

**DETERMINANTS OF FEMALE LABOR FORCE PARTICIPATION IN
RWANDA**

By

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Declaration

This research project is my original work and has not been presented for the award of a degree in this or any other university.

Signed Date.....

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This thesis has been submitted for examination with my approval as the university supervisor.

Signed Date.....

DR. Martine Oleche

Dedication

To my beloved parents.

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Abbreviations

FLFP	Female Labor Force Participation
GDP	Gross Domestic Product
ICLS	International Conference of Labor Statisticians
LFP	Labor Force Participation
LFPR	Labor Force Participation Rate
LPM	Linear Probability Model
NISR	National Institute of Statistics of Rwanda
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
RLFS	Rwanda Labor Force Survey
USA	United States of America

ABSTRACT

The government of Rwanda has registered remarkable achievements regarding gender equity and women empowerment over the years. However, in the labor force there seems to be a persistent gender gap. Female Labor Force Participation (FLFP) rate remains disproportionately below that of men, and more women are in the informal sector whereas men record a large number in the formal sector. There exists a dearth of empirical evidence on the factors influencing FLFP in Rwanda. Thus, this paper sought to bridge this knowledge gap by analyzing the factors that influence female labor force participation in Rwanda, using the recent Rwandan Labor Force Survey data 2017.

The study employed the binary logit model to establish the determinants of female labor force participation. We find that the main factors associated with female participation in the labor force are higher levels of education, urban residence, household size, head of household and age. In an attempt to investigate the factors influencing participation in formal and informal sectors, the study used the multinomial logit model. We establish a positive and significant effect of higher levels of education on female participation in the formal sector as opposed to informal sector.

In particular, we find that all levels of education are negatively associated with participation in the informal sector. The results suggest that educational attainment particularly higher levels, age of a woman, being married, head of the household, as well as urban residence, are associated with participation in the formal sector. The findings indicate almost similar results for informal sector with the exception of education. The study established the large extent of informal employment in Rwanda and the urgency to formalize the informal sector.

CHAPTER ONE

INTRODUCTION

1.1 Background

Female Labor Force Participation (FLFP) is a topic that has received great attention from scholars both in developed and developing countries, for a variety of reasons. Females' integration in the labor market is seen as the main driver for sustainable human development, worldwide (World Economic Forum, 2014), and participation in the labor force is the main channel through which they can be easily integrated. Exclusion of women in the labor force acts as a brake towards national development by stifling economic growth (Whitmore and Nunn, 2017). Through their effect on the stock of labor, FLFP is considered to be a motor and a consequence of development, as well as an important booster of economic growth (Verick, 2014; Psacharopoulos and Tzannato, 1989).

The participation of women in the labor force has demonstrated an increasing trend over the years in varying countries. Most studies report that the remarkable increase in female participation is mostly noticed since World War II (Ngai and Petrongolo, 2017; Semyonov, 1980). This rise has been investigated by many scholars both in developed and developing countries (Whitmore and Nunn, 2017; Heath and Jayachandran, 2016; Verick, 2014; Lau et. al., 2006; Nam, 1991), but remains an area of active and innovative research. Since the empirical work of Mincer (1962), there have been several studies investigating the determinants of female labor force participation, which is an interest of this research.

Empirical work has reported numerous factors attributable to female labor force participation. In addition to economic development, there is individual factors such as educational attainment which was established to influence female labor force participation positively, also hypothesized by the human capital theory, and age of a woman. Family factors such as fertility rate which exerts a negative impact on a woman's participation were also extensively documented. Other factors include geographical factors as well as government policies aiming at improving women's earning potential such as providing paid maternity leave or availability of child care subsidies, microfinance and business skills training (Semyonov, 1980; Heath and Jayachandran, 2016; Verick, 2014; Chen et al., (2014).

The present study also takes into account the fact that the determinants influencing women to participate in various employments vary, as shown by Mariara (2003) and Atieno (2006), and it intends to establish which ones are associated with their participation in either formal or informal sectors in Rwanda. For instance, Atieno (2006) found that women's education contributes to their participation in the formal sector in Kenya. Thamma-Apiroam (2016) stated higher level of education increases women's skills, and in turn makes them more competitive and contributes to them being admitted in higher position at the workplace.

As such, this allows them to be independent economically, provide for their families and gain bargaining power as well as making their contribution visible and high within the household. Thus, the stagnation of female labor force participation will exert a positive impact on their total well-being and empowerment. Women's employment, especially in well-paying jobs or higher positions, provides them with increased confidence, economic independence and social respectability (Heath and Jayachandran, 2016). Equally, Benedicte (2017) reported that increased female labor force participation can bring about larger family income which can lead to stepping out of poverty, can contribute to closing gender gaps and it could result in increased productivity levels with a corresponding rise in GDP.

However, the role of women is grossly downplayed in many developing countries. Despite playing crucial roles not only domestically but also in various sectors of a country's economy, female labor force participation rate seems to be below that of men. As explained by Verick (2014), women in less developed countries work longer hours but earn less money and they are likely to be more illiterate compared to men. In addition to this, Blackden et al., (2007) reported that poor growth performance in African countries is mainly associated with gender inequality. For instance, the Labor force Survey report by the NISR (2017) shows that FLFP continues to lag behind that of men at virtually all age groups, and in various sectors of the economy.

Notwithstanding the above revelation, female labor force participation in Rwanda is amongst the highest in the world. In Rwanda, reports show that as compared to neighboring countries the government of Rwanda has made impressive strides in developing policies and strategies towards women's empowerment and the advancement of gender equality, whereby both males and females are expected to have equal opportunity towards employment. An often-cited achievement is that Rwanda has topped the global list of countries with the most (64 percent) female parliamentarians (World Economic Forum, 2014). However, in other economic sectors, the gap is still evident.

1.1.1. Pattern of employment in Rwanda

The Labor Force Survey report by the National Institute of Statistics of Rwanda (NISR) (2017) showed that out of about 11.6 million Rwandans, 6.7 million representing 54 percent are in the labor force. The NISR (2017) defines the national LFPR as the percentage of the working-age population (16+) engaged in the labor force, working for pay (wage or salary) or profit excluding those engaged in subsistence foodstuff production. This definition is based on the new International Standard definition of the labor force which was adopted by 19th International Conference of Labor Statisticians (ICLS) in 2013.

The main sector employing relatively a large number of the population continues to be agriculture hiring about 45.9 percent (this rate excludes those engaged in subsistence foodstuff production) followed by the service sector (39.8 percent). A high percentage (83) of employed population (16 years and above) are in the informal sector, where 91 percent have informal employment. Coupled with this, the survey shows that a significant number of people who were employed in the formal sector have informal employment. NISR (2017) defines employment in the informal sector as all people engaged in unregistered private business enterprises and that do not keep written record of accounts.

Table 1 demonstrates the current situation of labor force participation in Rwanda. It shows that the total of male labor force participation rate (62.7%) remains higher than that of females (46.4%). Labor force participation is also higher in urban areas (64.5%) than in rural areas (50.8%). Similarly, in terms of employment, men record a higher share of employed population in both urban (55.9%) and rural areas (54.2%) than women. This is worrying given that the total female population aged 16 years and above (3,571,312) is higher than that of male population (3,137,871), as provided by the NISR (2017).

Looking at the sectoral participation, we notice that relatively large proportion of men 53.7% is employed in the informal sector compared to 46.3% of women. However, men are almost two times higher (64.5%) than women (35.5%) in the formal sector. It is clear that a large number of women is employed in the informal sector compared to formal sector, which is the opposite scenario for men. Equally important to note is that informal employment is very large in the rural areas by 80.9% than urban areas 19.1%. Turning on to the status of employment women are found in domestic chores or contributing as a family worker by 78.4% compared to 21.6% for men. On

the contrary, men record a higher percentage of employers in the formal sector than women. We note that men formal employers are almost three times higher than female employers.

