DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

(4) The word count of this research report is approximately 16,190 words.

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PREFACE

Historically, women were destined to stay at home to do housework and to take care of children. Moreover, gender discrimination is a widespread problem in the past that restrained women from joining the labor market. Even if women work, they were most likely being asked to do mechanize and lower skilled jobs which enable them to look after their children at the same time. However, these were what happened in the past. Thanks to the development and modernization of today's economy, gender discrimination problem has been largely curbed. With the enforcement of rules and regulation that protects women's rights in many countries, the problem of gender discrimination seldom happens in the workplace. This is one of the causes that encourage women to work as they were less likely being harass while they work. Besides that, rapid economic development has increase the need for the economy to absorb a huge amount of labor into the market. Female labor force participation rate were seen to increase in larger percentage than those of the male due to higher demand for labor all around the world. Therefore, most of the countries nowadays have display an increasing trend of female labor force participation rate.

While women labor force contributes to the economy, women still have to perform maternal responsibilities undoubtedly. Many economists had argued that women with children will tend to quit labor market because of incompatibility between the role of employee and mother. However, there are still cases where mothers involve themselves actively in the labor market. Thus, can a female employee do her paid work with utmost dedication and commitment while still doing a great job as a mother? This had been a question that raised the interest of many researchers these few decades. The purpose of conducting this research is to gain greater understanding on the relationship between female labor force participation rate and total fertility rate. The result of this paper has significant implications that define the relationship between these two variables.

ABSTRACT

The fundamental of this study is to investigate the relationship between female labor force participation rate and total fertility rate in the context of Japan. The empirical study uses time series data for the period of 1961 to 2005, obtained from the World Bank and Japan Statistical Yearbook. Specifically, the authors want to find out the impact of total fertility rate on female labor force participation rate, whether it affects female labor force participation rate negatively or vice versa. In order to carry out a more thorough analysis, other determinants of female labor force participation rate are included in this paper, which are inflation rate, female education and growth rate of male earnings. Besides that, the causality between female labor force participation rate and total fertility rate is being examined in this paper. After that, the authors also analyze the existence of causality among the variables in the short run as well as in the long run. The econometric model is estimated by using cointegration test, Ordinary Least Square (OLS) regression and Granger causality test to find out the long run and short run relationship between the variables. The result of this paper shows that total fertility rate is negatively related to female labor force participation rate, and there is uni-directional causal relationship running from total fertility rate to female labor force participation rate. The finding of the negative relationship between female labor force participation rate and total fertility rate is consistent with the role incompatibility hypothesis. Besides that, inflation rate and female education is also proved to have a negative impact on female labor force participation rate. However, growth rate of male earnings is found to be insignificant in the study of this paper. In the short run, there is evidence of a uni-directional short run causal relationship running from inflation rate to total fertility rate while a bi-directional causal relationship exists between total fertility rate and growth rate of male earnings.

CHAPTER 1: INTRODUCTION

1.0 Introduction

Labor supply decisions have always been an important topic in economic theory and policy, and considerable progress has been made in understanding the causes and consequences of changes in labor force participation. One of the most conspicuous phenomena of recent times has been the extent to which women have increased their share of the labor force. The increasing participation of women in paid work has been driving employment trends while the gender gaps in labor force participation rates have been shrinking.

Ever since the past, women involve in work that is viewed as productive in the agrarian societies. In contemporary societies, the demand for labor, rather than a sudden surge of the female workers who want to enter the labor force has been an important factor in explaining the United States women's rising labor force participation (Cotter, Defiore, Hermsen, Kowalewski & Vanneman, 1998). The demand for female labor played a crucial role in expanding women's labor force participation in the United States postwar period. Cotter et al. (1998) claim that women's labor must have an element of "strategic indispensability", which means that it is not merely women's ability to supply labor that matters but also the demand for their labor within the economy.

The continued economic development and globalization has increased the demand for female labor, which combined with demographically induced shifts in the supply of women, has resulted in a considerable rise in female labor force participation. In the early 1990s, labor force growth was substantially higher for women than for men around the world. However, female labor force participation rate generally falls around childbirth while mothers who have young children have

traditionally been considered as having low labor force attachment. Brewster and Rindfuss (2000) pointed out that the developed countries that experienced the largest increases in female labor force participation rates in the 1980s also tended to have the largest declines in total fertility rates.

While women contribute dynamically to economic development, they had to perform their maternal responsibilities undeniably. Can jobs in the labor market and maternal responsibilities be performed concurrently? Will having a child affects a woman's decision to enter into labor force? Given these, this paper was designed to inspect the relationship between female labor force participation rate and total fertility rate.

Section 1.1 will briefly discuss on the female labor force participation and fertility. The problem statement of this research will be systematically convey in section 1.2 while section 1.3 will reveal the research question, followed by the research objective in section 1.4. Last but not least, the significance of study for this paper will be discussed in section 1.5.

1.1 Research Background

In the past, working women are often being discriminated. In this new era, however, women participation in the labor force is viewed as a common phenomenon and not contradicts to social norm. Like any other male counterpart, women receive the same treatment, at least in most industrialized and developing countries, in terms of wages, remuneration, status, social respects and so on. Ho (1984) describes women as being a vital force for economic development over the years in the Western countries.

Cotter, Hermsen and Vanneman (2001) viewed that involvement of female in the labor force is the first condition for the liberation of the wife. In industrialized countries, the demand for female labor grew substantially over much of the twentieth

century. Industrialized countries such as the United States has seen a gradual decline in the gender gap in labor force participation rates, much of which is dictate by higher participation rates among women. This is a part of a change in the overall gender division of labor, with women's participation rate coming to resemble those of men.

Increased opportunity for higher education has increases the labor force participation rates, slightly more for women than for men (Cotter, Hermsen & Vanneman, 2001). As more females get educated and acquire more skills, they will increase their employability in the formal labor market (Sackey, 2005). Ince (2009) believes that literacy gives a fundamental skill that empowers women to take control of their own lives. Investment in education not only proliferate female's productivity by rising output in economic activities, it also increase the tendency for women to work for a longer period.

