barriers for single mothers to build their careers, cultural expectations, and society's perceptions about women's work, their working conditions, and their development and variations over time and across locations. The models estimated should further be extended with estimated earned income or the gender pay gap to infer the gender impact on poverty and make evidence-based policy recommendations.

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