This shows that men record a high share in the labor force whether in the rural or urban areas, as well as in terms of status of employment, which reveals a gender gap in LFP, as well as in other social opportunities like educational attainment. Education and consequently human capital is an important factor in terms of potential for employment and LFP. Whereas the highest educational attainment reported in the survey was primary education, women account for only 43.5% compared to 56.5% for their male counterparts. This is also the same case for higher educational levels. This implies that there is still much progress to be made to improve living conditions of women in all the country.

Table 1: Labor Force Participation rate, and employed population by sex, area of residence, sector and status of employment, and educational attainment.

		Total	Gender		Area of Residence			
					Urban		Rural	
			Male	Female	Male	Female	Male	Female
Employed Population		100	1,651,072	1,367,460	464,850	366,687	1,186,222	1,000,773
			54.7%	45.3%	55.9%	44.1%	54.2%	45.2%
Labor Force Participation		54.5%	1,967,906	1,658,041	1,014,798		2,610,731	
			62.7%	46.4%	64.5%		50.8%	
Sector of Employment	Formal	100	64.5%	35.5%	51.2%		48.8%	
	Informal	100	53.7%	46.3%	19.1%		80.9%	
Status of Employment	Employer	100	73.0%	27.0%	53.5%		46.5%	
	Cooperative	100	53.1%	46.9%	7.3%		92.7%	
	Family worker	100	21.6%	78.4%	27.5%		72.5%	
Education Level	Primary	100	56.5%	43.5%	27.5%		72.5%	
	Upper Secondary	100	56.8%	43.2%	51.6%		48.4%	

Source: Rwanda Labor Force Survey (2017)

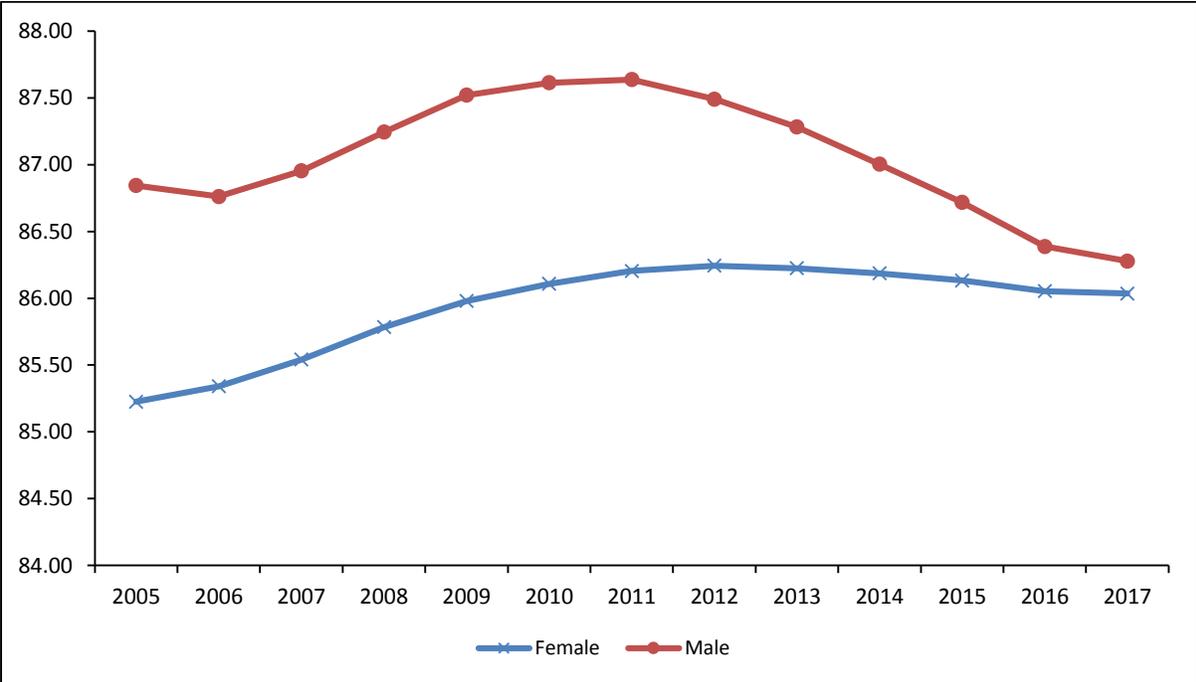
Note: On urban and rural areas the percentages are shown as the percentages of the entire labor force, except for employed population.

The similar picture is displayed in figure 1, where LFPR of men as the percentage of the population aged 15 and above remains above that of females. Figure 1 shows labor force participation of both men and females as the percentage of the total population aged 15+ years and above.

As shown clearly by figure 1, even though women's economic activity kept an increasing trend over the years, it remained below that of their male counterparts. For example, whereas FLFP was 86.11 percent in 2010, it was 87.61 percent for men. Similarly, in 2015, female labor force participation was 86.13percent whereas participation for men was about 86.72.

However, labor force participation of both men and women are moving towards convergence. Some of the reasons that could explain the incline in female labor force participation across all the years include government policies aiming at empowering women as well as increasing their engagement in economic activities. Such as; affirmative action policies, paid maternity leave, and access to childcare services (World Economic Forum, 2014).

Figure 1: Labor force participation rate (% of population ages 15+)



Source: Illustration based on World Bank indicator data

Therefore, despite the outstanding success mentioned above, Rwandan labor market still have unresolved gender gap, where men still record larger proportions of employed population as compared to females, as shown by the above statistics. This low rate of participation is surprising given that currently Rwanda enjoys rapid economic growth which has been found to relate positively with an increase in female labor force participation. Addition to this is a remarkable expansion of female education whereby reports reveal that in almost all parts of the country, education gender parity has been achieved (World Economic Forum, 2014). Given the emphasized and well-documented role of women in economic development (Psacharopoulos and Tzannato, 1989; Verick 2014) together with the highlighted need to improve female labor force participation in Rwanda, the current existing situation engenders the urgency of investigating the main determinants of female labor force participation in Rwanda.

1.2 Statement of the problem

Deficient representation of women in the labor market acts as a brake towards national development by stifling economic growth (Whitmore and Nunn 2017). In this case, closing gender gaps in all sectors of the economy will imply significant participation of women in all economic activities. Rwanda has achieved a substantial progress in removing gender gaps, in almost all areas of the country, but there are still significant challenges towards gender equality in the labor market as shown by Table 1. A significant percentage (64) of women in decision making organs in Rwanda would be able to result in improved positions of women in various economic activities. However, this is not the case as revealed by the statistics from the RLFS (2017). The ideal of equality in terms of economic opportunity remains elusive in the whole country. What does this mean for policymakers?

There has been a great deal of research focusing on the factors that are associated with female labor force participation both in developed (Jaumotte, 2013) and developing countries (Verick, 2014). However, the body of literature in relation to this is still scanty in Rwanda. The relatively existing information is reported by Mugenzi, et. al., (2017). Apart from their study which sought to assess various determinants associated with labor force participation in Rwanda by looking at the entire population, this related topic has never been empirically analyzed in the Rwandan context to the best of our knowledge and as unveiled by the reviewed literature. This highlights its prime contribution to the ever-growing body of knowledge by filling this gap.

As opposed to Mugenzi et. al. (2017), our study focuses solely on factors influencing female labor force participation and intends to use the recent Rwandan Labor Force Survey data by employing binomial logit model. Furthermore, our study aims to distinguish between the above factors, by analyzing which ones are attributable to women's employment in formal and informal sectors using multinomial logit model. Thus, this study intends to shade light on the factors that influence FLFP in Rwanda and to establish those influencing their participation in either formal or informal sectors of the economy, in order to contribute to improving labor market outcomes in Rwanda.

1.3 Research Objectives

The main objective of this study is to investigate the main determinants influencing female labor force participation in Rwanda.

More specifically, the study aims at:

- i. Investigating the main determinants of female labor force participation in Rwanda.

- ii. Establishing the relationship between these determinants with female participation in informal and formal sectors.
- iii. Basing on the findings for the two objectives, to draw policy recommendations towards the improvement of female participation in the labor market in Rwanda.

