



The Effect of the Number of Children on Mother's Labour Income in South Africa

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Abstract

The study examines the effect of the number of children on mothers' labour income in South Africa. This study uses panel data from the South African National Income Dynamic Survey (NIDS) from 2008 to 2017 and correct for sample selection bias caused by endogenous labour market participation using the Heckman two-stage model and quantile regression. The results show that the cumulative number of children and the presence of preschool-aged children have a significant negative relationship with mothers' labour income. The main results indicate that the number of children has a heterogeneous effect on the mother's labour income. Mothers with more children are likely to be hurt the most, especially those who are low-income earners at the bottom of the income distribution. Also, mothers with preschool-age children who are middle-income earners pay more penalty in their labour income. This shows that the responsibility of women as primary caregivers in a household is not without consequences or trade-offs between childcare and earnings. As a result, the study suggests continuous awareness of family planning, contraceptives, and child spacing. Also, we suggest work-family policies that could positively affect a mother's income from her employment and reduce household income inequality.

Keywords: Mother's labour income, number of children, selection bias, Heckman two-stage model, quantile regression

1. Introduction

The study investigates the effect of mothers' fertility—the number of children on their labour market income in South Africa. Motherhood is an experience that all women wish to have. However, it is not without economic consequences during pregnancy and childcare. For instance, when the number of children increases, the effects are far more severe and linger until childcare attention is reduced. The number of children may be referred to as a whole count of offspring or children belonging to a caregiver or a household through adoption or biological birth (Callister, 2012; Petrowski et al., 2017; Björkegren et al., 2022). For this study, the number of children is the cumulative number of children and children under 6 years. An increase in the number of children in a household can be enhanced by factors such as religious and cultural belief, gender desire, social and economic, poverty, lack of education, inadequate information about family planning, early marriage, end of barrenness, and health reasons (Lamb, 2012; McAllister et al., 2019; Sukneva et al., 2020; Zanbak & Çağatay, 2021; John, 2024) among others.

Existing studies have found that the arrival of children in the family may contribute to gender inequality (Kleven et al., 2019). There is perpetual gender inequality regarding females in the South African labour market. For instance, the female unemployment rate moved up from 26.6 to 31.3 in the 4th quarter between 2014 and 2019 in South Africa. At the same time, men's unemployment rate, which is at a reduced rate, moved from 22.4 to 27.2 within the same period (Stat SA, 2021). The consequences of the increase in the number of children in a household are likely to affect the mother more than the father. These may include a reduction in the mother labour participation, career interruption or delay in potential growth, socioeconomic effect, and low-income earnings (invariably, they may lead to poverty). The study hypothesised that motherhood penalties vary from one person to another. The literature about motherhood has revealed that an increase in the number of children may likely reduce mother's participation in the labour market (Aguero & Marks, 2008; Azimi, 2015; Baranowska-Rataj & Matysiak, 2016). Existing studies have found that motherhood and an increase in the number of children may lead to lower human capital endowment (Aizer & Currie, 2014; Klemp & Weisdorf, 2019), labour market discrimination (Grimshaw & Rubery, 2015; Matysiak & Cukrowska-Torzewska, 2021; Kalabikhina, et al., 2024) or both.

Eventually, women earn less relatively than men in the labour market (Bhorat & Goga, 2013; Cabeza-García et al., 2018; El Haj, et al., 2024). The effect of the number of children may have caused a situation where women are not treated equally and are subsequently underpaid or denied basic employment rights because the policy on employment was not applied equally. This places mothers at a disadvantage in earning a higher income (Budig & Hodges, 2010; Livermore et al., 2011; De Hoon, et al., 2017; Harkness, 2022). This is because the arrival of a child would require an increase in the time allocation for childcare and a reduction in the time allocation for labour participation. Also, the consequence of being a mother may increase the marginal propensity to consume without a substantial increase in labour income. Likewise, the energy needed to raise a

child may reduce labour income (Budig & England, 2001; Livermore et al., 2011). Therefore, a mother's labour income is an important factor to consider in the labour market and is of unwavering interest to policymakers, stakeholders, and scholars worldwide. Neglecting the mother's labour income has implications for health, household welfare, and economic growth for society (Attanasio et al., 2008; Bhoratl et al., 2016; Carta et al., 2023; Halim et al., 2023).

The number of children may affect the mother's income directly and indirectly. Indirectly it may be through the choice relative to educational attainment and occupation type, while directly through the influence of unobserved effects between the number of children and the mother's income. The study indicates that the number of children, whether one or two, does not affect the hourly wages of the mothers using the fixed effect in the case of Australia (Livermore et al., 2011) and ordinary least squares (OLS) in the study of Indonesia (Swarniati & Setyonaluri, 2024). Previous studies provide an in-depth understanding of the motherhood penalty. Existing studies have revealed a rise in the negative impact of the number of children on female labour income (Gamboa & Zuluaga, 2013; Dotti Sani, 2015). Budig and Hodges's study (2010) revealed that the number of children has a significant effect on low-income women in the United States. Hence, the number of children is likely to have a varied effect on a mother's labour income, depending on whether the mother is a lower, middle or upper earner.

A strand of the literature examines the effect of the motherhood penalty, focusing on previously marginalised groups using a cross-sectional dataset from South Africa NIDS 2017 (Magadla et al., 2019). The study points to the fact that there is a wage gap between those who are mothers and non-mothers, and the motherhood penalty affects those in the lower-income (at the 10th quantile) distribution. Also, studies have shown that preschool-age children significantly negatively affect mother's labour income in the United States (Budig & Hodges, 2010; Budig et al., 2016; Ryu, 2020; Nicoletti, et al., 2023). We noticed that persistently low female labour participation and low income have consistently undermined the development process (Tsani et al., 2013; Sorsa et al., 2015). Even though some researchers have published relevant studies on motherhood. There is a paucity of studies on the effect of the number of children on the mother's labour income in South Africa correct for sample selection bias using Heckman's two-stage model, a robust ordinary least square and quantile regression.

Non-random sample selection is an inevitable issue in applied economics (Heckman, 1979; Buchinsky, 2002; Arellano & Bonhomme, 2017; Bendig & Hoke, 2022), such as in the study of the effect of the number of children on the mother's labour income. The study contributes to the empirical literature by examining the heterogenous effect of the number of children (continuously measured) and children aged below 6 years (preschool age) on mother's labour income distribution, correcting for sample selection bias in quantile regression. There is a paucity of related studies in sub-Saharan African countries, especially in the South African context. The study's uniqueness was that we controlled biased estimates, misinterpretation of association, statistical inference errors, and policy recommendations inaccuracy.

This remaining part of the study is as follows: Section 2 describes the data, including the selection bias and summary statistics. Section 3 is the econometric approach and the exclusion restrictions. Section 4 explains the empirical results and discusses the findings. Section 5 concludes the study.

2. Data

2.1 Data and Sample Selection Bias

The dataset was drawn from the National Income Dynamics Study (NIDS) conducted between 2008 and 2017 (Dataset retrieved from <http://www.nids.uct.ac.za/nids-data/data-access>). The estimated South African population will be 63.016 million by 2024, according to Statistics South Africa (Stats SA). While the male population is about 30.886 million, the female population is approximately 32.13 million, and the sample represents approximately 4.13% of the female population. Sample selection bias could arise for some reason or scenario. The labour income may not be determined strictly by participation but by rental income, among other variables. The outcome (mother's labour income) is assumed to be determined by participation in the labour market, which has many missing values in the observation. The mother's labour income is the outcome variable of interest, and truncation depends on it because of missing data. Therefore, this study assumes sample selection bias. The current study uses the log of real labour income (log labour income divided by deflator and uses 2017 as the base year) and accounts for inflation in labour income received over time. The study computed real labour income by using a deflator¹ to divide the nominal labour income. The study follows the definition of labour income in the NIDS user manual (Brophy et al., 2018). The study identifies two main independent variables: the number of children (a continuous variable) and the children aged below 6 years (a dummy variable) on the mother's labour income. The children's ages are from zero (0) to fourteen (14); however, the study focused on preschool age (aged below 6 years), which is the age when the children need caregivers or their mother's attention the most.