In historical and pre-industrial societies, non-mechanized agricultural task allowed women to combine both work and child supervision with relatively less danger to the child and minimum loss of economic productivity (Brewster & Rindfuss, 2000). However, as industrialization proceeded, child care and economically productive work became progressively more incompatible. Some women stop working once they get married or have their own children. Does marriage and children retain women from participating in the labor force, or women who involved in the workforce tend to have less children as well as late marriage? This has been a question which puzzled most people, especially the Japanese.

Japan, one of the Asian countries that is listed as a developed industrialized country with $33, 828 Gross Domestic Products (GDP) per capita in 2010. Japanese economy focuses on exporting new and skill-intensive commodities, which led Japan to have high demand for skilled workers. Hence, less skilled workers are easily being replaced by the skilled one. Besides that, Japan's permanent employment system (Brinton, 1993) assumed that workers will remain with the same employer until

retirement. This excessively high cost of providing long term employment and age-based wages are among the reasons of job exits among women (Yu, 2005).

Moreover, Japanese management used gender-specific promotion tracks, differential treatment with regard to training, and direct pressure to eliminate young women upon marriage. In order to justify their job security and fringe benefit, Japanese employees were often expected to work overtime or to spend their after-work-hour on work-related social activities (Yu, 2005). Such committed work demand made jobs more incompatible with family responsibilities. Hence, this paper was aimed to study the relationship between female labor force participation rate and fertility rate among Japanese women.

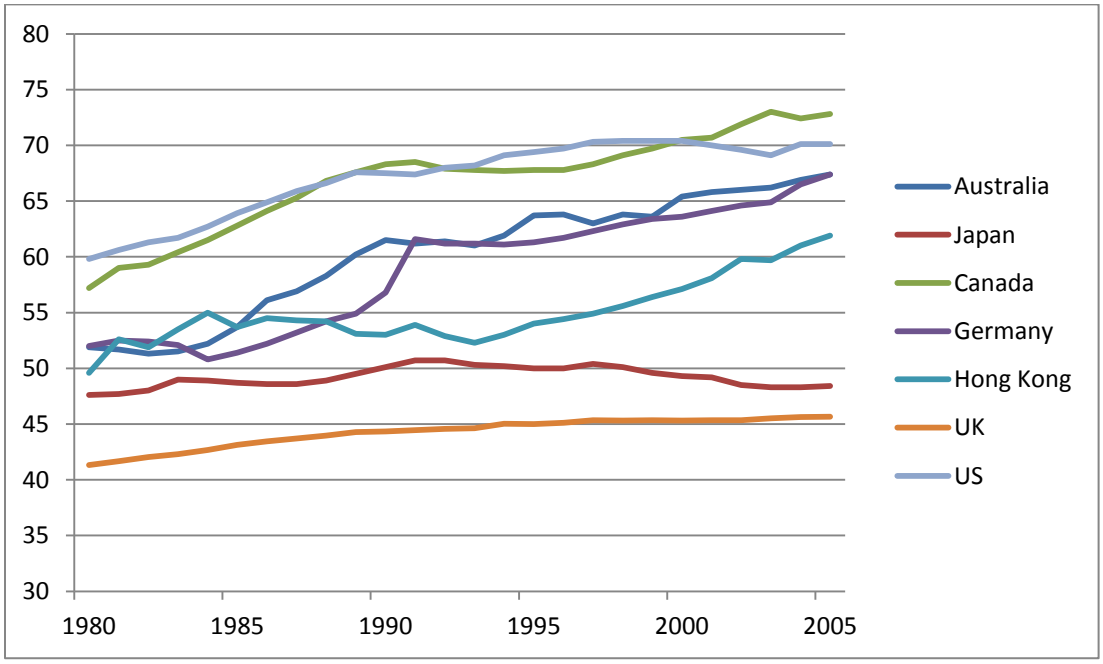
1.2 Problem Statement

Japan is a country with a total land area of 145, 925 square miles with approximately 127 million people. Despite being a small country, Japan has been acclaimed as one of the "economic miracles" in the history of economic development. From 1980 until 2010, Japan's average quarterly GDP Growth was 0.55 percent reaching an historical high of 3.15 percent in June of 1990 and a record low of -4.37 percent in March of 2009. Japan's industrialized, free market economy is the second-largest in the world where its economy is highly efficient and competitive in areas linked to international trade.

Over the years, women have been recognized as an important source of economic development in Western countries which are mostly industrialized. Women involve themselves in blue-collar as well as white-collar jobs which may range from teachers, construction workers, office workers or even politicians. Japanese women, nevertheless, also participated actively in the labor force besides being a responsible and caring mother. While the number of female workers exhibits a rising trends throughout the postwar period of economic development, Japan has

shown a declining trend of aggregate female labor force participation rate (FLFPR), unlike other industrialized nations such as the United States, the United Kingdom, Australia, Germany (Brewster & Rindfuss, 2000), Canada (Officer & Andersen, 1969) and Hong Kong (Ho, 1984) as illustrated in Figure 1.1.

Figure 1.1 Female Labor Force Participation Rate in Australia, Japan, Canada, Germany, Hong Kong, United Kingdom and United States from 1980-2005



Source: The World Bank

Questions arise. Why Japan's FLFPR did not show a trend similar to that of other industrialized nations? What are the causes that determine Japanese women employment decisions? Brewster and Rindfuss (2000) show that the roles of paid worker and mother are performed sequentially rather than simultaneously in Japan. In other words, Japanese women who need to take care of children may be less productive, or working women tend to have no or less children. According to Levey and Silver (2006), Japanese female labor force participation rate for full-time workers is one of the lowest among industrialized nations. The authors further explain that Japanese women are much likely to drop out of the labor force when marrying and to reenter it only after the children have grown up, a pattern that was true for women in

the United States some 20 years ago. Hence, in Japan, women are at a disadvantage legally and economically compared to men.