1.4 Justification of the study

Rwanda is recognized worldwide as one of the countries that have registered great achievement in terms of gender equality. However, as demonstrated by Table 1 there is still great challenges to achieve gender equality in terms of economic opportunities for both males and females. Therefore, this study shed light on the key important factors that can be given priority to improve labor market outcomes in Rwanda.

The purpose of this study is three-fold. First, this topic has never been empirically analyzed in the Rwandan context to the best of our knowledge and based on the reviewed literature. This highlights its prime contribution to the ever-growing body of knowledge, by revealing the determinants that influence female labor force participation in Rwanda. This study, therefore, seeks to fill this gap by using a recent Labor Force Survey data collected in 2017 by the National Institute of Statistics of Rwanda.

Secondly, the contribution of this paper is the distinction between the above factors, by analyzing which ones are attributable to women's employment in formal and informal sectors. Last but not least, this study takes into consideration a women's educational attainment as a key determinant of female labor force participation and of employment in the formal sector. This will be extensively discussed in detail in the Second Chapter of this study.

1.5 Organization of the study

The rest of this thesis is organized as follows: Chapter Two presents the reviewed literature, both theoretical literature, and empirical literature. Chapter Three describes the model that this study utilized, a detailed definition of variables and presents the data. Chapter 4 presents the analysis of the data and discussions of the findings. Chapter 5 provides the summary of the findings, the conclusion of the study, the policy recommendations, and areas of further research and study limitations, respectively.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical literature

This section uses two complementary theoretical theories to explain labor supply decisions and these will be useful in identifying the factors influencing female labor force participation. These are the neoclassical model of allocation of time and human capital investment models. The former theory is concerned with how a typical woman in the labor force allocates her time between work (working for pay) and leisure (by choosing to spend her time at home or in leisure activities, like for example spending time at home or going to the theater); while the latter theory explains how labor time is allocated between acquiring valuable skills or training (Altonji and Blank, 1999). Essentially, the two theoretical models of labor supply look at the trade-off between work-leisure decisions on the one hand and a time spent acquiring skills or working on the other hand. Outlined below, is a brief description of these models.

2.1.1 Neoclassical model of allocation of time

According to Ehrenberg and Smith (2006), the leisure-work decisions by a typical worker is analogous to utility maximization decisions by individuals in consumer theory. Assuming that an individual is rational, s/he chooses consumption-leisure bundle to maximize his/her utility subject to a budget and time constraint. In the neoclassical model, three factors influence labor supply. These are market wage rate, non- labor income and personal preferences. A striking feature of the neoclassical theory of labor supply is that there is a positive relationship between wage rate and hours worked (labor supplied). This can be expounded using substitution and income effects.

An increase in the wage rate, holding other factors constant, make leisure more expensive. In other words, if wage rate increases, holding other factors constant, the opportunity cost of leisure increases. Therefore, an individual will choose work over leisure. This is referred to as the substitution effect. This means that if wage rates are high the substitution effect dominate or labor supply increases. On the contrary, the increment of wages will have effect on individual's income. As wage keeps increasing, an individual will become better off, and thus s/he will prefer leisure over work. Therefore, by consuming additional hours of leisure resulted from additional income, the individual gives up more in forgone wages, which reduces his working hours but result in more hours for leisure. This is referred to as the income effect. However, the model fails to clearly predict how individuals will allocate their limited time because of these ambiguities. Economic

theory shows that a corner solution of this model or turning point, in this case, will be when the individual has decided to abdicate from work. This is termed reservation wage. This is simply the wage below which an individual will not participate in the labor force. The value of the reservation wage is influenced by his/her preferences, non-labor income, marital status, and a number of children among others.

Becker (1965) expounded on the latter (i.e. the number of children) by showing that a woman derives satisfaction or her utility from child rearing and participation in the labor market. In this sense, a woman allocates her time on the labor market (working for pay) or caring for her children (leisure), in a way that gives her the highest utility possible. Therefore, her decision to join the labor market will be only when the market wage exceeds the reservation wage.

2.1.2 Human Capital Investment model

The human capital investment model is anchored on two pillars; investment in education and future earnings or returns associated with increased skills training. It is expected that workers with higher levels of skills and training are more likely to earn higher wages than those with lower levels of skills and training. Therefore, individuals choose to make higher investment in education and in training, if they prefer to be full-time workers. Besides higher wages, more skilled workers are associated with increased job satisfaction and greater satisfaction from non-market activities. In spite of the predominant role of the human capital theory in the literature, the empirical literature shows that men are more likely to invest in education or training as compared to women.

2.2 Empirical Literature

This section focuses on the empirical literature worldwide with a focus on Rwanda, and on factors that determine women labor force participation, either positively or negatively. Empirical literature shows that the factors influencing female labor force participation may vary across countries, but they are related to those influencing the supply side and the demand side which include; individual characteristics (like age of a woman and educational attainment, marital status), family characteristics (which include, the family size, the number of children present, husband's income and gender of the household head) and others relate to geographical factors, and government policies (such as providing paid maternity leave and access to childcare services). An extensive review of these factors is provided in the next section.

Education is recognized worldwide to be a potential booster of FLFP which exerts a positive impact on economic growth, especially in developing countries. Various studies established that women's involvement in economic activities is positively and significantly associated with their educational attainment (Psacharopoulos and Tzannatos, 1989; Nam, 1991; Sackey, 2005; Kiani, 2013; Nazier and Ramadan, 2018; Heath and Jayachandran, 2016).

For instance, Nazier and Ramadan (2018) employed a probit model to investigate the community as well as individual factors influencing female labor force participation in Egypt. They also sought to establish amongst the above factors, which ones influence the type of employment that a woman occupies in the labor market. With education being one of the important factors that affect a woman's decision to participate in the labor force, the study revealed that the community in which a woman lives influences significantly her decision to join labor force. Equally, once a woman joins the labor market, individual and household's characteristics determine her decision regarding which type of employment to choose.

Sackey (2005) used Ghana living standard survey data to investigate the role of education on female labor force participation and fertility. The study reveals that female education is very important in both rural and urban areas. The results of both multinomial logit and probit models show that primary and post-primary education affect positively and significantly a woman's decision to join labor force in Ghana. The author states that educational attainment especially higher levels of education increase the opportunity cost of a woman's time which would be spent in the household production. In addition, Kiani (2013) found that the probability that a woman will work for a paying job and contribute productively to her society will increase and improve with how educated she is.

Nabalamba, Sennoga, and Kasirye (2014) found that education is the main significant factor that allows female employment in formal sector in Rwanda, especially in urban areas. The study shows that higher educational attainment is associated with formal employment and reduces the chances that a woman will be employed in agriculture and informal sectors. This also was found by Naqvi and colleagues (2002) in their study. They established that a disproportionately larger number of women were found to be in low paying and low skilled jobs. In particular, they concluded that women' chances of higher earnings depend on their level of education, holding other factors constant. Also, Magidu (2010) investigated socio-economic factors associated with labor force

participation in Uganda and showed that low educational levels restricted women to informal sector which has low productivity and low wages.

On the contrary, Sorsa et al. (2015) revealed that education is not the main factor influencing female labor force participation in India. The same finding was reported by Mon (2000). The Authors sought to assess the main drivers of the low female labor force participation in India and found social and cultural factors to be the major factors that keep women outside the labor force in India. They established that financial inclusion and financial development impact positively female labor force participation. In particular, they stated that having their own bank account raises the autonomy of women in the family and thus increases their decisions to work.

Abraham et al. (2017) investigated the factors influencing females' labor force participation and how they affect women' employment choice between formal and informal sectors in Ghana. The study used the Ghana Population and Housing Census data. They reported that marital status and education influence significantly female labor force participation. The results of the estimated multinomial logit model suggest that females with higher education levels (degree and diploma) are more likely to be employed in formal wage employment in Ghana. In addition to this, Sackey (2005) noted that additional years of schooling reduced the probability of being in self-employment but increased the tendency for wage employment.