2.2 Summary Statistics

Table 1 presents the mother's age, children aged more than 5 years, and preschool age in the sample. The study selected females aged between 23 and 44 years as the sample. The selection of the female age category is motivated by the fact that those below 23 years are likely to be in school studying for a career path. Some young graduates complete their first degree and start motherhood in South Africa after the age of 22 (Marteleto et al., 2008). The existing study points to the fact that a female at age 22 is young (Madhavan & Thomas, 2005) and may not be a mother yet. Also, the maximum age of the mother is 44 years, and a limited number of preschool-age children is attributable to the mothers ages 43 and 44. The choice of a female aged 44 years was informed by

¹ For a technical application of how a deflator is computed see De Villiers et al. (2013)

the literature as the fertility risk increases as the female's age rises and the baseline age for maternal fertility (Kovac et al., 2013; Cavazos-Rehg et al., 2015; Glick et al., 2021). The focus group is preschool-age, and mothers between 23 and 26 years old have the highest number of preschool children (ranging between 402 and 465).

Table 1: Detail of mother's age by Preschool age and above Preschool age

Mother's age	Children age more than 5	Children age less than 6 (preschool age)	Total
23	91	402	493
24	164	426	590
25	215	465	680
26	291	423	714
27	327	397	724
28	378	354	732
29	405	313	718
30	410	291	701
31	412	297	709
32	432	268	700
33	424	226	650
34	400	207	607
35	403	201	604
36	386	200	586
37	368	179	547
38	377	171	548
39	406	154	560
40	366	139	505
41	401	112	513
42	377	110	487
43	360	98	458
44	352	85	437
Total	7,745	5,518	13,263

Source: Author's computation 2025

In Table 2, The total number of observations is 13263, but the mother's labour income is lower because of missing values (Miller, 2011). Female labour market participation is a binary variable. The average proportion of those participating is 40.3%, and of the non-participants is 59.7%. Female labour participation is low, and existing studies have revealed that females are more unemployed than males (Banerjee et al., 2008; Viljoen & Dunga, 2013). The explanatory variable is the number of children. The number of children is a discrete numerical variable with a minimum of 1 child and a maximum of 9 in the household. In addition, a binary category of the age of the children is generated. The percentage of children below 6 years is about 41.4%, and above 5 years is 58.6%. It is assumed that mothers with preschool-age children are likely to pay a more significant motherhood penalty than older children. Many females have an education above the primary level but below matric. This may have been reflected in the geographical location where the average (50.6%) resides in urban areas. The study creates an index of women's decision-making

using multiple correspondence analysis (MCA) from five decision-making variables. The standard deviation of the women's decision-making index is one (1), and the mean is zero (0).

Table 2: Descriptive Statistics

Variables	Obs.	Mean	Std.Dev.	Min.	Max.
Dependent Variable					
Log of mother's labour income	5171	7.327	1.17	-0.364	11.68
Independent Variables					
Number of children	12954	2.104	1.155	1	9
Children Aged below 6 years	13263	0.414	0.493	0	1
1 child	13263	0.349	0.477	0	1
2 children	13263	0.344	0.475	0	1
3 children	13263	0.177	0.381	0	1
4 or/& more children	13263	0.068	0.252	0	1
Labour market					
Female labour participation	13263	0.403	0.491	0	1
Years of experience in the current job	4000	4.668	5.038	0	33
Education					
No schooling	13263	0.031	0.173	0	1
Primary	13263	0.083	0.277	0	1
Primary but below matric	13263	0.509	0.500	0	1
Matric	13263	0.188	0.391	0	1
Post matric	13263	0.166	0.372	0	1
University	13263	0.021	0.145	0	1
Others diploma	13263	0.001	0.038	0	1
Family structure					
Married	13263	0.277	0.448	0	1
Cohabiting	13263	0.107	0.309	0	1
Widow	13263	0.028	0.165	0	1
Divorce	13263	0.02	0.139	0	1
Single	13263	0.568	0.495	0	1
Race					
African	13263	0.836	0.371	0	1
Indian	13263	0.008	0.089	0	1
White	13263	0.015	0.121	0	1
Coloured	13263	0.141	0.348	0	1
Demographic Factors					
Child's Gender	13263	0.5	0.5	0	1
Child's age	13263	6.805	4.006	0	14
Mother's age	13263	32.811	6.062	23	44
Mother's health status	13263	0.92	0.271	0	1
Life satisfaction	13263	0.595	0.491	0	1
Decision-making index					
Women's decision-making index	13263	0	1	-1.04	1.247
Daily household expenditures	13263	0.511	0.5	0	1
Decision on large unusual purchases	13263	0.427	0.495	0	1
Decision on where children go to school	13263	0.567	0.496	0	1
Decision on where household should live	13263	0.397	0.489	0	1
Who is allowed to live in a household	13263	0.403	0.491	0	1
Geographical location					
Farm	13263	0.060	0.238	0	1
Urban	13263	0.506	0.500	0	1

Traditional	13263	0.433	0.496	0	1
Job Characteristics / Primary Occupation					
Private Household Exterritorial Organization	13263	0.039	0.193	0	1
Agriculture hunting, forestry and fish	13263	0.023	0.15	0	1
Mining and quarrying	13263	0.004	0.064	0	1
Manufacturing	13263	0.024	0.153	0	1
Electricity gas, and water supply	13263	0.002	0.041	0	1
Construction	13263	0.007	0.082	0	1
Wholesale and retail trade	13263	0.007	0.082	0	1
Transport storage and communication	13263	0.066	0.249	0	1
Financial intermediation insurance	13263	0.004	0.066	0	1
Community social & per.	13263	0.024	0.153	0	1
Provinces					
Western Cape	13263	0.11	0.313	0	1
Eastern Cape	13263	0.106	0.308	0	1
Northern Cape	13263	0.075	0.264	0	1
Free State	13263	0.059	0.237	0	1
KwaZulu-Natal	13263	0.287	0.453	0	1
Northwest	13263	0.075	0.264	0	1
Gauteng	13263	0.114	0.318	0	1
Mpumalanga	13263	0.077	0.266	0	1
Limpopo	13263	0.096	0.295	0	1

Source: Author's compilation/computations from NIDS Wave 1 to 5. Source: Author's compilation 2025

Also, about 83.6% of the sample consists of black South Africans, coloured females at 14.1%, whites at 1.5%, and Indians at 0.8% of the sample. The family structure consists of married, cohabiting, widowed, divorced, and single mothers in our sample. In percentage, the average number of married people is about 27.7%, and 10.7% are cohabiting with a partner. A large proportion of the family structures are headed by single mothers (56.8%). The divorcées and widows are 2% and 2.8%, respectively, of the sample. Looking at the proportion of provinces, Kwazulu-Natal (28.7%) has the highest representation in the sample, followed by Gauteng (11.4%), Western Cape (11%), and Eastern Cape (10.6%) among others.

3. Econometric strategy

The study model is specified as follows:

$$\ln Y_{it}^* = \beta_0 + \beta_1 X_{it} + \varepsilon_{it} \quad (1)$$

Where $\ln Y_{it}$ is the natural logarithm of the mother's labour income, the dependent variable $i = 1, \dots, n$ is the sample from the population. X_{it} consists of regressors, the number of children and age of the children below 6 years, and other covariates (maternal education, mother's age, married and cohabiting status, geographical location, province, and job characteristics). ε_{it} is the residual for the sample.

The study employs the Heckman selection model (Gronau, 1974; Heckman, 1976; Bendig & Hoke, 2022) to investigate sample selection bias in the effect of the number of children on a mother's labour income. The labour income equation is expressed as:

$$\ln Y_{it}^* = X_{it}\beta_1 + u_{1it} \quad (2)$$

The labour income for observations is perceived if the mother participates in the labour market (the selection = x_{it}) is

$$x_{it}^* = z_{it}\gamma_1 + u_{2it} \quad (3)$$

where $\text{corr}(u_{1it}, u_{2it}) = \rho$.