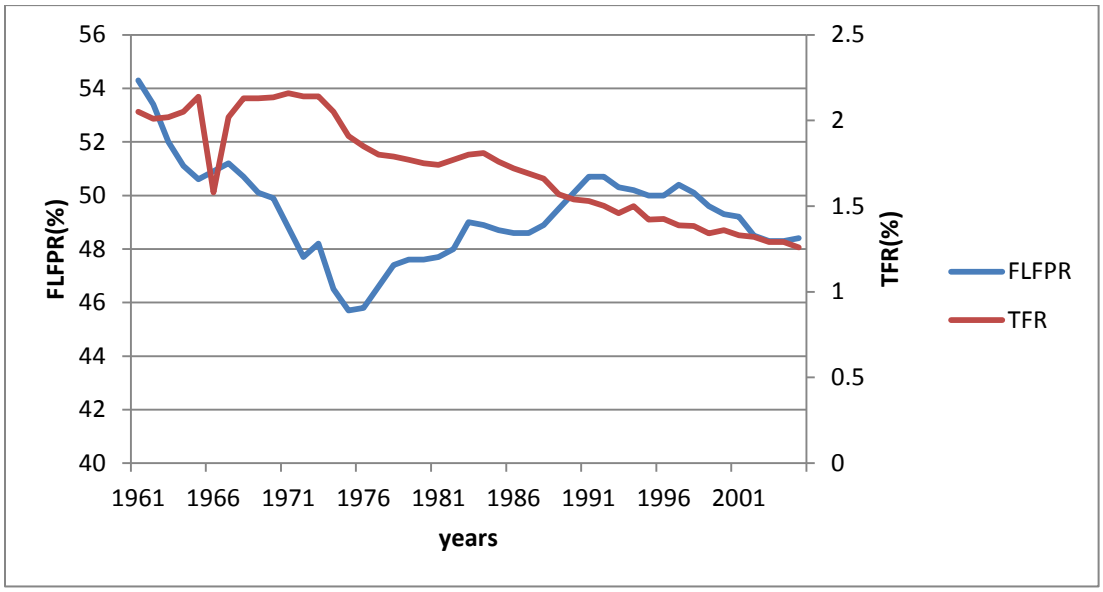
Are having children the main concern for women when they come to working decision? If yes, how will the fertility of a women affects her decision? Cotter et al. (2001) argue that declining fertility is the cause of rising female participation in labor force due to rising opportunity cost of having children. Ho (1984) also suggested that lower fertility rate enable women to work outside the home, while those who prefer to work are less likely to have children as in the case of Hong Kong. This can be well defined by the role incompatibility hypothesis (Cotter et al., 2001; Mishra & Smyth, 2009) where the role of mother and paid work cannot be performed simultaneously.

Meanwhile, societal response hypothesis has provided evidence that there is a positive relationship between total fertility rate and FLFPR (Brewster & Rindfuss, 2000; Bernhardt, 1993). The societal response hypothesis states that institutional changes and policy reform made it possible for women to combine work and childcare more successfully. Brewster and Rindfuss (2000) have found that the relationship between FLFPR and total fertility rate has changed from negative to positive in the 1980s because of societal level responses such as changing attitudes towards working mothers, increased availability and affordability of childcare as well as increasing rates of part-time employment have ease the incompatibility between childbearing and work.

While some past studies supporting the role incompatibility hypothesis, some had demonstrate evidence for the societal response hypothesis. Obviously, these previous researches have shown an ambiguous relationship between FLFPR and total fertility rate. With this unclear relationship, it is difficult for policy makers and firms to design the most appropriate labor policy. Hence, this study will reconcile this confusion of mixed results in the past.

Figure 1.2 shows the trend of FLFPR and total fertility rate in Japan from 1961 to 2005. In the early 1960s, while FLFPR was having a declining trend, total fertility rate had shown a slight increase. Total fertility rate drop drastically and increase again at a very rapid pace in the mid-1960s whereas FLFPR had shown a slight increase and decrease yet again. FLFPR and total fertility rate demonstrate a declining pattern in the early 1970s until mid-1970s where both variables moved in a contrasting pattern. However, from 1990s onwards, FLFPR and total fertility rate had again, displayed a declining trend. By observing Figure 1.2, there is a diverse pattern between FLFPR and total fertility rate. Both variables perceived to exhibit positive and negative relationship at different time period. If this is the case, then what is the long run relationship between FLFPR and total fertility rate in Japan? Hence, the authors derive the problem statement of this paper that the relationship between FLFPR and total fertility rate is ambiguous.

Figure 1.2 THE TREND OF FEMALE LABOR FORCE PARTICIPATION RATE AND TOTAL FERTILITY RATE IN JAPAN FROM 1961 TO 2005



Source: The Statistics Bureau and the Director-General for Policy Planning of Japan

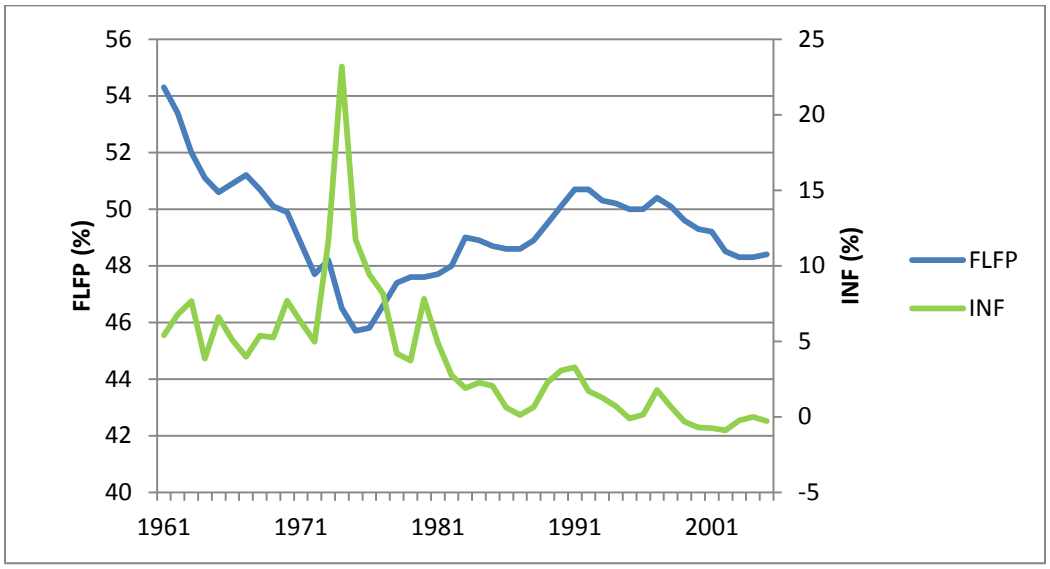
Although the main concern for this study is to determine the relationship between FLFPR and total fertility rate, the author also includes other determinants of female labor force participation in this study, which are inflation rate, growth rate of male earnings and female's education level. Based on past studies, these variables are found to be vital in determining the level of female labor force participation rate.