Thamma-Apiroam (2016) employed time series analysis to assess the determinants of female labor force participation of married women in the United States for the period of 1975-2002. The study used men's income, children age groups from 3 to 18 years old, and women's earnings among others. The study found that wages do not influence significantly female labor force participation. This is because married women are not only influenced by the market wage but also their leisure time. Where they have to decide whether to work or to dedicate their time to their children. The author found a significant negative effect of men's income on married women participation. Another contribution of the study is revealing that like in most other developing countries like the USA, for women to secure good-paying jobs, higher educational level attainment matters.

Thévenon (2013) assessed the influence of labor market and institutional characteristics on female labor force participation in 18 OECD countries. The study findings establish that the structure of the labor market, institutional setting that supports work-life balance, and women's educational attainment are the main factors influencing the trends in female labor force participation amongst

these countries. In particular, Thévenon (2013) concluded that the increasing enrolment in childcare services and paid maternal and parental leave enhance full-time and part-time female labor force participation.

The family structure exerts a significant effect on aggregate female labor force participation. Analyzing the determinants influencing labor force participation of married women in urban China, Maurer-Fazio et. al (2010) estimated the probit model using Chinese population census data. They find that when the family members comprise of those that necessitates care such as older people above 75 years and having in-laws in the family draws women towards labor market. But when there is young children or preschool-aged children female participation tend to decrease. Similarly, Sasaki (2002) found a positive correlation between female labor force participation and co-residence with their own parents or in-laws in Japan. Hfiz and Twyefur (2016) noted that family size (if large) and the number of children in the household tend to influence participation.

Naqvi et al, (2002) investigated the factors influencing female labor force participation in Pakistan, by using discrete choice models (probit and logit models). They reported that the main factors include age, education and marital status. The study also showed that area of residence, family size, employment status of the head of the household mostly a male and the number of children between 0-5 years influence women's decision to work. In particular, the authors argue that the employment of illiterate heads of households (if male) tend to be dim which raises the probability that women will join the labor force by 5.3 percent.

Fertility is found to be amongst the important factors that influence female labor supply. Various studies were conducted to highlight the effect of fertility on female labor force participation. Evidence from Bloom et. al., (2009) using a panel data of 97 countries covering the period of 1960 to 2000 and of Devaney (1983) who employed time series analysis to analyze variations in U.S. fertility and female labor force participation trends, for the period of 1947-1977, demonstrate the critical role of reduced fertility on women's decisions to join labor market. In particular, Bloom et al, (2009) establish that reduction in fertility increases women's labor supply by around 18 percentage points.

Forgha and Mbella (2016) employed time series analysis using data covering a period of 37 years (1980 to 2014). The study used the Generalized Method of Moments estimation technique to investigate the determinants of female labor force participation and its influence on economic

growth in Cameroon. Their findings indicated that increased fertility rate per woman is negatively related to participation in the labor force. They stated that as the number of children per woman keeps increasing her participation rate reduces.

Empirical work also established a significant effect of population health status on labor force participation. Using panel data from 46 sub-Saharan African countries, Novignon et al. (2015) found that people with improved or better health status have higher probability of participation. But the study shows that in the case of poor health there is relatively limited time for labor activities. This is because instead of working individuals will spend more time seeking medical care. Similar results were obtained by Nwosu and Woolard (2015) in South Africa.

The relation between age and female labor force participation has also been documented by many researchers. For instance, Besamusca et al. (2015) sought to establish factors explaining female labor force participation in 117 countries including Rwanda. They report that women between 25 and 55 years are influenced by the availability of childcare services, paid maternity and increased enrollment in pre-primary education to join the labor force. They argue that factors that can encourage or hinder women to engage or participate in economic activities vary across different age groups. They note that women between 25 and 59 years have relatively higher participation rate than those below and above. In particular, they stated that female labor force participation rate starts increasing as women mature but start decreasing until retirement.

Chen et al. (2014) estimated a probit model to analyze the factors that influence female labor supply in rural and urban areas in China. By looking both at family dynamics (such as; income from one's husband, the number of people in the family, and the existence of childcare) and individual characteristics (education and age), the findings show that factors relating to the family composition determine labor force participation for women in rural areas, whereas individuals' factors explain participation in urban areas.

Culture factors are also important factors associated with a woman's decision to join the labor force. For instance, Jaumotte (2003) concluded that general labor market conditions and cultural attitudes (as well as female educational attainment) remain major determinants of female labor force participation in OECD countries.

2.3 Overview of the literature

The consensus from the reviewed literature indicates that female labor force participation is a subject of interest and worth exploring. The main factors influencing female participation identified include the presence of children, education, age, marital status, wage, non-labor income, husband's income and head of the household. For example, studies establish a negative relationship between the presence of young children and female labor force participation (Gronau, 1977; Maurer-Fazio et. al., 2010) but show that availability of child subsidies increases participation (Heath and Jayachandran, 2016).

The overall reviewed literature stresses the positive impact of education on female labor force participation in both developed and less developed countries, and its positive influence on the participation in the formal sector, with fewer exceptions of studies of Sorsa et al. (2015) in India and of Mon (2000) in Burma. Reviewed studies have used different methodologies to show the empirical relationship between labor force participation and the above-mentioned variables, across countries. Given the lack of the literature on the related matter in Rwanda, we aim to fill the knowledge gap by using the recent labor force survey data collected in February 2017 by the National Institute of Statistics of Rwanda (NISR), and by employing the binary logit model to investigate the main drivers of female labor force participation in Rwanda, in both formal and informal sectors using multinomial logit model.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Section 3.2 of this chapter presents the theoretical model. Section 3.3 presents the econometric model, while section 3.4 and 3.5 presents the definition of variables and the data used, respectively.

3.2 Theoretical Model

This study adopts the neoclassical model of allocation of time. This theory analyses how a typical woman in the labor force allocates her fixed amount of time between work (working for pay) and leisure (by choosing to spend her time at home or in leisure activities), in order to achieve the highest utility possible (Ehrenberg and Smith, 2006).

Individuals, therefore, must decide how many hours they will be working for pay and get earnings to use in acquiring most of their basic needs which include food, and clothing and how many hours to spend consuming leisure activities; like spending much of their time in domestic chores, raising children, growing food or going to the theater. That is, individuals shall maximize their utility on leisure by reducing the available working hours. If the benefits generated from participating in labor force are higher than not participating, an individual shall choose to utilize his/her time in labor and vice-versa.

Assuming that an individual is rational, he/she chooses consumption-leisure bundle to maximize his/her utility (U) by acquiring goods and services, given by (C) and by spending his/her time in leisure, given by (L) subject to a given budget and time constraint. Thus, the study shall compare the utilities of an individual who chooses to participate in the labor force or to remain out of labor force.

Firstly, an individual shall maximize utility from choosing to join the labor force. Thus, his/her utility function can be written as:

$$U_1 = f(C, L, X, \mathcal{E}) \dots\dots\dots (1)$$

Where,

U is an index that measures the individual's wellbeing. Assuming that individuals have the innate ability to rank in order his/her choices from the least to the highest desirable. Thus, a higher index U means highest utility or highest satisfaction received from consuming L or purchasing C, and X

represents individual woman's characteristics (observable) and \mathcal{E} represents unobservable characteristics.

Secondly, an individual shall maximize utility from choosing to remain out of the labor force.

Thus, his utility function will be given by:

$$U_2 = g(C, L, X, \mathcal{E}) \dots\dots\dots (2)$$

On one hand, therefore, If $U_1 > U_2$, an individual shall decide to participate in labor force. That is because benefits from working are more than benefits from enjoying leisure. On the other hand, If $U_1 < U_2$, an individual shall decide not to participate in labor force. That is because benefits from working are less than benefits from enjoying leisure. In both cases, the level of consumption of both goods will be contingent on his market wage rate (W), preferences, and his/her non-labor income (V). An individual maximizes his utility function subject to the full income and time constraint.

The constraints (budget and time) will be:

The time constraint is

$$L + H = T \dots\dots\dots (3)$$

Where,

T is total time available to an individual, which needs to be divided between; L (hours for leisure and H (hours for work).