The Heckman model yields a reliable, asymptotic, efficient analysis for all the coefficients in the model. In the application, similar covariates affect both income and the selection equation. It is important to note that exclusion restriction variable(s) should be included in the selection equation (Buchinsky, 1998) but excluded in the income equation. The study employed a robust ordinary least squares (OLS) fixed effect to control for unobserved and time-invariance components in the model. Also, we employed a conditional τ^{th} ($10^{th} - 90^{th}$) quantile regression (Buchinsky, 1998; Koenker, 2004; Budig & Hodges, 2010) to answer the question of where the effect of the number of children lies on the distribution of a mother's labour income.

3.1 Motivation for Exclusion Restriction

Selection into the labour income equation relies on the mother's participation. The sample selection bias can be referred to as endogeneity bias. For instance, there is the possibility that some mothers may receive income from other means, such as rent, so they do not participate in the labour market. As earlier mentioned, the composition of labour income includes self-employment income, bonus payment, profit sharing, and help from a friend's income. Hence, an individual with such an income may be subjective in her decision and not motivated to participate in the labour market. Also, some mothers may have inconsistent labour participation; they may be employed in the wave 1 dataset but not in wave 2 (or subsequent waves) or vice versa. It is a concern whether the mother's labour income is accounted for. According to Koné et al. (2019), exogenous variables in the income equation are assumed to be a set of exogenous variables in the selection equation. Hence, the variables predicting the income equation are similarly likely to indicate selection.

Exclusion restriction is very important because, without it, it may be hard to be assured of the result (Wooldridge, 2011). Wooldridge (2010) assumes the exclusion restrictions should be at least two variables. While one variable should be an instrument, another exogenous variable should determine selection. Marital status is assumed to be the exclusion variable in this study. The motivation for this is that married and/or cohabiting women are likely to be unstable at work due

to the care of their child or family welfare. There is also a probability of a tradeoff between time spent at work and childcare at home for married women. They are more likely to take maternity leave and/or sick leave. Hence, marital status may influence labour participation. In the application, marriage and cohabiting are enormously significant in the selection equation, certifying exclusion restriction variables. The study follows the Heckman two-step model and generates the inverse Mills ratio². Hence, the Mills ratio is included in the estimation to control for sample selection bias, even in the quantile regression.

4. Empirical results

4.1 Without correcting for sample selection bias

4.1.1 Controlling for unobserved time invariance: Fixed effect estimator

Table 3 presents the effect of the number of childbirths on mothers' labour income without correcting for sample selection bias using a fixed effect estimator. In column (1), one child has an insignificant positive effect on the mother's labour income. Column (2) presents that two children significantly affect the mother's labour income. Two children's results indicate that we have yet to control selection bias. The number of childbirths (three children and four or more children) has an insignificant effect on the mother's labour income.

Table 3: Effect of childbirth count on mother labour income: Fixed effect without correcting for selection bias

	(1)	(2)	(3)	(4)
Variables	Labour income	Labour income	Labour income	Labour income
1 child	0.000518 (0.0487)			
2 children		0.0678* (0.0375)		
3 children			-0.0505 (0.0422)	
4 & more children				-0.0830 (0.0969)
Education	0.102*** (0.0325)	0.103*** (0.0325)	0.102*** (0.0325)	0.102*** (0.0324)
Mother's age	0.117** (0.0457)	0.117** (0.0457)	0.118*** (0.0457)	0.117** (0.0457)
Women's decision-making	-0.00166 (0.0181)	-0.00211 (0.0181)	-0.00111 (0.0181)	-0.00219 (0.0181)
African	0.341*** (0.101)	0.348*** (0.0817)	0.341*** (0.0812)	0.341*** (0.0813)
Coloured	-1.015*** (0.0774)	-1.013*** (0.0772)	-1.011*** (0.0777)	-1.014*** (0.0773)
Mother's health status	0.133* (0.0774)	0.134* (0.0772)	0.136* (0.0777)	0.133* (0.0773)

² see: Tauchmann, 2010 and Sarma, 2021 for details

	(0.0800)	(0.0798)	(0.0800)	(0.0800)
Urban	0.168	0.164	0.166	0.166
	(0.113)	(0.114)	(0.115)	(0.113)
Traditional	0.169	0.159	0.170	0.167
	(0.139)	(0.141)	(0.140)	(0.140)
Agriculture, hunting forestry & fishing	0.469***	0.471***	0.468***	0.473***
	(0.121)	(0.121)	(0.121)	(0.121)
Mining and quarrying	1.401***	1.408***	1.409***	1.394***
	(0.383)	(0.381)	(0.384)	(0.385)
Manufacturing	0.676***	0.680***	0.676***	0.679***
	(0.114)	(0.114)	(0.114)	(0.114)
Electricity, gas, & water supply	0.266	0.284	0.262	0.267
	(0.232)	(0.243)	(0.230)	(0.231)
Construction	0.577***	0.578***	0.577***	0.576***
	(0.133)	(0.133)	(0.133)	(0.133)
Wholesale and retail trade	0.525***	0.526***	0.526***	0.526***
	(0.0659)	(0.0660)	(0.0659)	(0.0660)
Transport storage & comm.	0.621***	0.619***	0.620***	0.623***
	(0.148)	(0.149)	(0.149)	(0.148)
Financial intermediation	0.664***	0.667***	0.664***	0.667***
	(0.0928)	(0.0926)	(0.0928)	(0.0927)
Community social & personal	0.380***	0.383***	0.381***	0.382***
	(0.0609)	(0.0609)	(0.0609)	(0.0610)
Eastern Cape	0.370**	0.391**	0.377**	0.374**
	(0.172)	(0.170)	(0.169)	(0.172)
Northern Cape	-0.152	-0.150	-0.153	-0.150
	(0.206)	(0.195)	(0.204)	(0.206)
Free State	0.209	0.261	0.223	0.213
	(0.332)	(0.323)	(0.317)	(0.329)
KwaZulu-Natal	0.508*	0.553*	0.525*	0.510*
	(0.307)	(0.297)	(0.296)	(0.306)
Northwest	-0.0138	-0.0318	-0.0324	-0.0139
	(0.308)	(0.298)	(0.304)	(0.308)
Gauteng	-0.0608	-0.0647	-0.0593	-0.0604
	(0.319)	(0.311)	(0.315)	(0.319)
Mpumalanga	0.240	0.246	0.242	0.243
	(0.413)	(0.401)	(0.405)	(0.413)
Limpopo	-0.0514	-0.0708	-0.0478	-0.0484
	(0.438)	(0.431)	(0.433)	(0.438)
Wave 2_5 dummy	Yes	Yes	Yes	Yes
Married	-0.0295	-0.0334	-0.0283	-0.0310
	(0.0584)	(0.0579)	(0.0579)	(0.0577)
Cohabiting	-0.0432	-0.0483	-0.0434	-0.0410
	(0.0658)	(0.0659)	(0.0658)	(0.0659)
Constant	2.007	1.995	1.990	2.017
	(1.389)	(1.390)	(1.389)	(1.389)

Observations	5,171	5,171	5,171	5,171
R-squared	0.395	0.396	0.396	0.396
sigma_u	1.343	1.347	1.345	1.339
sigma_e	0.635	0.634	0.634	0.634
rho	0.817	0.819	0.818	0.817

Robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Source: Computed by the Author 2025

4.1.2 Robust OLS and quantile regression without controlling selection bias

Table 4 presents the estimation of the effect of the number of children on the mother's labour income using pooled ordinary least squares (OLS) with robust standard error and quantile regression bootstrapped. Column (1) of the OLS results reports that the cumulative number of children has a significant negative relationship with the mother's labour income. This implies that the cumulative effect of the number of children reduces the mother's labour income by 3.2%. The children under 6 years have a negative relationship with the mother's labour income, but it is not statistically significant. The mother's age, education, and health significantly positively affect the labour income (Osundina, 2020). This implies that education and a good state of health are likely to increase labour income. Women's decision-making has a positive but insignificant relationship with labour income. Hence, *ceteris paribus*, using the OLS, is unlikely not to be biased, and there is a clear indication that without correcting for sample selection bias, the results may be doubtful.