Inflation, which will determine the real wage, has turn out to be one of the key factors in labor supply decision. According to Niemi and Lloyd (1981), inflation has become an important economic phenomenon that must be taken into account in analyzing the determinants of labor supply trends since 1970s. With higher inflation within a country, women are incline to involve more in paid work due to the decreasing purchasing power in order to achieve higher standard of living. Niemi and Lloyd had found that inflation is having an independent positive effect on female labor force participation. The authors further explain that the labor supply behavior is influenced not only by current wages and prices, but also by the expectation of future inflation.

Theoretically, inflation rate is expected to be positively related to FLFPR. However, Japan did not show this trend. From Figure 1.3, it clearly shows that while FLFPR is having a declining trend, inflation rate is rising; while FLFPR is decreasing, inflation rate augments substantially. Based on this graph, FLFPR and inflation rate in Japan perceived to have a negative relationship, which is contrast to the expected theory. Therefore, inflation rate will be included in this study to clarify the relationship between these two variables.

Other than inflation rate, female's educational level was also discovered to affects FLFPR positively. Higher education will empower women so that women can contribute to the society as what their male counterpart did. The attainment of higher education level signify a more knowledgeable and skilled labors. Hence, women with higher education level are more likely to get employed with higher wages. This appears to be the main attractions for women to join labor force.

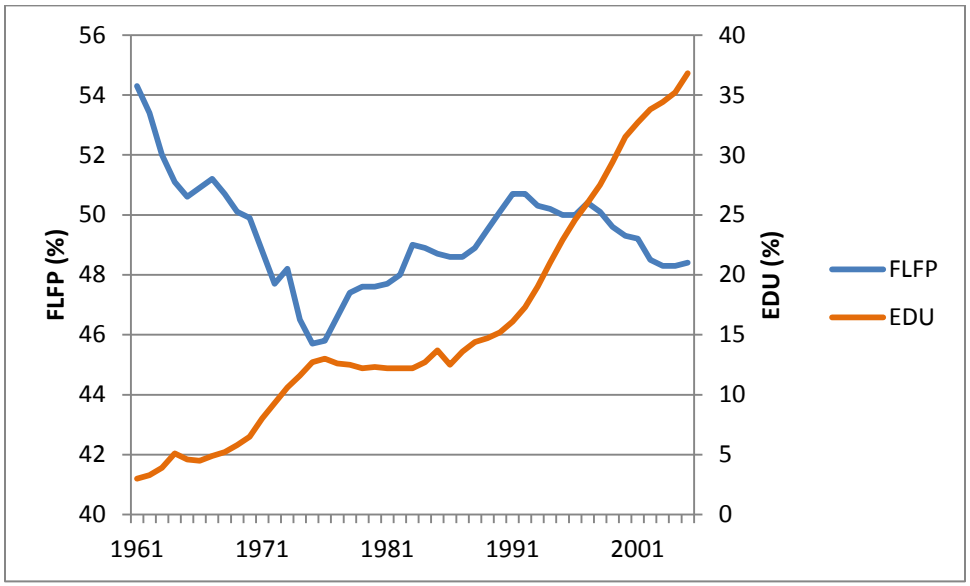
Figure 1.3 THE TREND OF FEMALE LABOR FORCE PARTICIPATION RATE AND INFLATION RATE IN JAPAN FROM 1961 TO 2005



Source: The Statistics Bureau and the Director-General for Policy Planning of Japan

Figure 1.4 shows the trend of FLFPR and female's education level in Japan from 1961 to 2005. From this graph, it illustrate that from 1960s to mid 1970s, FLFPR was experiencing a downward trend while female's education level was moving in the opposite direction. Both variables tend to move upward since mid 1970s until mid 1990s where female's education level continue to increase higher but FLFPR started to decrease. Hence, the observation of the effect of female's educational level on FLFPR was uncertain where positive and negative relationships exist in Japan. Negative relationship between FLFPR and female's educational level is not corroborate with the expected theory and hence has become an argument in this paper.

Figure 1.4 THE TREND OF FEMALE LABOR FORCE PARTICIPATION RATE AND FEMALE EDUCATION LEVEL IN JAPAN FROM 1961 TO 2005



Source: The Statistics Bureau and the Director-General for Policy Planning of Japan

Last but not least, growth rate of male incomes is also one of the independent variables included in this study. Growth rate of male incomes is used as a proxy for the household head's income where it is presumed to be negatively associated with FLFPR. With higher growth rate of male incomes, men are expected to earn more so that their wives are less likely to participate in labor force. On the other hand, if growth rate of male incomes is low or declining, women will engage themselves in labor market with the intention to uplift their families' standard of living. Therefore, how much men earned will directly affects FLFPR. However, is this statement still applies to the Japanese society nowadays? Hence, growth rate of male incomes is included in this study to find out whether it affects FLFPR negatively and significantly or not.