The budget constraint is given by

$$(WH) + V = P_c C \dots\dots\dots (4)$$

Where,

$P_c C$ is the price of goods and services, W is the market wage rate or labor income and V is non-labor income. The individual's budget constraint shows that his expenditures must be in line with his total income.

Therefore, the labor supply model which is to be estimated based on this utility function can be specified as follows:

$$FLFP = f(\text{non-labor income, education, age, area of residence, sex of household head, marital status, and the household size}) \dots\dots\dots (5)$$

3.3 Empirical model

The main objective of this study is to investigate the main determinants influencing female labor force participation. As demonstrated by our model specification below, our dependent variable is a binary variable, measured as (1) if a woman is in labor force or (0) if she is out of labor force. This requires the estimation using discrete choice models. According to Cameron and Trivedi (2005), in such equations, the use of Ordinary Least Squares estimation which is also known as the Linear Probability Model (LPM) is not helpful. Since it is prone to estimation bias, therefore, it is not likely to provide reliable estimates. It also has the disadvantages of the possibility of the estimated dependent variable laying outside the 0-1 range, in which our dependent variable “labor force participation” is classified.

This, therefore, requires resorting to nonlinear estimating procedures like the logit or probit regression. Our estimation technique assumes the logistic distribution and therefore, makes use of the logit model. Logit model gives parameter estimates which are asymptotically consistent, efficient and logistically distributed with the probability laying between 0 and 1, which is not the case for the OLS estimation technique and is most likely to produce higher magnitude than the probit model (Cameron and Trivedi, 2005).

Following Cameron and Trivedi (2005), the choice of being in the labor force or out of labor force for an individual i is observed conditional on the explanatory variables X . The observable outcome is $y=1$ if individual i is in labor force and $y=0$ out of labor force. So that:

$$y_i = \begin{cases} 1 & \text{if in labor force} \\ 0 & \text{Out of Labor force} \end{cases} \dots\dots\dots (6)$$

Therefore,

$$y_i = \beta_0 + B_1x_i + \varepsilon_i \dots\dots\dots (7)$$

Where y_i is the dependent variable which is labor force participation, β 's are the parameters, X represents a vector of the explanatory variables and ε is the error term. With the corresponding probabilities: (8) if in labor force and (9) otherwise.

$$P (y=1/x) = f(x, \beta) \dots\dots\dots (8)$$

$$P (y=0|x) = 1- f(x, \beta) \dots\dots\dots (9)$$

The interest is to estimate the probability of participating in the labor force given a set of explanatory variables.

Therefore, equation 8 can be written as:

$$P_i = Pr(y_i = 1|x) = F(X_i'\beta) \dots\dots\dots (10)$$

Where, $F(.)$ shows the logistic Cumulative Distribution Function (cdf), and $(X'\beta) = Z$ which is the logistic index ($Z = \beta_0 + B_1x_i + \varepsilon_i$). Therefore, the logit model aims at solving the following non-linear function:

$$\ln\left(\frac{P_i}{1-P_i}\right) = \alpha + X_i'\beta + \varepsilon_i \dots\dots\dots (11)$$

Where P_i is observed if a woman joins the labor force and $1 - P_i$ is observed if otherwise, while $\ln\left(\frac{P_i}{1-P_i}\right)$ is the log-odds ratio. Following Cameron and Trivedi (2005) the probability of joining the labor force is given by:

$$P_i = Pr(y_i = 1|x) = \frac{\exp(X_i'\beta)}{1+\exp(X_i'\beta)} \dots\dots\dots (12)$$

For which the likelihood function is given by:

$$L = \prod_{i=1}^N P_i^{y_i} (1 - P_i)^{1-y_i} \dots\dots\dots (13)$$

With Π being the product term for all i where $i=1, 2, \dots, n$. Hence, the log-likelihood function that will be estimated for our model 1 to address the first objective can be stated as follows:

$$\log L = \sum_{i=1}^N [y_i \ln P_i + (1 - y_i) \ln(1 - P_i)] \dots\dots\dots (14)$$

3.3.1 Model 1-Binary Logit Model

The model of labor force participation for our objective one can be written as follows;

$$FLFP = X_i \beta + \varepsilon \dots\dots\dots (15)$$

Where FLFP represents female labor force participation, X is a vector of explanatory variables, B and ε represent a vector of parameters to be estimated and the error term, respectively.

Therefore, the binary logit model to estimate the objective one is given by:

$$y_i = \beta_0 + \beta_1 Educ + \beta_2 nnlbrinc + \beta_3 Maritst + \beta_4 Age + \beta_5 hhsz + \beta_6 hhhead + \beta_7 Resid + \varepsilon \dots\dots\dots (16)$$

Where,

y_i is the probability of labor force participation; and education, non-labor income, marital status (1 is being married), household size, head of the household, and residence represent the

explanatory variables. Thus, this model (16) provides us with the determinants of female labor force participation.

3.3.2 Model 2-Multinomial Logit Model

To address the second objective on the drivers of informal and formal sector employment, or to remain out of labor force we estimate a multinomial logit model. A woman has three choices to make; to remain out of labor force, to join formal or to join informal sector.

Let y_i denote the dependent variable that takes the values $\{0, 1, \dots, j\}$ and \mathbf{x} the vector of explanatory variables, such as education, age, and place of residence among others.

The choice probability for a woman is given by;

$$p_{ij} = \frac{\exp(\beta' X_{ij})}{1 + \sum_{j=1}^3 \exp(\beta' X_{ij})} \dots\dots\dots (17)$$

Where, $j=0, 1, 2$. Since y takes the values; 0 a woman remains out of labor force, 1 if a woman is in informal sector and 2 if she is in formal sector. P_i is the probability of being in the labor force either in formal or informal sector. β represents a set of unknown parameters, \mathbf{x}_i is the vector of i^{th} explanatory variables including; education, age, marital status, household head, number of household members (or household size) and residence and ϵ is the error term.

The log likelihood function that will be estimated using the maximum likelihood estimation (MLE) technique is given by;

$$\ln L = \sum_{i=1}^N \sum_{j=1}^J [y_{ij} \ln(F(X' i \beta_i)) + (1 - y_{ij}) \ln(1 - F(X'' i \beta_i))] \dots\dots\dots (18)$$

Therefore, the multinomial logit model to estimate the second objective is given by:

$$y_i = \beta_0 + \beta_1 Educ + \beta_2 Age + \beta_3 Maritst + \beta_4 hhsz + \beta_5 hhhead + \beta_6 Resid + \epsilon \dots\dots\dots (19)$$

In this case, y_i represents participation in either informal or formal sector or to remain out of labor force.

3.4 Definition of variables

3.4.1 Dependent variables

Our study has two dependent variables. The first dependent variable is a binary variable which takes two values: 0 if a woman is not in the labor force, and 1 if she is in labor force. The second dependent variable for the three-way choice model takes three values: 0 is out of labor force, 1 if she is employed in the informal sector, and 2 if she is employed in the formal sector.

3.4.2 Independent variables used in the study

The variables reported to influence FLFP considered in this study include: 1) individual factors: age, education, and marital status; 2) family structure and socio-economic factors: members of the households or the household members/size, nonlabor income and the gender of the head of the household, and (3) geographic location factor: area of residence; urban and rural residence.

Individual and demographic factors

Education: as shown by the reviewed literature we expect a positive relationship between education and female labor force participation, for both the binary and multivariate models. Studies established that higher educational attainment is associated with FLFP and participation in well-paying jobs particularly the formal sector. It was found that the probability of being employed in the formal sector is relatively higher for educated women compared to those who are not educated (Sackey, 2005; Nabalamba, Sennoga, and Kasirye, 2014; Naqvi et. al., 2002; Magidu, 2010).

Age: in this study, age is a continuous variable. The study used women aged between 16 and above. 16 years and above is the age representing active labor force in Rwanda. Turning on to the literature, we noted that the relevant literature remains inconclusive. However, Besamusca et al. (2015) found that female labor force participation is relatively higher between 25 and 55 years but relatively lower below 25 and above 55 years.