Columns (2) to (10) present estimating the mother's labour income distribution from the cumulative effect of the number of children using a quantile regression bootstrapped. The results indicate that the cumulative effect of the number of children significantly negatively affects the distribution of the mother's labour income. This implies that the cumulative effect of the number of children will put mothers at a disadvantage in labour income distribution even without correcting for sample selection bias. However, children under 6 years hurt the labour income of those assumed to be lower-income earners, but it is not statistically significant. While children aged below 6 years (preschool children) positively affect the labour income distribution of those on 0.2 to 0.9 quantiles without sample selection, albeit not statistically significant. Women's decision-making has a varying effect on labour income. The study finds that those from 0.5 and 0.8 quantiles significantly positively affect their labour income. Mothers with some levels of decision-making are likely to participate in the labour market and earn income. Job characteristics have a significant positive effect on labour income distribution. The study revealed that many women in Gauteng and Northwest participated in the labour market. However, the result is unlikely to be consistent without correcting for sample selection bias.

Table 4: Quantile regression without correcting for sample selection bias

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
Variables	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income
Number of children	- 0.032* *	- 0.052* **	- 0.052* **	- 0.056* **	- 0.042* **	- 0.031* *	- 0.033* *	- 0.034* *	-0.030	- 0.033*
	(0.013)	(0.019)	(0.018)	(0.017)	(0.015)	(0.013)	(0.013)	(0.014)	(0.021)	(0.018)
Children aged below 6 years	-0.009	-0.008	0.008	0.029	0.028	0.021	0.033	0.027	0.022	0.003
	(0.025)	(0.038)	(0.034)	(0.031)	(0.024)	(0.028)	(0.023)	(0.031)	(0.020)	(0.031)
Education	0.369* **	0.292* **	0.313* **	0.331* **	0.345* **	0.376* **	0.383* **	0.388* **	0.393* **	0.410* **
	(0.013)	(0.013)	(0.019)	(0.021)	(0.016)	(0.011)	(0.012)	(0.014)	(0.014)	(0.023)
Mother's age	0.019* **	0.021* **	0.014* **	0.014* **	0.016* **	0.016* **	0.017* **	0.018* **	0.020* **	0.020* **
	(0.002)	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Women's decision-making	0.014	0.001	0.006	0.017	0.015	0.032* *	0.031* *	0.033* **	0.022* *	0.025
	(0.012)	(0.021)	(0.018)	(0.016)	(0.012)	(0.019)	(0.015)	(0.011)	(0.013)	(0.018)
Race Ref. India										
African	- 0.541* **	- 0.388* **	- 0.623* **	- 0.587* **	- 0.540* **	- 0.525* **	- 0.444* **	- 0.457* **	- 0.508* **	- 0.576* **
	(0.098)	(0.199)	(0.199)	(0.103)	(0.141)	(0.071)	(0.114)	(0.158)	(0.164)	(0.172)
Coloured	- 0.434* **	-0.260	- 0.397* **	- 0.332* **	- 0.339* *	- 0.342* **	- 0.306* **	- 0.327* *	- 0.460* **	- 0.530* **
	(0.106)	(0.235)	(0.219)	(0.128)	(0.156)	(0.076)	(0.113)	(0.144)	(0.177)	(0.168)
White	0.133	0.349	0.202	0.206*	0.211	0.187* *	0.202*	0.138	0.063	0.017
	(0.120)	(0.289)	(0.235)	(0.106)	(0.192)	(0.080)	(0.111)	(0.189)	(0.197)	(0.181)
Mother's health status	0.214* **	0.324* *	0.167* **	0.221* **	0.245* **	0.209* **	0.179* **	0.138* *	0.093	0.063
	(0.054)	(0.128)	(0.059)	(0.049)	(0.059)	(0.081)	(0.049)	(0.067)	(0.064)	(0.076)
Geo. Location Ref: Farm										
Urban	0.211* **	0.337* **	0.349* **	0.287* **	0.194* **	0.181* **	0.143* *	0.094* *	0.124* *	0.096
	(0.053)	(0.095)	(0.091)	(0.058)	(0.041)	(0.058)	(0.057)	(0.039)	(0.060)	(0.087)
Traditional	0.033	0.116	0.170	0.082	-0.014	-0.018	-0.019	-0.034	-0.004	-0.004
	(0.057)	(0.098)	(0.113)	(0.061)	(0.053)	(0.059)	(0.058)	(0.040)	(0.065)	(0.066)
Job characteristics Ref: Private households' exterritorial org										
Agriculture, hunting forest. & f.	0.694* **	1.036* **	0.877* **	0.778* **	0.712* **	0.659* **	0.640* **	0.505* **	0.438* **	0.364* **
	(0.051)	(0.098)	(0.082)	(0.045)	(0.049)	(0.046)	(0.051)	(0.051)	(0.049)	(0.059)
Mining and quarrying	1.598* **	1.691* **	1.657* **	1.721* **	1.723* **	1.554* **	1.555* **	1.435* **	1.370* **	1.187* **
	(0.103)	(0.256)	(0.156)	(0.210)	(0.101)	(0.097)	(0.119)	(0.090)	(0.122)	(0.136)
Manufacturing	0.793*	1.069*	0.912*	0.781*	0.801*	0.753*	0.757*	0.637*	0.608*	0.527*

	**	**	**	**	**	**	**	**	**	**
	(0.045)	(0.100)	(0.062)	(0.055)	(0.046)	(0.054)	(0.029)	(0.034)	(0.060)	(0.081)
Electricity, gas and water supply	1.130* **	1.304* **	1.105* **	0.913* **	1.059* **	1.036* **	1.167* **	1.084* **	1.067* **	0.886* **
	(0.166)	(0.163)	(0.127)	(0.217)	(0.336)	(0.285)	(0.251)	(0.278)	(0.175)	(0.328)
Construction	0.702* **	0.714* **	0.508* **	0.475* **	0.647* **	0.625* **	0.724* **	0.594* **	0.552* **	0.820* **
	(0.101)	(0.191)	(0.106)	(0.123)	(0.136)	(0.078)	(0.131)	(0.072)	(0.181)	(0.200)
Wholesale and retail trade	0.704* **	1.023* **	0.850* **	0.768* **	0.744* **	0.616* **	0.602* **	0.526* **	0.469* **	0.415* **
	(0.034)	(0.068)	(0.037)	(0.046)	(0.041)	(0.029)	(0.034)	(0.038)	(0.037)	(0.039)
Transport storage & comm.	1.159* **	1.296* **	1.142* **	1.044* **	1.135* **	1.085* **	1.012* **	1.004* **	0.952* **	1.141* **
	(0.093)	(0.178)	(0.116)	(0.101)	(0.128)	(0.118)	(0.094)	(0.116)	(0.211)	(0.169)
Financial intermediation	1.015* **	1.352* **	1.141* **	1.008* **	0.962* **	0.866* **	0.846* **	0.827* **	0.764* **	0.728* **
	(0.045)	(0.106)	(0.057)	(0.041)	(0.039)	(0.050)	(0.059)	(0.062)	(0.045)	(0.141)
Community social & personal	0.821* **	0.722* **	0.690* **	0.705* **	0.782* **	0.814* **	0.842* **	0.821* **	0.817* **	0.742* **
	(0.035)	(0.088)	(0.056)	(0.051)	(0.047)	(0.047)	(0.042)	(0.037)	(0.036)	(0.046)
Province Ref. Western Cape										
Eastern Cape	-0.043	-0.023	- 0.104*	-0.006	0.004	0.003	-0.047	-0.073	- 0.124* **	-0.146
	(0.054)	(0.123)	(0.063)	(0.059)	(0.079)	(0.047)	(0.071)	(0.077)	(0.047)	(0.098)
Northern Cape	-0.018	0.032	-0.031	-0.026	-0.011	0.026	-0.041	-0.094	-0.098	-0.060
	(0.049)	(0.108)	(0.061)	(0.068)	(0.063)	(0.061)	(0.051)	(0.069)	(0.064)	(0.089)
Free State	- 0.148* *	-0.074	-0.101	- 0.144* *	-0.130	-0.127	-0.118*	-0.115	- 0.126*	-0.106
	(0.064)	(0.137)	(0.071)	(0.061)	(0.080)	(0.095)	(0.068)	(0.080)	(0.074)	(0.075)
KwaZulu-Natal	0.060	0.137	0.126* *	0.169* *	0.151* *	0.111* *	0.039	0.021	-0.045	-0.077
	(0.052)	(0.112)	(0.061)	(0.084)	(0.071)	(0.053)	(0.049)	(0.059)	(0.052)	(0.051)
Northwest	0.162* *	0.283* *	0.162* *	0.224* *	0.186* *	0.175* **	0.134*	0.115*	0.100	0.015
	(0.063)	(0.134)	(0.070)	(0.107)	(0.083)	(0.062)	(0.079)	(0.059)	(0.079)	(0.071)
Gauteng	0.193* **	0.389* **	0.250* **	0.296* **	0.231* **	0.213* **	0.159* **	0.121*	0.093*	0.135* *
	(0.051)	(0.093)	(0.060)	(0.063)	(0.055)	(0.050)	(0.041)	(0.064)	(0.052)	(0.063)
Mpumalanga	0.088	0.254* *	0.111	0.165* *	0.081	0.055	-0.000	0.055	0.035	0.076
	(0.059)	(0.114)	(0.092)	(0.079)	(0.050)	(0.053)	(0.059)	(0.064)	(0.086)	(0.079)
Limpopo	- 0.211* **	-0.128	- 0.208* **	- 0.173* *	- 0.133*	- 0.156*	- 0.131* *	- 0.143*	- 0.130*	- 0.167* *
	(0.069)	(0.139)	(0.057)	(0.086)	(0.074)	(0.080)	(0.058)	(0.077)	(0.072)	(0.065)
Wave Ref. Wave 1 dummy										
Wave 2_5 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Married	0.088*	0.085*	0.108*	0.151*	0.130*	0.100*	0.077*	0.069*	0.072*	0.045