1.3 Research Question

Based on previous findings, there is no clear cut relationship between FLFPR and total fertility rate. In the context of Japan, what is the relationship between FLFPR and total fertility rate? This is the research question that the authors ask in this paper.

1.4 Research Objective

The objective of this study is to examine the relationship between FLFPR and total fertility rate in Japan from the year 1961 to 2005. The authors want to find out whether total fertility rate affects FLFPR negatively or vice versa.

1.4.1 General Objectives

Particularly, the core objective of this study is to determine the relationship between FLFPR and total fertility rate in Japan. Earlier researches had yield ambiguous result on the relationship between these two variables. Hence, this paper is aimed to investigate whether total fertility rate of Japanese women will affect FLFPR positively or negatively.

1.4.2 Specific Objectives

Specifically, this study also desire to:

i. Take a closer look on other determinants of the FLFPR. This study also includes female's education, inflation rate and growth rate of male incomes to test whether they affect FLFPR significantly.

ii. Scrutinize the causality between FLFPR and total fertility rate. On one hand, the changes of total fertility rate can affect FLFPR; on the other hand, FLFPR may affect total fertility rate as well where an increase of FLFPR can cause total fertility rate to decrease or vice versa.

iii. Examine the dynamic of the variables in the short run and long run. Variables may behave differently in different time period. Hence, this paper will find out the causality amongst the variables within the study (FLFPR, total fertility rate, inflation rate, growth rate of male earnings and female education) in the long run as well as the short run.

1.5 Significance of Study

The purpose of this study is to examine the relationship between FLFPR and total fertility rate. At micro-level, every woman may react differently. Some women will quit labor force when they have their own children so that they have more time to care for their children and to build a stronger bond between them. However, there are cases that women decide to enter labor force when they have children. This is because the cost of rearing a child is huge and hence women join labor force to earn money and gain ability to grow their child. At macro-level, however, total fertility rate in a country may affect its female labor force participation rate in certain and distinctive ways. By knowing how fertility rate may affect female labor force participation, it lays the foundation for the firm, government and policy makers to make decision accordingly.

From the firms' point of view, the relationship between FLFPR and total fertility rate is important in the manner that they can affect firms' hiring policy and employees' benefits. The result of this study can be use as guidance for firms to amend their hiring policy accordingly. For the country as a whole, the relationship between FLFPR and total fertility rate aid policy makers especially in the formulation of the labor policy for the country. Policy makers can implement policies that utilize all labor force within the country and in a most productive ways that can enhance economic growth.

This study also investigates the causality between FLFPR and total fertility rate to indicate whether FLFPR will affect total fertility rate or not. The causality between these two variables also affects policy makers in designing a policy that best suited a country. Other than that, this paper includes other determinants of FLFPR, which is inflation rate, growth rate of male earnings and females' education. If inflation rate influences females' employment decision, then what is the most appropriate rate of inflation that can generate the most benefit to the country? How about the growth rate of male earnings? Moreover, education is perceived to have a

positive association with FLFPR theoretically. What should be done to improve the female's education so that it increases FLFPR and thus improve productivity of a country? These are the questions that concern the policy makers.

While the result of this study is imperative for policy establishment, it is nevertheless an essential guidance for knowledge enhancement, especially for scholars who focus on this field. Above all, this paper can provide scholars with the updated knowledge investigated in this study.

1.6 Chapter Layout

The subsequent chapters of this paper are organized as follows:
Chapter 2 is the literature review where preceding studies will be discussed and evaluate to get a deeper insight for the progress of this study. The research framework will also be proposed in this chapter. Methods used within the framework of this study will be discuss in chapter 3 following by the empirical test and results of this paper in chapter 4. Chapter 5 will touch on the limitation of this study and recommendation suggested by the authors for future research to improve the study as well as summarizing this study.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

This section consists of the documentation of a comprehensive review of the published secondary sources of information that are available and needed in the study of the female labor force participation rates (FLFPR) and total fertility rates. Information is gathered and analyzed from various different sources. The literature review serves to assess the work of other researches in a precise and methodical way to identify research issues that are relevant for the study, and also provide an insight to build a theoretical foundation for the research so that the authors can proceed with further investigation and hypotheses testing. Based on the aspect of this research topic, the literature review provides a better understanding of the study of the relationship between FLFPR and total fertility rates. The review of the relevant literature also suggests other determinants of FLFPR, which are inflation rate, growth rate of male earnings and female education that are believed to have relationship with FLFPR. Hence, the authors include these variables in the study for a more thorough analysis.

2.1 The Determinants of Female Labor Force Participation

2.1.1 Female Labor Force Participation Rates and Total Fertility Rates

The studies of the relationship between female labor force participation rates (FLFPR) and total fertility rates have received a lot of attention by many economists across worldwide. This is because women's employment decision is closely related to their fertility rate. The theory of the allocation of time in Becker (1965) implies the importance of labor supply and fertility decisions. Under this framework, fertility decision is viewed as an economic one, and the costs of having a child is the forgone earnings of the person caring for the child at home, in most cases of the mother. From previous researches, it is important to note that an increase in total fertility rates can have two opposite effects on FLFPR.

On one hand, most studies have found that there is a negative association characterizes the relationship between total fertility rates and FLFPR (Heckman, 1974; Heckman & Willis, 1977; Ho, 1984; Angrist & Evans, 1998; Cotter, Hermsen & Vanneman, 2001; Bloom, Canning, Fink & Finlay, 2007; Mishra & Smyth, 2009). Women who work for pay tend to have fewer children, on average, than women who do not work; mothers are less likely being employed, on average, than childless women. Given this, an increase in total fertility rates will reduce FLFPR and vice versa. Hence, it is believed that FLFPR generally falls around childbirth of women. This predominant inverse relationship between FLFPR and total fertility rates can be well explained by the role incompatibility hypothesis (Stycos & Weller, 1967; Weller, 1968; Cotter, Hermsen & Vanneman, 2001; Mishra & Smyth, 2009).