Marital status: this is coded as 1 if married and 0 otherwise. 1 representing married status and 0 for single women or ever married status including; separated, divorced, and widowed. We expect a negative relationship between married women and female labor force participation given the fact that married women mostly have the responsibilities to remain at home to take care of children and other domestic chores. Furthermore, some women will depend on their husband's or partner's income considered as non-labor income and therefore, choose not to participate. But we expect a positive relationship between single and ever married status of a woman with their labor force

participation. Thamma-Apiroam (2016) established a negative effect of men's income on labor force participation of married women in the USA.

Family structure and socio-economic factors

Household size: This is a continuous variable showing the members of a household. The maximum number of the household is 10. We expect a positive relationship between the increase in the household size and female labor force participation as found by Hfiz and Twyeafur (2016). But we conclude that this is indeterminate given the assumption that this variable depends on the family structure. For instance, in the presence of younger children in the household, lower female participation could be expected, which can result into a negative relationship.

Sex of the head of household: this is a dummy variable, representing 1 if is a female and 0 if male. We expect a positive relationship between the head of the household (if female) and female labor force participation, given the fact that being the head of a household suggests the woman has more responsibilities including providing for her household.

Nonlabor income: On this variable a proxy of variables showing whether an individual received non-labor income is used. Such as; income from own property or income from spouses. As postulated by the existing literature, a negative relationship is expected between female labor force participation and the existence of non-labor income as reported by Thamma-Apiroam (2016).

Geographic location factor: Area of residence: a dummy variable coded as 1 if a woman resides in an urban area and 0 rural areas. We expect a positive correlation between urban residence and the probability of joining labor force and participating in the formal sector. Naqvi et. al. (2002) highlight the effect of the place of residence on labor force participation. A clear picture of these explanatory variables is provided in Table 2.

Table 2: Description of explanatory variables

Explanatory Variables	Definition	Expected sign for both models
Educational Attainment	A set of dummy variables capturing the education level of a woman. 0” No education”, 1 “Primary”, 2 “Secondary”, “3 Tertiary” education.	Positive
Marital Status	This is the marital status of a woman that is 1 if “married” and 0 “Otherwise”	Negative
Age	This is a continuous variable showing the age of a woman from 16-65 years	Indeterminate
Non-labor Income	Income from own property is used as a proxy	Negative
Household Head	This is the gender of the head of a household coded as 0“male” or 1 “female”	Positive
Household Size	This is the number of people in the household. The maximum number of persons is 10.	Indeterminate
Place of residence	Residence= 1 if “urban” and 0 “rural”.	Positive

Source: Author’s conceptualization

3.5 Source and Type of Data

The study used the recent Labor Force survey data from the National Institute of Statistics of Rwanda that was conducted from February to April 2017. This survey was the second after the pilot that took place in 2016. The main objective was collecting data representing the characteristics of the Rwandan labor force, which included people who were either employed or unemployed, those who are out of labor force, and on other relevant features of the population who are in the labor force. The survey interviewed a sample size of 9,344 households. According to this survey, employment constitutes only people who are working for pay or those receiving some profits excluding those who are engaged solely in subsistence foodstuff production. The survey provides information on most of the variables that we used in this study, including; labor force participation, participation in the formal and informal sector, educational attainment, non-labor income, and marital status among others. The maxim age recorded in the survey is 95 years. Our study only used women between 16 to 65 years old.

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION OF THE FINDINGS

4.1 Introduction

This chapter presents the empirical analysis of the determinants of female labor force participation. This includes descriptive statistics, the correlation matrix and the regression results using the logit model.

4.2 Description of the variables

Table 3 shows the summary statistics of the variables. At first glance, the full sample contains varying observations. It reveals that the total female labor force participation rate is about 47 percent. Table 3 also summarizes the percentages of women who are not in the labor force, those employed in either formal or informal sectors. It shows that 79 percent of women are in informal sector whereas about 21 percent are in the formal sector and that about 53 percent are not in the labor force. It indicates that there is a small percentage (11 percent) of female heads of households and that the proportion of the household size is 5.4 persons.

Table 3: Descriptive statistics

Variable	Observation	Mean	Standard Deviation	Min	Max
Labor Force Participation	12,967	0.4691	0.4990	0	1
Informal sector	7,882	0.7936	0.4047	0	1
Formal Sector	2,050	0.2064	0.4047	0	1
Non-labor income	8,035	0.6499	0.4770	0	1
Age of a woman	11,362	32.8649	12.7865	16	65
Marital Status	14,010	0.3044	0.4602	0	1
Household Size	20,206	5.4490	2.0923	1	10
Household Head	20,206	0.1146	0.3185	0	1
Urban residence	20,206	0.29659	0.4567	0	1
Education Levels					
None	12,967	0.1421	0.3492	0	1
Primary	12,967	0.5445	0.4980	0	1
Secondary	12,967	0.2467	0.4311	0	1
Tertiary	12,967	0.0666	0.2493	0	1

Source: Author's computation

Table 3 also indicates that women in the study have 32 years on average, about 30 percent are married (the remainder includes single, divorced or separated and widowed), and about 29 percent live in urban areas. The largest percentage (54) of women have a primary education, whereas 24

and 6 percent have attained secondary and tertiary education levels respectively and about 14 percent have no education. It further shows that about 64 percent receive non-labor income which can be income from their own property or their spouses.

4.3 Correlation analysis

Table 4: Pairwise correlation matrix

	Education	Non-Labor income	Age 16+	Marital Status	Household Size	Household Head	Residence
Education	1						
Non-Labor income	0.4315	1					
Age 16+	-0.4720	-0.4643	1				
Marital Status	-0.2282	-0.3478	0.4009	1			
Household Size	0.1416	0.1558	-0.1491	0.0053	1		
Household Head	-0.2055	-0.2002	0.4609	-0.191	-0.3011	1	
Residence	0.4324	0.3966	-0.1312	-0.159	0.0588	-0.0022	1

Source: Author's computation

Table 4 shows very low correlations among the variables. Thus, multicollinearity that may exist between the explanatory variables, in this case, is not a problem.

4.4 Determinants of Female Labor Force Participation in Rwanda

In the next section, the determinants that influence labor force participation either negatively or positively are discussed. Table 4 depicts the marginal effects of the binary logistic regression where we examine the determinants of female labor force participation as stated in our objective 1. The corresponding logistic regression results are presented in Table A1 in the Appendix. In discussing the study findings, we focus on the marginal probabilities instead of the coefficients, because of the nonlinear nature of the model. This is also because the interpretation of the log odds

ratios may sound unfamiliar to the laymen relative to the marginal probabilities. The marginal probabilities indicate the change in each independent variable holding other variables constant.

The fit of the model is shown by the Likelihood ratio test of -2903.2118, Chi-square of 238.31 and a p-value of 0.0000. This implies that the variables in the model jointly explain significantly labor force participation. The pseudo-R-squared is equal to 0.0394 which fits well our cross-sectional model. The number of observations in the binary model amounts to 6,563.

Table 5: Determinants of Female Labor Force Participation

Variables	Marginal Effects	Standard Errors	Z statistic	P-value
Education Levels				
Primary Education	0.0122	0.0175	0.70	0.485
Secondary Education	0.0024	0.0204	0.12	0.906
Tertiary Education	0.0732	0.0306	2.40	0.017
Non-Labor Income	-0.0087	0.0124	-0.71	0.478
Age (16+)	-0.0028	0.0005	-5.33	0.000
Marital Status	0.0123	0.0121	1.01	0.313
Household Size	-0.0124	0.0022	-5.63	0.000
Household Head	0.0496	0.0204	2.43	0.015
Urban Residence	0.1115	0.0131	8.50	0.000

Source: Author's Computation. Binary Logistic regression results
Likelihood ratio=-2903.2118, number of observations= 6,563, LR chi2(9) =238.31,
P-value=0.0000, Pseudo R2=0.0394

Notes: Education= The benchmark category is women with no education

Marital status: Showing married women

As expected and as predicted by the human capital investment theory, education exerts a positive impact on female labor force participation. We find that the probability of participating in the labor force increases with higher educational attainment. Using women with no education as the benchmark category, we find that women with primary and upper secondary levels of education are 1.22 and 0.24 percent more likely to participate in the labor force compared to women with no education. However, this effect is not significant at 5 percent level.