	**		*	**	**	**	*		*	
	(0.029)	(0.046)	(0.045)	(0.048)	(0.031)	(0.028)	(0.035)	(0.038)	(0.031)	(0.030)
Cohabiting	-0.042	-0.059	-0.040	-0.054	-0.057	-0.046	-0.049	-0.039	0.021	0.017
	(0.038)	(0.062)	(0.077)	(0.056)	(0.048)	(0.032)	(0.047)	(0.050)	(0.044)	(0.045)
Constant	4.680*	3.375*	4.387*	4.516*	4.616*	4.811*	4.928*	5.223*	5.421*	5.815*
	**	**	**	**	**	**	**	**	**	**
	(0.157)	(0.302)	(0.311)	(0.167)	(0.194)	(0.153)	(0.150)	(0.263)	(0.166)	(0.213)
Observations	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058
R-squared	0.510									

All standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Source: Author's computation 2025

4.2 Heckman sample selection with two-step option

Table 5 presents the estimation of the Heckman sample selection with a two-step option result. Column (1) shows the labour income model, which consists of the number of children, the mother's education, age, women's decision-making, geographical location, provinces, and job characteristics. The result shows that the number of children significantly negatively influences the mother's labour income. This means that a unit increase in the number of children will likely reduce a mother's labour income by 3%. The inverse Mills ratio or lambda is statistically significant (Kelifa, 2023); hence, the exclusion restrictions assumption is satisfied, and there is a sample selection bias in the form of missing values in the outcome variable. Furthermore, the inverse Mills ratio generated was included in the quantile regression model to correct for the sample selection bias.

Table 6 column (2) presents the selection model comprised of a dummy of labour market income as an opposed dummy of labour participation. Other variables include the exclusion restrictions (married and cohabiting), women's decision-making, children aged below 6 years, race, mother's health, dwelling, province women's decision-making and waves dummies. The variables of exclusion restrictions are not included in the first (or labour income) model (Certo et al., 2016), where the inverse mills ratio is strongly significant in the model (Bendig & Hoke, 2022). The results reveal that children aged below 6 years have a significant negative influence on the mother's labour participation. Conversely, a mother's participation in the labour market outside the home may harm children's early childhood development. The existing study has reported that a mother's presence is vital for children's health, cognitive development, and responsiveness (Ruhm, 2004; Gupta et al., 2008; Milkie et al., 2015).

Table 5: Heckman Selection bias two-step

Variables	(1) Labour income	(2) Selection
Number of children	-0.0310** (0.0121)	
Children aged below 6 years	-0.0953** (0.0390)	-0.151*** (0.0252)
Education	0.545*** (0.0551)	0.325*** (0.0123)
Mother's age	0.0368*** (0.00565)	0.0322*** (0.00226)
Women's decision-making	0.0860*** (0.0276)	0.136*** (0.0125)
African	-0.471*** (0.145)	0.181 (0.131)
Coloured	-0.257 (0.163)	0.398*** (0.137)
White	0.261 (0.170)	0.313* (0.162)
Mother's health status	0.348*** (0.0666)	0.234*** (0.0450)
Urban	0.139** (0.0599)	-0.126** (0.0505)
Traditional	-0.267** (0.109)	-0.533*** (0.0530)
Agriculture hunting forestry	0.686*** (0.0536)	
Mining and quarrying	1.600*** (0.116)	
Manufacturing	0.794*** (0.0507)	
Electricity gas and water supply	1.123*** (0.189)	
Construction	0.692*** (0.0885)	
Wholesale and retail trade	0.708*** (0.0353)	
Transport storage and comm.	1.151*** (0.112)	
Financial intermediation ins.	1.019*** (0.0531)	
Community, social, & personal	0.819*** (0.0324)	
Eastern Cape	-0.151** (0.0702)	-0.216*** (0.0573)
Northern Cape	-0.170** (0.0748)	-0.289*** (0.0549)
Free State	-0.252*** (0.0778)	-0.208*** (0.0656)
KwaZulu-Natal	-0.0168	-0.134**

	(0.0612)	(0.0544)
Northwest	-0.00832	-0.300***
	(0.0896)	(0.0654)
Gauteng	0.121*	-0.128**
	(0.0635)	(0.0568)
Mpumalanga	0.0322	-0.0993
	(0.0696)	(0.0632)
Limpopo	-0.308***	-0.186***
	(0.0778)	(0.0646)
Wave 2_5 dummy	Yes	Yes
Married		-0.103***
		(0.0287)
Cohabiting		-0.101**
		(0.0398)
Constant	2.889***	-2.064***
	(0.593)	(0.174)
Observations	5058	13,150
lambda/mills	0.846***	
	(0.264)	
rho	0.799	
sigma	1.058	

Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Source: Author's computation 2025

4.3 With correction for sample selection

4.3.1 Controlling for unobserved time invariance: Fixed effect with correction of selection bias

Table 6 presents the effect of the number of childbirths on mother labour income using a fixed effect estimator and correcting for sample selection bias. The results revealed that mothers are disadvantaged in their labour income with one child, three children or more than four children. However, it is not statistically significant. Also, the effect of 2 children has an insignificant positive impact on the mother's labour income. The effect of a categorically measured number of childbirths on a mother's labour income is inconclusive. The finding is compatible with the study of Gupta and Smith (2002), who remarked that after controlling for unobserved and time invariance heterogeneity, the effect of the number of childbirths on mother labour income disappeared.