Role incompatibility hypothesis proposed that the negative relationship is due to the conflicts in performing the roles of both employee and mother. Women are forced unwittingly to make trade-offs between their participation in productive employment and the number of children they bear. There are few explanation for this trade-offs that women need to make. First of all, the presence of children especially the infant children increases the amount of work in the home, thereby reducing the time available for women to seek outside work. Besides that, if women choose to work, their children are most likely being sent to childcare centre if there is no one to take care of them. However, the cost of childcare may possibly make up a large portion of women's income. This is especially critical for each additional child that a female has, with an increase in the cost that she would pay for childcare if she worked, while income remains the same. Another reason is that mothers who have young or small children are more reluctant to leave their children to join labor market due to the attachment of feeling that will exist normally by mothers to their children.

Ho (1984) had provided evidence that there is a negative relationship between FLFPR and total fertility rates in the context of Hong Kong. From the ancient time, the traditional Chinese family was characterized by a sharp demarcation of labor by sex where it stated that men should manage the society and women should stay at home. However, in order to pursue parity between the sexes, women have to develop a mentality of treating outside work as a long term career. Based on the finding in the research, Ho concluded that with improved education and a transformation to smaller sized families, there is no reason why the participation of women in the labor market will not continue to expand.

However, on the other hand, an increase in total fertility rates can increase FLFPR as well. A positive association between total fertility rate and FLFPR has been suggested by several authors (Berhardt, 1993; Pinnelli, 1995;

Rindfuss & Brewster, 1996). This could be explained by the presence of children increases the household's need for more income, which in turn increases the necessity for mothers to seek outside job to earn more income in order to support the living expenses of their family. Furthermore, recent advances in demographic theory have suggested a reduction in the incompatibility hypothesis between FLFPR and total fertility rates. This is a result of changes in social norms and the availability of childcare which directly affected fertility decision. Some authors found that the cross-country correlation between FLFPR and total fertility rates turned from a negative value before the 1980s to a positive value thereafter (Ahn & Mira, 2002; Brewster & Rindfuss, 2000). Brewster and Rindfuss (2000) had argued that the countries that are now with the lowest levels of fertility are those with relatively low rates of women's employment, and the countries with higher fertility levels tend to have relatively high rates of women's employment.

This demographic theory was supported by the idea in some Organization for Economic Cooperation and Development (OECD) countries where increasing participation rates do not depress fertility rates if these societies manage to minimize the incurred costs of childbearing and work. The link between fertility and women's employment has weakened owing to the greater availability of child-care services, family policies such as state-mandated maternity leave, and behavioral change towards working mothers (Rindfuss & Brewster, 1996; Rindfuss, Brewester & Kavee, 1996). The authors argued that behavioral change in particular has played an important role and it might explain a positive association between FLFPR and total fertility rates. Moreover, women are enabled to combine work and childcare more successfully if structural obstacles are restricted through the provision of social organization and support for families with children. These findings have given rise to societal level responses hypothesis that have eased the incompatibility role of females between having children and employment. In

short, changes in total fertility rates are seen to have both positive and negative impact on FLFPR.

2.1.2 Female Labor Force Participation Rates and Inflation Rates

Inflation has become increasingly important in analyzing the determinants of labor supply trends. Inflation is defined as the increase of general price level. Hence, inflation will directly affects real wages. A very high inflation rate can lead to a decrease in the real wage where in turn, a fall in the real wages denotes a decline in the purchasing power. This has become a motivation for women to increase their participation in labor force so that they can earn more money to support their family. Nevertheless, high inflation will lead employees to demand for higher wages. If the increase of wages is greater than the increase in price level, real wage will therefore rise instead of decreasing. Hence, a rise in inflation rate will indirectly cause an increase in the real wage. Higher real wage in the labor market encourage women to work outside so that they can get higher salary to uplift their family's standard of living. Therefore, in either case, higher inflation rate is expected to be followed by a rise in FLFPR.

A rapidly growing literature, inspired by Friedman (1977), has shown that inflation raises the variability of relative price changes. Besides that, Niemi & Lloyd (1981) had explored inflation as a possible independent influence on labor supply, because of its growing visibility. Since real wage serves as a primary determinant of labor force participation for females, any effect of changes in price level does matter. Rapid rise in price level is believed to have a depressing effect on real wage, which will attract females to enter workforce as the purchasing power has been reduced. Niemi & Lloyd had uncovered that inflation appears to have an effect on labor force

participation rates above and beyond the effect it generates through reducing the real wage. The result produced had signified positive and significant coefficients on the Consumer Price Index (CPI) which serves as inflation rates for women labor. Other than that, expectation of inflation rates will affect the long-term growth of women's labor supply too. If the market anticipate inflation to grew higher in the future, there is a need for people to work and earn more now so that they can cope with the high inflation in the future. Thus, expectation of inflation encourages women to enter workforce now. The total effect of inflation on labor force participation was considerably more pronounced when the CPI rose much more rapidly. Overall, inflation is having an independent positive effect on FLFPR where female labor force participation is increasing, in response to rising prices level.

Besides that, there are also other studies that advocate the positive relationship between inflation and FLFPR. A study of inflation as an economic variable driven solely by labor force change has been carried out by Kitov (2006, 2007) for the USA, Japan, France, and Austria. The study has revealed linear relationships between inflation, unemployment and labor force. In the USA, the linear relationships are also characterized by time lags with the change in labor force leading inflation and unemployment. In the research carried out by Kitov, Kitov, Dolinskaya (2007), the analysis confirm the existence of a unique linear and lagged relationship between inflation and labor force change. Additionally, inflation can get out of control because price increases can lead to demands for higher wages as people try to maintain their real living standards.