We find that women with tertiary education are 7.32 percent more likely to participate in the labor force compared to non-educated women. The coefficient of the marginal effect is associated with the z statistic of 2.40 which is greater than z tabulated of 1.96. This is significant at 5% level as confirmed by the associated p-value of 0.017. This demonstrates a significant importance of greater educational attainment for women in order to increase their labor force participation. This

finding aligns with the findings of Thamma-Apiroam (2016), Sackey (2005), and Nazier and Ramadan (2018).

As postulated by the basic neo-classical theory of allocation of time also prior to our expectations, receiving non-labor income reduces the probability of joining the labor force. We find that women who receive non-labor benefits are almost 1 percent less likely to participate in the labor force, though not significant. Often husband's income is used as a proxy for non-labor income, but our study made use of income from own property and from spouses as proxies. Studies that found similar results using husband's income include; Chen et al. (2014) in China and Thamma-Apiroam (2016) in the USA.

The results indicate that married women are more likely to participate in the labor force by 1.23 percent compared to single, divorced or separated, and widowed women. This is different from what we expected. However, the coefficient of marital status is not statistically significant, which could have supported this finding. This finding is contrary to the finding of Naqvi et al. (2002) who found that the rate of participation decreases when women are married in Pakistan.

We find that age is negatively and significantly correlated with female participation in the labor force. Particularly, we find that an increase of 1 year of age reduces the probability of participating by 0.28 percent. This explains that as women get older their participation decreases. Turning on to the existing literature, studies have documented that women tend to join labor force participation in childbearing age and their participation tends to reduce as they grow old. This finding was reported by Besamusca et al. (2015) who argue that participation increases with age but start decreasing until their retirement.

The participation of a woman in labor force can be significantly influenced by her status in the household. As expected, female heads of households are 4.9 percent more likely to participate as compared to those who are not head of households. This is associated with a z statistic of 2.43 and a p-value of 0.015 which is significant at 5 percent level. This means that women who are heads of their household need to join labor force in order to provide for their household members. This is similar to the findings of Naqvi et al. (2002) in Pakistan, who reported that in the household where the head of the household is illiterate, women are 5.3 more likely to join the labor force.

We find that household size affects negatively and significantly female labor force participation. The results indicate that an increase in the household size by one member reduces the probability of joining labor force by 1.24 percent. The corresponding z statistic of -5.63 is associated with a p-value of 0.000 which is significant at 5 percent level. Empirical work has documented varied results in relation to this finding.

For example, the presence of one's parents or in-laws which requires taking care of them increases female participation, but the presence of younger children reduces women participation in the labor force as reported by Maurer-Fazio et. al (2010). Therefore, a conclusive result on this variable may depend on the family structure and composition. In case a household is large but composed of working individuals, female participation in economic activities may reduce. Female participation will also reduce in case many members include young children who require more attention from their mothers as found by Maurer-Fazio et. al (2010).

Women who live in urban areas as expected are 11.15 percent more likely to join labor force than those living in rural areas, with the corresponding z statistic of 8.50 and a p-value of 0.000. The higher probability of participating in economic activities for those in urban areas can be easily associated with greater employment opportunities existing in urban areas and different working conditions in these two areas.

4.5 Factors associated with participation in the formal sector or informal sector

In our second objective, the dependent variable is a trichotomous variable, indicating if a woman is not in the labor force, or if she is employed in the formal or informal sectors. This is the reason for using the multinomial logit model for the estimations. The discussion of the findings is based on the marginal effects from the multinomial logistic regression, and more importantly, the focus is on the participation in the formal sector. The results are shown in Table 5. The corresponding multinomial logistic regression results are reported in Table A2 in the Appendix.

The fit of the model is shown by the Likelihood ratio test of -7630.2828, Chi-square of 1875.48 and a pseudo-R-squared of 0.1094. The p-value is significant at 5 percent level. This implies that our variables jointly explain significantly participation in either formal or informal sectors. The number of observations is 9,684.

Table 6: Factors influencing participation in both formal and informal sectors

Variables	Marginal Effects	Standard Errors	Z statistic	P-value
INFORMAL SECTOR				
Primary Education	-0.0037	0.01578	-0.24	0.811
Secondary Education	-0.2196	0.01712	-12.83	0.000
Tertiary Education	-0.3373	0.01236	-27.30	0.000
Age (16+)	-0.0022	0.00054	-4.13	0.000
Marital Status	0.0385	0.01274	3.03	0.002
Household Size	-0.0048	0.00257	-1.90	0.057
Female Head	0.1654	0.01824	9.07	0.000
Urban Residence	0.0445	0.01282	3.47	0.001
FORMAL SECTOR				
Primary Education	0.0299	0.00868	3.45	0.001
Secondary Education	0.1956	0.033	5.93	0.000
Tertiary Education	0.6303	0.05423	11.62	0.000
Age (16+)	0.00078	0.00017	4.48	0.000
Marital Status	0.0313	0.00497	6.30	0.000
Household Size	-0.00085	0.00078	-1.10	0.272
Household Head	0.0337	0.0085	3.96	0.000
Urban Residence	0.0215	0.00468	4.60	0.000

Source: Author's computation. Multinomial Logistic Regression Results

Likelihood ratio= -7630.2828, number of observations =9,684, LR chi2(16) =1875.48

P-value=0.0000, Pseudo R-square=0.1094

Notes: Education= The benchmark category is women with no education

Marital status: Showing married women

Non-labor income variable is not included in the multinomial logit model because people who are in the formal and informal sectors did not report on their non-labor income status.

As expected, all the levels of education have positive marginal effects for participation in the formal sector but are negative and relatively small for the informal sector. Any form of educational attainment offers higher chances of not participating in informal employment. For example, we find that the probability of being in the formal sector is 3 percent higher than being out of labor force, for women with primary education compared to women who are not educated. The coefficient of the marginal effect is associated with the z statistic of 3.45 which is greater than z tabulated of 1.96. This is significant at 5% level as confirmed by the associated p-value of 0.001.

The results show that the probability of participating in the formal sector for women increases with an increase in the levels of education with marginal effects ranging between 3 and 63 percent. For example, the probability of being employed in the formal sector compared to remaining out of

labor force for female with secondary education is 19 percent higher relative to non-educated women. The highest educational level (tertiary education) exhibits the highest marginal effects 63 percent, with z statistic of 11.62 and p-value of 0.000. Therefore, the probability of participating in the formal sector relative to remaining out of labor force for women with highest educational level is 63 percent higher compared to women with no education. Thus, as education level increases, the probability of participating in the formal sector rises.

Apart from primary education, all levels of education are significantly and negatively associated with participation in the informal sector compared to remaining out of labor force. This implies that women with some educational attainment are motivated to seek formal employment which is likely to be more secure and offers higher payment. This is consistent with the findings of Nabalamba, Sennoga, and Kasiry (2014) in Rwanda and Abraham et al. (2017) in Ghana.

Similar to our first model married women are more likely to join labor force and to work in formal and informal sectors relative to women who are single, divorced or separated and widowed. The results indicate that their marginal probabilities for participating in the informal and formal sector are respectively 3.85 and 3.13 percent. These are significant at 5 percent level with a p-value of 0.002 and 0.000, and z statistic of 3.03 and 6.30, respectively.

As expected, being the head of a household positively and significantly influences women participation in both formal and informal sectors. We find that relative to being out of labor force, women who are heads in their households are 16.53 and 3.37 percent more likely to be employed in both sectors, respectively. However, we find that the highest marginal effects are for participation in the informal sector compared to formal sector.

The results indicate that an increase of one household member decreases the probability of women's participation in the labor force by 0.488 and 0.085 percent in the informal and formal sectors, respectively. We believe that this could depend on the composition of the household. Whereby, women participation is expected to decrease if members are mainly younger children. This effect is significant in informal sector as shown by the corresponding p-value of 0.057 though not significant at 5 percent level. However, it is not significant in the formal sector.