Table 6: Effect of childbirth count on mother labour income: Fixed effect and correcting for selection bias

	(1)	(2)	(3)	(4)
Variables	Labour income	Labour income	Labour income	Labour income
1 child	-0.00859 (0.0507)			
2 children		0.0598 (0.0370)		
3 children			-0.0489 (0.0423)	
4 & more children				-0.0716 (0.0975)
Education	0.0691 (0.0581)	0.0654 (0.0576)	0.0719 (0.0574)	0.0689 (0.0577)
Mother's age	0.115** (0.0468)	0.114** (0.0468)	0.116** (0.0468)	0.115** (0.0468)
Women's decision-making	-0.0158 (0.0286)	-0.0179 (0.0285)	-0.0138 (0.0284)	-0.0162 (0.0284)
Coloured	-1.011*** (0.0800)		-1.006*** (0.0804)	
Mother's health status	0.109 (0.0891)	0.110 (0.0886)	0.114 (0.0888)	0.112 (0.0887)
Urban	0.182 (0.115)	0.181 (0.115)	0.180 (0.116)	0.181 (0.115)
Traditional	0.223 (0.152)	0.221 (0.152)	0.221 (0.153)	0.223 (0.152)
Agriculture, hunting, forestry, fishing	0.473*** (0.121)	0.475*** (0.121)	0.472*** (0.121)	0.476*** (0.121)
Mining and quarrying	1.463*** (0.412)	1.472*** (0.411)	1.471*** (0.414)	1.458*** (0.414)
Manufacturing	0.676*** (0.114)	0.680*** (0.114)	0.676*** (0.115)	0.680*** (0.115)
Electricity, gas, & water supply	0.247 (0.291)	0.255 (0.299)	0.248 (0.288)	0.247 (0.289)
Construction	0.586*** (0.139)	0.587*** (0.138)	0.586*** (0.138)	0.587*** (0.139)
Wholesale and retail trade	0.527*** (0.0665)	0.528*** (0.0665)	0.527*** (0.0664)	0.528*** (0.0665)
Transport storage & comm.	0.626*** (0.146)	0.626*** (0.147)	0.625*** (0.148)	0.629*** (0.146)
Financial intermediation	0.667*** (0.0939)	0.677*** (0.0945)	0.667*** (0.0940)	0.676*** (0.0946)
Community social & personal.	0.384*** (0.0613)	0.387*** (0.0614)	0.384*** (0.0613)	0.386*** (0.0614)
Eastern Cape	0.390*** (0.151)	0.396*** (0.150)	0.388*** (0.150)	0.391*** (0.150)

Northern Cape	-0.136	-0.130	-0.139	-0.134
	(0.213)	(0.206)	(0.213)	(0.214)
Free State	0.215	0.282	0.232	0.215
	(0.489)	(0.474)	(0.469)	(0.487)
KwaZulu-Natal	0.503	0.568	0.528	0.502
	(0.525)	(0.510)	(0.508)	(0.525)
Northwest	0.00177	-0.00175	-0.0144	-0.000211
	(0.376)	(0.367)	(0.372)	(0.377)
Gauteng	-0.0597	-0.0525	-0.0535	-0.0607
	(0.373)	(0.365)	(0.369)	(0.375)
Mpumalanga	0.221	0.241	0.231	0.224
	(0.514)	(0.502)	(0.506)	(0.515)
Limpopo	-0.0599	-0.0585	-0.0466	-0.0528
	(0.503)	(0.496)	(0.497)	(0.504)
Wave 2_5 dummy	Yes	Yes	Yes	Yes
Mills ratio	-0.166	-0.185	-0.150	-0.164
	(0.255)	(0.251)	(0.250)	(0.251)
Constant	2.605*	2.424	2.542*	2.404
	(1.507)	(1.494)	(1.498)	(1.498)
Observations	5,058	5,058	5,058	5,058
R-squared	0.394	0.394	0.394	0.394
sigma_u	3,091	3,091	3,091	3,091
sigma_e	1.273	1.184	1.276	1.178
rho	0.634	0.634	0.634	0.634

Robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Source: Author's computation 2025

4.3.2 Robust OLS and quantile regression with correction of selection bias

Table 7 shows that the cumulative effect of the number of children has a significant negative relationship with the mother's income using OLS in Column (1). The cumulative effect of the number of children may be a constraint, thereby reducing the full utilisation of women's educational capacity and shrinking their income. This result is compatible with the findings of Budig and Hodges (2010), namely, that the number of children disadvantages the mother in the issues of labour income. The class of children aged below 6 years has a negative relationship with their mother's labour income. In other words, a unit increase in preschool-age children is likely to reduce the mother's labour income by at least 1% after correcting for sample selection bias, but it is insignificant. This implies that women with preschool-age children tend to spend more time on childcare, which is likely to reduce the time available for labour participation and invariably reduce labour income.

The mother's educational attainment tends to increase the labour income; however, the result will be overestimated without correcting sample selection bias. The findings support the findings of Miller (2011), who established that educated women have an advantage in labour earnings. Also, the results show that the mother's age has great potential to influence their labour income (Sheran, 2007). While the African (57.7%) and Coloured (48.3%) groups have a significant negative relationship with the mother's labour income compared to India, *ceteris paribus*. These are both

previously marginalised groups. Although the historical antecedent of apartheid has ended, the lingering effect of income inequality remains.

Furthermore, mothers living in urban locations are likely to experience an increase in their labour income compared to those living in farming areas. Those in the traditional location are likely to have an insignificant increase in income compared to those in a farming location. Living in an urban environment is expected to reduce travelling time and mobility costs, compensating for a lower worker income. The urban location result is consistent with and without correcting for sample selection bias and the literature indicates that the income grows with urban mass for the benefit of labour (Di Addario & Patacchini, 2008). There is a high chance that those mothers living in a traditional location in South Africa face a high cost of mobility, which implies that they are likely to reside far from their workplace. Mothers in the Free State (14.5%) and Limpopo (20.7%) are likely to receive less labour income than those in the Western Cape. Meanwhile, those in Gauteng (19.2%) and Northwest (15.9%) are likely to show an improvement in their labour income. The results of the provinces also point to the fact that correcting for sample selection is important.

Furthermore, Table 7, columns (2) to (10), presents quantile regression correcting for sample selection bias. The quantile regression analysis shows that the cumulative number of children has a negative effect (with an irregular pattern) on the mother's labour income distribution, all things being equal. This finding is similar to that of Budig and Hodges (2010), who reported that mothers are primarily at an income disadvantage, especially those with the lowest income distribution. There is a notable change in the results of the effect of children aged below 6 years on the labour income distribution between uncorrected and corrected sample selection at all quantiles. The children aged below 6 years harm the mother's labour income, albeit it is not statistically significant at the lower tail.

The mother's age and education significantly positively affect the mother's labour income distribution with a higher degree of variation after correcting for sample selection bias. The positive effects of mothers' health status on their labour income distribution are moderately stronger after correcting for sample selection bias. Women's decision-making positively influences the labour income of those who are likely to be high-income receivers. On the one hand, the higher earners may have high savings in their bank accounts, even when the child of care increases their expenses and reduces time because they are likely to decide to buy expensive child-mother products. The current study finds that women's decision-making positively affects the labour income of those with an upper income (at 0.9 quantiles), but it is statistically insignificant. The upper-income earners are also more likely to increase their maternity leave and stay at home (Simonsen & Skipper, 2012).

Also, living in an urban area significantly positively affects the mother's labour income distribution. The analysis could have presented overestimated results without correcting for sample selection bias. This study found that job characteristics significantly positively affect the mother's labour income distribution after correcting for sample selection bias. This implies that the opportunity to participate in the labour market will increase the mother's income.

Table 7: Heckman Model correcting for sample selection bias in Quantile regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
Variables	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income	Labour income
Number of children	-0.031* (0.012)	-0.051* (0.027)	-0.052** (0.018)	-0.044** (0.015)	-0.031* (0.014)	-0.028* (0.014)	-0.027* (0.013)	-0.040** (0.013)	-0.023* (0.014)	-0.035* (0.017)
Children age below 6 years	-0.097** (0.034)	-0.111 (0.076)	-0.061 (0.053)	-0.064 (0.044)	-0.093* (0.041)	-0.079* (0.039)	-0.054 (0.038)	-0.054 (0.037)	-0.046 (0.039)	-0.079 (0.048)
Education	0.550** (0.049)	0.466** (0.110)	0.484** (0.076)	0.538** (0.063)	0.581** (0.059)	0.591** (0.056)	0.561** (0.055)	0.548** (0.053)	0.520** (0.056)	0.557** (0.069)
Mother's age	0.037** (0.005)	0.035** (0.011)	0.032** (0.008)	0.035** (0.006)	0.039** (0.006)	0.038** (0.006)	0.035** (0.006)	0.035** (0.005)	0.033** (0.006)	0.034** (0.007)
Women's decision-making	0.088** (0.025)	0.086 (0.055)	0.083* (0.038)	0.091** (0.031)	0.108** (0.030)	0.115** (0.028)	0.104** (0.027)	0.104** (0.026)	0.074** (0.028)	0.094** (0.035)
Race Ref. India										
African	-0.470** (0.102)	-0.391 (0.275)	-0.460* (0.190)	-0.543** (0.158)	-0.420** (0.149)	-0.446** (0.140)	-0.391** (0.137)	-0.372** (0.132)	-0.457** (0.140)	-0.467** (0.174)
Coloured	-0.253* (0.121)	-0.143 (0.311)	-0.093 (0.215)	-0.178 (0.178)	-0.065 (0.169)	-0.120 (0.159)	-0.136 (0.155)	-0.158 (0.150)	-0.316* (0.158)	-0.337* (0.197)
White	0.263* (0.126)	0.431 (0.320)	0.498* (0.221)	0.355* (0.183)	0.392* (0.173)	0.375* (0.163)	0.348* (0.159)	0.296* (0.154)	0.131 (0.163)	0.197 (0.202)
Mother's health status	0.350** (0.065)	0.454** (0.131)	0.281** (0.090)	0.385** (0.075)	0.409** (0.071)	0.355** (0.067)	0.299** (0.065)	0.247** (0.063)	0.177** (0.067)	0.186* (0.083)
Geographical Location Ref: Farm										
Urban	0.138* (0.056)	0.241* (0.116)	0.279** (0.080)	0.196** (0.066)	0.094 (0.063)	0.075 (0.059)	0.079 (0.058)	0.037 (0.056)	0.089 (0.059)	0.031 (0.073)