Fosu (1999) concludes that cost of living plays a role in labor force participation model. Businesses increase prices to maintain profits but this higher price will in turn put further pressure on wages which will depress real wage. Followed by a depressing real wage, inflation will therefore reduce the purchasing power. Purchasing power signifies how much a unit of currency is

actually worth in terms of the goods and services it can purchase. Thus it means that labor will only be able to buy lesser goods and services with their constant income when facing inflation. This situation will encourage women to work outside so that they can earn higher income. Furthermore, according to Niemi and Lloyd (1981), money illusion is the condition where inflation is underestimated but growth of real wage is overestimated. This will give wrong information to females that the wage rate that offered in the job market is quite high thereby make them have more incentives to participate in the labor market. Hence, inflation is expected to be positively related to FLFPR.

2.1.3 Female Labor Force Participation Rates and Education

Educational attainment is a powerful determinant of FLFPR. Education is an asset as well as a long term investment, once gained, it cannot be sold. Based on the observation of past researches, educational attainment is among the key determinants of labor supply decision. What are the rationales behind this? Firstly, females' education increases their productivity by rising output in economic activities. Based on the theory that education is an investment in human capital, as the level of education increases, individual's skills and competencies will also increase as well. Human capital is productive due to the immediate effect of raising the skills of workers by enhancing the adaptability and efficiency of allocation of resources (Schultz, 1975). As the world economy is changing rapidly, those with better adaptation to changes are said to have advantage than others as they are more able to absorb new ideas, adapt to new technologies from foreign, and improve local technologies (Heckman, 2002). Most importantly, higher educated labor has a much higher marginal product compared to those lower educated labor as education gives individuals more knowledge and ability which can be applied in workplace. According to Ince (2010), educated women are able to increase their problem solving, life skills, flexibility and will become more open minded.

Other than that, the improvement in local technologies and the use of new technologies requires a highly educated workforce with the anticipation that they can improve marginal product of labor. Following this, demand for workers with better education soar up as new technologies need to be operated more preferably by skilled labor and those with higher education. Since there is increasing demand, highly educated people are often offered with higher wages. Lam and Duryea (1999) use data sets from the Brazilian economy to explore the effects of schooling on fertility, labor supply and investments in children. The authors observed that the impact of schooling on the relevant variables invariably gives direction to the extent to which better educated women are drawn into the labor force by higher wages. More demand for higher education will leads to more labor supply since these women want to benefit from their investment in human capital. Thus, it is said that female education is associated with a greater incentive to participate in market activity.

In addition, formal education is believed to be the key for status placement. This is because it provides a fundamental skill that empowers women to take control of their own lives and can have more access in attaining a better position in the labor market. With this, women's position in the society will be enhanced, causing females with higher education to enter workforce with more certainty. Also, education as the key mechanism for enhancing female human capital and productive employment, has favorable impacts on perceptions of ideal family size. Knowledge gained in the education will facilitate female in acquiring information on modern contraceptive devices and family planning. The increasing value of women's time increases the opportunity cost of having children. Therefore, women are more likely to enter workforce rather than stay at home supplying child services (Schultz, 1981, 1997; Mincer, 1963). Overall, increased education of women is believed to have a positive effect on female employment.

Sprague (1988), Van der Klauw (1996), Lam and Duryea (1999) and Fosu (1999) have touched on issues revolving around labor force participation and schooling decisions. Theoretical and empirical studies had shown a strong and positive relationship between female educational attainment and labor force participation rates, and education is one of the most important factors in explaining differences in female labor force participation across countries and over time (Goldin, 1995; Stanfors, 2003). Wolfe (1980) observed that increased education leads to increased labor force attachment. In addition, Sackey (2005) uses data from the Ghana living standards surveys with demographically enriched information to estimate female labor force participation model. The author discovered that female schooling does matters in both urban and rural localities; both primary and post-primary schooling levels exert significant positive impact on women's labor market participation. Other studies had demonstrated that education encourages married women's labor force participation in Australia (Evans, 1984; Kelley & Evans, 2002; Santow, 1991) and in other countries such as the U.S. (Kerckhoff, 2001; Rosenfeld, 1996). Meanwhile, Cheng (1999) found that education is directly related to FLFPR which is consistent with the finding of Ogawa and Clark (1995) that education has a positive and significant impact on FLFPR.

2.1.4 Female Labor Force Participation Rates and Male Incomes

Another important determinant of participation and employability of female is the earning income of male. A number of studies have revealed substantial effects of husband's income on the wife's labor supply decision (Bowen & Finegan, 1969; Cain, 1966). It is clear from the analysis that a husband's income determines female participation in the labor market particularly for married women (Mon, 2000). Relatively high levels of income of husband

indicate affluence and are observed to have a negative impact on FLFPR. Carliner et al (1984) found a significant negative effect of husband's earnings on wife's lifetime labor supply while Rosenzweig and Schultz (1984) report negative and generally significant effects on labor force participation in two years and in the interval between those years. However, Schultz (1980) noted that the depressing impact of husband's income on female labor force participation is less pronounced for the youngest age group of female.

In Easterlin's relative income hypothesis (1973, 1980), males' income relative to their economic aspirations is considered as the governing factor of FLFPR. These aspirations are determined by the living standards of their parents observed by these young adults as teenagers. Income of young male adults divided by the income of their parents with appropriate lagged is the measurement used by the author for ideally relative income. The author also explains that male wages are responsive to shocks in the female labor supply relation. In order to raise their economic status, female are encouraged to participate in the labor market and education, or delay marriage and reduce childbearing. Many studies have attempted to test the power of Easterlin's model and the results are found to be quite supportive whereby Macunovich (1998) provides a comprehensive literature review of empirical studies on the Easterlin hypothesis while Waldorf and Byun (2005) provide a meta-analysis of empirical results.

According to Mincer (1993), family economic status, which may be reflected in husband's education, family expenditure, or house ownership and condition, will influence women's economic activity, and women whose husbands earn high incomes are less likely to be active in the labor market. Furthermore, households with husbands who are unemployed will receive less family income, inducing the wives to seek work in order to maintain household consumption levels. The willingness of married women to participate in the labor market can be attributed to their desire of providing

their families with a better living or to maintain the current living life. In short, a male income is viewed to have a negative relationship with FLFPR.