The results indicate that age is positively correlated with being in the formal sector. Specifically, an increase of one year of age increases the probability of being employed in the formal sector by

0.078 percent relative to remaining out of labor force. This is associated with a z statistic of 4.48 and a p-value of 0.000. This could be explained by the experience that is accumulated over the years which is mostly required in various formal sectors. But, we find that age is negatively associated with employment in the informal sector. The results indicate that an increase of 1 year of age reduces the probability of participating in the informal sector by 0.22 percent. This is significant at 5 percent level as shown by a p-value of 0.000 with a z statistic of 4.13.

The place of residence affects significantly female participation in both sectors. We do not find a difference between participation in the two sectors given the urban residence. The result suggests that women who live in urban areas are 2.15 percent more likely to join the formal sector compared to those who live in rural areas, and relative to remaining out of labor force. However, the results show that women who live in urban areas have 4.45 percent higher probability of participating in the informal sector as compared to their rural counterparts. Even though this finding is different from what was expected, it could be explained by the structure of both informal and formal sector in Rwanda.

According to the Labor Force Survey report by the National Institute of Statistics of Rwanda (2017), high percentage (83) of employed population (16 years and above) are in the informal sector, where 91 percent have informal employment. Furthermore, among employed people in the formal sector, a large number have informal employment. Thus, the fact that the place of residence does no matter in sector employment is not surprising.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the key findings, the conclusion of the study and policy implications, areas on which this study can be extended and the study limitations.

5.2 Summary of the key findings

This study is the first attempt to investigate the factors that influence female labor force participation in Rwanda, by also highlighting those influencing the participation in formal and informal sectors. The study used Rwanda Labor Force Survey (RLFS) data and employed binary and multinomial logit model to achieve the study objectives. The results indicate that education particularly higher levels of education, household size (if large), marital status (if married), being head of the household and urban residence are the main determinants of female labor force participation.

Examining the factors influencing a woman's decision to participate in the labor force, we find that attainment of higher educational levels impact positively and significantly the decision to participate as opposed to remaining out of labor force. In modeling the sector choice, which is our three-way choice model, we establish a significant effect of education in both sectors. In particular, we find that any form of educational attainment reduces the chances of employment in the informal sector. We note that the marginal effects increase from lower levels to higher levels, ranging between 3 and 63 percent.

We establish a negative correlation between non-labor income and female labor force participation. The results suggest that women who receive non-labor benefits such as income from their own property, and their spouses are less likely to participate in the labor force.

Being married influences positively female labor force participation. This finding was significant for those who are employed in the formal sector, but not for the informal sector and in our first model.

In both two models, we find that an increase of one household member reduces the probability of participating in the labor force. We consider this negative impact to be highly associated with the effect of fertility (which can be explained by children especially younger ones in the household)

on female labor force participation. We find that significantly larger households influence female participation in the informal sector.

We find that urban residence impacts female participation positively and significantly in both models. However, we do not find any difference between participating in formal and informal sectors given urban residence.

5.3 Conclusion

This study was motivated by the interest to improve labor market outcomes in Rwanda through efficient integration of women in the labor force. Based on our findings, female labor force participation is influenced by higher levels of education, in particular, tertiary education, urban residence and the head of household (female in our case). These are the same variables together with age of a woman that influence participation in the formal sector. For participation in the informal sector, results indicated urban residence, age, head of the household and household size.

5.4 Policy implications

Basing on the strong impact of education on female labor force participation and on women's employment in the formal sector, policies aiming at improving education levels could be given more focus. Especially, helping women to attend higher education levels will help integrate them fully in high paying employment.

Given the effect of age on women's participation, increasing policies that may help them to participate at early stages including vocational training may help reduce lower participation at younger ages.

Kayitare (2016) revealed that the important factors contributing to informal sectors in Rwanda include low incomes, lack of awareness and poor benefits design (towards informal sector). In line with this, and based on our findings, there is need to design better policies towards the formalization of the informal sector.

5.5 Areas of further research

The suggestion for further research is to use different data like time series data to analyze the determinants of female labor force participation in Rwanda over time. The endogeneity of education to labor force participation should also be considered in case of availability of the data. Basing on the study findings, there is need to reduce informality in the country (Rwanda).

Therefore, there is need for further research to assess better approaches of formalization of the informal sector. This will enable the government to address the persistence of informal sector in the whole country. Furthermore, in case of availability of data, further research in relation to this could consider examining the effect of the highlighted missing key variables in our study, as shown in the next section.

5.6 Data Limitations

The study used recent and available Labor Force Survey data from the National Institute of Statistics of Rwanda that was conducted in 2017. However, we encountered numerous limitations in relation to some missing variables and data manipulation. The first significant limitation is the design of the data set. There was significant missing observations and non-response on some variables, which restricted the use of some important variables.

Secondly, it was not possible to create a link between mothers and their children. Even though the information on children is available in data set such as age of working children and their employment status. The number of children which represents a woman's fertility rate and explains significantly whether a woman will decide to work or to remain at home could have been a key variable in our model.

Thirdly, we were not able to find in the data set the Instrumental Variables to use to control for the endogeneity between education and labor force participation. Last but not least, the neo-classical model which was considered in this study postulates that the decision to join labor force is influenced by an individual's wage among other factors. However, we were not able to utilize the income variable which is available in the data set. The main problem was on very few observations which could have resulted in biased estimates, and more importantly on lack of close proxies (like annual consumption/expenditures, etc..) in the data set. Consequently, the effect of wage on female labor force participation is not captured in our study.

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APPENDIX

Table A1: Binary Logistic Regression results.

Log Likelihood=-2903.2118
Number of Observation= 6,563
LR chi2(9) = 238.31
Prob > chi2 =0.0000
Pseudo R2=0.0394

Labor Force	Coefficient	Standard Errors	Z Statistic	P-value
Primary Education	.0899899	.1290158	0.70	0.485
Secondary Education	.017687	.1496624	0.12	0.906
Tertiary Education	.4726398	.1753235	2.70	0.007
Non-Labor Income	-.0643419	.0901502	-0.71	0.475
Age (16+)	-.0206601	.0039023	-5.29	0.000
Marital Status	.0897134	.0880973	1.02	0.309
Household Size	-.0914574	.0163357	-5.60	0.000
Female Head	.3366868	.1282418	2.63	0.009
Urban Residence	.7451275	.0812711	9.17	0.000
Constant	-.8326201	.2091731	-3.98	0.000

Source: Author's Computation.

Table A2: Multinomial logistic regression results

Log likelihood = -7630.2828
 Number of Observation = 9,684
 LR chi2(16) = 1875.48
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.1094
 Log likelihood = -7630.2828

	Coefficient	Standard Errors	Z statistic	P-value
Out of Labor Force (base outcome)				
Informal Sector				
Primary Education	0.0335731	0.0683277	0.49	0.623
Secondary Education	-0.7884593	0.0893856	-8.82	0.000
Tertiary Education	-1.26809	0.1509224	-8.40	0.000
Age (16+)	-0.0084341	0.0023407	-3.60	0.000
Marital Status	0.2233319	0.0552469	4.04	0.000
Household Size	-0.022922	0.0111758	-2.05	0.040
Female Head	0.7778596	0.0758572	10.25	0.000
Urban Residence	0.2322703	0.0550675	4.22	0.000
Constant	-0.1074418	0.1195542	-0.90	0.369
Formal sector				
Age (16+)	0.8866066	0.2597684	3.41	0.001
Marital Status	2.360771	0.2711674	8.71	0.000
Household Size	3.911478	0.2800681	13.97	0.000
Female Head	0.0191007	0.0050648	3.77	0.000
Urban Residence	0.8900149	0.1128151	7.89	0.000
Constant	-0.0330534	0.0223993	-1.48	0.140
Age (16+)	1.104175	0.1556023	7.10	0.000
Marital Status	0.6408847	0.1075211	5.96	0.000
Constant	-5.342058	0.3314806	-16.12	0.000

Source: Author's Computation.