	)	)		)	)	)	)	)	)	)
Traditional	- 0.273* **	-0.200	-0.111	- 0.278* *	- 0.416* **	- 0.410* **	- 0.327* **	- 0.317* **	- 0.211* **	- 0.262* **
	(0.099)	(0.215)	(0.148)	(0.123)	(0.116)	(0.110)	(0.107)	(0.103)	(0.109)	(0.136)
Job characteristics Ref: Private households exterritorial org										
Agriculture hunting forestry & f	0.686* **	1.047* **	0.870* **	0.813* **	0.703* **	0.663* **	0.622* **	0.502* **	0.442* **	0.376* **
	(0.050)	(0.120)	(0.083)	(0.069)	(0.065)	(0.061)	(0.060)	(0.058)	(0.061)	(0.076)
Mining and quarrying	1.600* **	1.646* **	1.677* **	1.682* **	1.723* **	1.589* **	1.549* **	1.449* **	1.384* **	1.171* **
	(0.104)	(0.255)	(0.176)	(0.146)	(0.138)	(0.130)	(0.127)	(0.123)	(0.130)	(0.161)
Manufacturing	0.795* **	1.100* **	0.928* **	0.811* **	0.805* **	0.758* **	0.730* **	0.653* **	0.581* **	0.537* **
	(0.045)	(0.112)	(0.077)	(0.064)	(0.061)	(0.057)	(0.056)	(0.054)	(0.057)	(0.071)
Electricity gas and water supply	1.122* **	1.346* **	1.172* **	1.028* **	1.049* **	1.053* **	1.181* **	0.998* **	1.021* **	0.879* **
	(0.166)	(0.396)	(0.273)	(0.227)	(0.215)	(0.202)	(0.197)	(0.191)	(0.202)	(0.251)
Construction	0.692* **	0.793* **	0.523* **	0.509* **	0.646* **	0.665* **	0.709* **	0.607* **	0.552* **	0.819* **
	(0.100)	(0.198)	(0.137)	(0.114)	(0.107)	(0.101)	(0.099)	(0.096)	(0.101)	(0.126)
Wholesale and retail trade	0.709* **	1.018* **	0.873* **	0.779* **	0.737* **	0.626* **	0.595* **	0.529* **	0.469* **	0.420* **
	(0.034)	(0.078)	(0.054)	(0.045)	(0.042)	(0.040)	(0.039)	(0.038)	(0.040)	(0.049)
Transport storage & comm.	1.151* **	1.292* **	1.195* **	1.090* **	1.101* **	1.078* **	1.014* **	1.005* **	0.958* **	1.145* **
	(0.092)	(0.241)	(0.166)	(0.138)	(0.131)	(0.123)	(0.120)	(0.116)	(0.123)	(0.153)
Financial intermediation ins.	1.019* **	1.358* **	1.154* **	1.051* **	0.974* **	0.893* **	0.861* **	0.849* **	0.750* **	0.743* **
	(0.045)	(0.115)	(0.079)	(0.066)	(0.062)	(0.059)	(0.057)	(0.055)	(0.058)	(0.073)
Community social & personal s	0.819* **	0.740* **	0.710* **	0.727* **	0.768* **	0.799* **	0.848* **	0.829* **	0.804* **	0.750* **
	(0.035)	(0.071)	(0.049)	(0.041)	(0.039)	(0.036)	(0.035)	(0.034)	(0.036)	(0.045)
Province Ref. Western Cape										
Eastern Cape	- 0.152* *	-0.139	-0.172*	-0.092	- 0.138* *	- 0.116* *	- 0.155* *	- 0.193* **	- 0.193* **	- 0.245* **
	(0.062)	(0.135)	(0.093)	(0.077)	(0.073)	(0.069)	(0.067)	(0.065)	(0.068)	(0.085)
Northern Cape	- 0.173* **	-0.117	-0.184*	- 0.183* *	- 0.225* **	- 0.166* *	- 0.224* **	- 0.232* **	- 0.208* **	- 0.212* *

	(0.065)	(0.145)	(0.100)	(0.083)	(0.078)	(0.074)	(0.072)	(0.070)	(0.074)	(0.092)
Free State	- 0.253* **	-0.142	-0.167	- 0.236* **	- 0.253* **	- 0.222* **	- 0.248* **	- 0.249* **	- 0.194* *	- 0.209* *
	(0.070)	(0.149)	(0.103)	(0.085)	(0.080)	(0.076)	(0.074)	(0.072)	(0.076)	(0.094)
KwaZulu-Natal	-0.017	0.065	0.073	0.088	0.068	0.030	-0.028	-0.069	-0.087	- 0.149* *
	(0.055)	(0.117)	(0.081)	(0.067)	(0.063)	(0.060)	(0.058)	(0.056)	(0.059)	(0.074)
Northwest	-0.011	0.123	0.024	0.056	-0.008	-0.030	-0.049	-0.075	-0.003	-0.139
	(0.077)	(0.176)	(0.121)	(0.101)	(0.095)	(0.090)	(0.087)	(0.085)	(0.089)	(0.111)
Gauteng	0.120* *	0.350* **	0.194* *	0.208* **	0.157* *	0.139* *	0.080	0.032	0.054	0.060
	(0.054)	(0.121)	(0.083)	(0.069)	(0.065)	(0.062)	(0.060)	(0.058)	(0.061)	(0.076)
Mpumalanga	0.032	0.225*	0.079	0.086	0.030	-0.008	-0.043	-0.042	0.004	-0.015
	(0.061)	(0.133)	(0.092)	(0.076)	(0.072)	(0.068)	(0.066)	(0.064)	(0.068)	(0.084)
Limpopo	- 0.308* **	-0.180	- 0.274* **	- 0.283* **	- 0.272* **	- 0.280* **	- 0.213* **	- 0.250* **	- 0.191* *	- 0.252* **
	(0.075)	(0.150)	(0.104)	(0.086)	(0.081)	(0.077)	(0.075)	(0.072)	(0.076)	(0.095)
Wave Ref. Wave 1 dummy										
Wave 2_5 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mills ratio	0.864* **	0.843	0.803* *	0.980* **	1.090* **	1.043* **	0.876* **	0.790* **	0.613* *	0.720* *
	(0.235)	(0.529)	(0.365)	(0.303)	(0.286)	(0.270)	(0.264)	(0.255)	(0.269)	(0.335)
Constant	2.847* **	1.769	2.505* **	2.395* **	2.271* **	2.631* **	3.110* **	3.549* **	4.114* **	4.284* **
	(0.518)	(1.179)	(0.814)	(0.676)	(0.639)	(0.602)	(0.587)	(0.568)	(0.600)	(0.747)
Observations	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058	5,058
R-squared	0.510									

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Source: Author's computation 2025

Figure 1: Visual effect of the Number of children

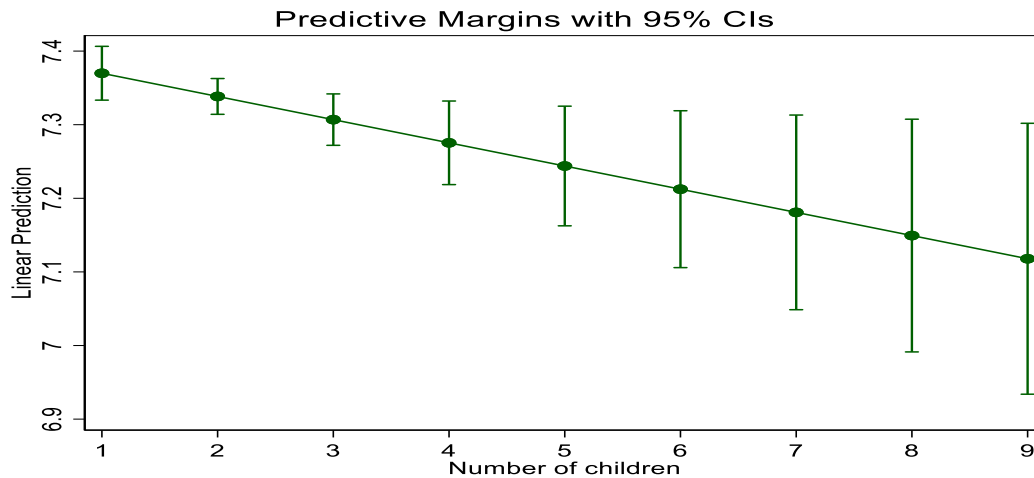


Figure 1 displays a visual presentation of the effect of the number of children on a mother's labour income. The marginal impact of the cumulative number of children increases as the labour income decreases. The effects of the differences between the number of children and the number of others are not statistically significant at 95% confidence intervals. The mother's labour income is expected to decrease as the children gradually increase (Wrohlich, 2011).

4.4 Discussion

The study compared the results without and with correcting for sample selection in applying a robust OLS and quantile regression in the study of the effect of the number of children on a mother's labour income. The findings clearly show that the analysis presents overestimated results without correcting for sample selection bias. The current study accounts for inflation in the labour income, which makes this study different from existing related studies. The findings point to two new pieces of evidence in the South African case. First, the results reveal that the number of children negatively and heterogeneously affects the mother's labour income distribution (Budig & Hodges, 2010). For the cumulative number of children, the findings show that women at the lowest income distribution (such as 0.10 and 0.20 quantiles) are primarily disadvantaged in their labour income compared to those on the other quantiles. Studies have reported that upper-income mothers are likely to receive income for maternity leave, so the effect of childbirth count may be minimal on their income compared to lower-income mothers (Budig & Hodges, 2014; Bailey et al., 2019). The current study explains a unique pattern of income inequality among mothers with a high number of children in South Africa. Arguably, women who earn very little may not be able to afford daycare or nanny (child cost), and they are likely to participate less in the labour market if they spend more time on childcare. Budig and Hodges (2010) in the United States found a similar result: the number of children explains women's earnings disadvantage in the lower-income distribution. It is noted in the literature that women at the lower quantiles of income distribution find it challenging to combine work and family (Budig & Hodges 2010). However, it is important to point out that women are motivated differently to participate in the labour market, even with

childcare. Hence, a balance between family responsibilities and labour market participation for women with some children (Kuziemko et al., 2018) is important.

Second, women with children aged below 6 years are mainly disadvantaged in their labour income. This indicates that mothers with preschool-age children (in early childhood) demand physical (Budig & Hodges, 2010) and emotional attention for childcare. Mothers with children of preschool age are either likely to be nursing mothers or on maternity leave and, therefore, less likely to participate in the labour market. They are likely to face a problem of underutilisation of potential or capacity. Those mothers in the upper-income distribution will likely trade off their time allocation between childcare and labour participation. Even having some children negatively affects the mother's potential and labour income (Zhu, 2012). The current results show that Black South African women with some children are primarily disadvantaged in their labour income as compared to other groups. The findings further revealed that mothers suffer various degrees of labour income disadvantage by racial group. Whites have a more significant advantage over other groups (Budig & England, 2001; Budig & Hodges, 2010). Also, the findings reveal that mothers with the lowest income distribution are primarily disadvantaged across the labour income distribution, regardless of job characteristics.

Although children's nutrition variables are not included in this current study, the study envisages that the increase in the number of children will likely worsen child nutritional outcomes. Existing studies have found that the number of siblings (household size) hurts the children's nutritional status (Kumar & Ram, 2013). Even a more recent study has found that the number of children might reduce the nutritional quality (Feng & He, 2021) in the case of China. However, parental investment in children in early childhood development is likely to enhance short and long-term health and cognitive outcomes (Cunha et al., 2010; Demir et al., 2020). In addition, the study found that women's decision-making has a heterogeneous effect on their income. This is compatible with the study of Debnath (2015). Van Biljon et al. (2018) remark in their study that women with some levels of decision-making are unlikely not to participate in the labour market and earn income. Even women's decision-making will influence child education outcomes (Alfano et al., 2010).

5. Conclusion

This current study is the first to investigate the effect of the number of children on the mother's labour income distribution in the South African context and correct for sample selection bias by employing the Heckman selection model in quantile regression. The econometric findings show that one could have overestimated the effect of the cumulative number of children and underestimated children aged below 6 years on mothers' labour income without correcting for sample selection bias. The cumulative number of children negatively and irregularly affects the mother's labour income distribution. The number of children tends to differentiate mothers economically. For instance, mothers with fewer children (e.g. less than 3) are likely to be better off economically. At the same time, those with an increased number of children (e.g. above 3) are likely to be worse economically unless they have resources or high household income.

Notably, there may be a female income gap due to a break in career path and the underutilisation of potential that arises from the cumulative effect of the number of children and preschool-age childcare. The findings also show that mothers at lower income levels might be the lower income earners. They will likely live far from work in traditional or rural locations, and their earnings may

not be sufficient when they use a large part of it for transport fares. The study suggests the protection of women through a strong labour market institution (Gammage et al., 2020). The findings reveal a need for policy recommendations to enable flexible time management in the workplace for mother-child care. The study further suggests that capacity building and lifelong learning policies could limit the disadvantaged position that mothers always find themselves in when they return to the labour market. It is believed that higher education attainment is likely to pave the way for labour market participation (Weiss et al., 2014).

Furthermore, the study suggests that the government and stakeholders in the labour market should support and raise awareness of family planning, contraceptives, and child spacing. Regular talks on family planning are likely to reduce the cumulative effect of the number of children on mothers' labour income. Contraceptives should be encouraged (Pasha et al., 2015), and child spacing should be used for better health outcomes for the mother and child. Using contraceptives will reduce unplanned pregnancies and increase labour market participation (John et al., 2020). The country may learn from China's family planning (two-child) policy implemented in 2016 (Wang et al., 2017). Perhaps it may reduce the increase in the number of children and allow full labour participation of females after giving birth to two children. When the number of children is reduced, the cumulative period spent during maternity leave will be reduced, and time for potential capacity development will likely increase.

An existing study has revealed that the current maternity leave policy is individualistic and negatively affects mothers and children (Boswell & Boswell, 2009). The maternal leave varied from one sector to another (Walsh et al., 2019). The leave policies in South Africa favour only those in former employment (professionals and public service), and some are in the private sector. Hence, the current study suggests that policymakers should improve maternity leave to close the gap in the leave allocation in the different sectors and pursue social equality. The study suggests that non-governmental organisations (or international foundations) should invest in a childcare centre, and mobile production firms should seek to provide a solution through low-cost mobility or transport for those living in the traditional farming and rural environment far from the workplace. Finally, this study suggests that entrepreneurship development programmes for mothers are essential for them to become self-sufficient in generating an income and have time for the early childhood development of their children. One of the limitations of the study is that adult males are absent in the South African dataset because childbirth records are mostly attached to female information. A future study should compare households where adult males are present and households where they are not present.

Acknowledgement

The dataset used, and some contents in this article came from my PhD thesis submitted to the University of the Witwatersrand (Wits). Therefore, this publication acknowledges the university's rights and confirms that there is no conflict of interest regarding the copyright of the thesis.

Declaration of conflicting interest

The author reported no potential conflict of interest in this paper.

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