2.2 Causality between Female Labor Force Participation Rates and Total Fertility Rates

Several studies have tried to test the existence and the direction of causality between female employment and fertility in a bivariate context for specific countries by applying methods of time series analysis such as unit root, cointegration and Granger causality testing (Engelhardt, Kogel & Prskawetz, 2004; McNown & Ridao-Cano, 2005; Narayan & Smyth, 2006). There are mixed results noticed on the existence and direction of causality between FLFPR rates and total fertility rates (Cheng, 1996a; Klijzing, Sieger, Keilman & Groot, 1988; Michael, 1985).

In section 2.1.1, the authors had discussed on how total fertility rates can affects FLFPR. At the other possible association, an increase in FLFPR may have a negative impact on total fertility rates, which is the opposite direction of negative relationship which mentioned in section 2.1.1. This is consistent with the role incompatibility hypothesis too. In fact, the main concern for working women is the opportunity costs that associate with having children. Why say so? This is because, the opportunity cost could take the form of income foregone from giving up paid employment if they need to leave their jobs or switch from full time job to part time job to look after their child. Even though she wishes to remain employed, she still has to pay for child care. In contrast, females who are in the workforce are likely to foregone the chance of having children as time spent in market work will reduces the time and energy available for child rearing. Stolzenberg and Waite (1977) documented that the negative impact of FLFPR on total fertility rate is more pronounced following the first birth, once women have experienced the demand of juggling works and child rearing.

Furthermore, the cost of living nowadays is getting higher, so do the costs of raising children. Since the cost of having children is increasing as well, some female would rather remain at workforce to earn income for their own living expenses than opt for having children. Additionally, there is also costs reflects in the form of interruption to the career path of females. The possibility of loss of a higher potential future income stream and non-pecuniary benefits including status associated with the position in her chosen profession will induce females to put off having children. The cumulative effects of time and cost spent in activities of job searching process, training and establishing oneself with the employer, need to be considered if women wish to re-enter job market after their infant children grows and able to take care themselves. Thus, some working women will rather choose to stay employed instead of having children. Cheng (1996b) has discovered unidirectional Granger causality running from FLFPR to total fertility rates. In addition, Cramer (1980) also argued that current employment reduces both actual and expected fertility, and since this effect builds up over time, employment may in the long run have a substantial effect on fertility.

Besides that, there may be a reciprocal relationship exists between the two variables which is the bi-directional relationship. Michael (1985), using US time series data from 1948 to 1980, and Klijzing et al. (1988) using Dutch survey data for 1977 to 1988 found short run bi-directional causality running between female employment and fertility. Engelhardt et al. (2004) examined the long-run relationship between FLFP and total fertility rates within a cointegration and Granger causality framework for France, Italy, Sweden, West Germany and the United Kingdom over the period 1960 to 1994. These authors found long run bi-directional Granger causality for all countries studied except for Sweden.

To simplify for negative relationships between FLFPR and total fertility rates, either the causation runs from total fertility rates to FLFPR, or the causation runs from FLFPR to total fertility rates, or both, and these would support the role incompatibility hypothesis. However, if causation runs from total fertility rates to

FLFPR and total fertility rates has a positive effect on FLFPR, this would agreed with the societal response hypothesis. More recent studies such as Mishra and Smyth (2009) have employed vector error correction models which distinguish between long-run and short-run causality. Some have often utilized a multivariate approach (Cheng, 1999) including explanatory variables that suggested by the underlying economic theory. These are because there are possibilities that a third factor for example education or a set of factors are responsible for creating the inverse relationship or contribute to the outcomes. Hence, this paper will also look into the causality relationship between FLFPR and total fertility rates in the context of Japan.

2.3 Conclusion

From the past studies, researchers have identified a number of variables that affect the FLFPR. Variables that are taking into considerations for the study in Japan are total fertility rates, inflation rates, female education and male earning. Different research papers have suggested different relationships between the independent variable with the dependent variable. The analysis in this study is trying to improve and gain additional knowledge and guidance to others.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This section is an introductory overview of the research methodology, a description of process to field and analysis of study. Data source and description for selected variables for analysis will be considered. Analytical approaches to investigate the various issues under consideration will be discussed in this section too.

3.1 Model Specification and Research Framework

In this paper, the relationship between female labor force participation rates (FLFPR) and total fertility rates is being studied, the effects of inflation rates, education, and the growth rates of male earning to FLFPR is taking into consideration to avoid any misspecification of the model. Thus, the model of our study is functioned as follow:

$$FEM = f(TFR, INF, EDU, GRME)$$

Where,

FEM = female labor force participation rates,

TFR= total fertility rates,

INF = inflation rates,

EDU= rate of advancement to universities (faculty) for female,

GRME = growth rates of male earning.

For years, numerous studies had been focused on the relationship between FLFPR and total fertility rates (Angrist & Evan, 1998; Cheng, Hsu & Chu, 1997; Heckman, 1974). Fertility is the natural capability of women in giving birth to new life, and it is also one of the major life events of a woman, where it is believed that there is a negative relationship with FLFPR (Heckman, 1974; Heckman & Willis, 1977; Angrist & Evans, 1998; Bloom, Canning, Fink & Finlay, 2007). Therefore, it is hypothesized that: ***The higher the total fertility rates, the lower the female labor force participation rates.***

The second independent variable included in this study is inflation rate, which is defined as the rise in the general price level for goods and services in an economy over a period of time. According to Friedman (1977), inflation raises the variability of relative price changes. Since real wage serves as a primary determinant for labor force participation of females, thus any effect of changes in price level does matter. It is believed that rapid rise in the price level will decrease real wage and purchasing power will be falling if nominal wage remain constant. Thus it encourages women to work in order to earn more money to maintain their living expenses. Following that, a rise in inflation rates is expected to have positive relationship with FLFPR (Niemi & Lloyd, 1981). Therefore, it is hypothesized that: ***The higher the inflation rates, the higher the female labor force participation rates.***

Next, education is included as one of the independent variables as well. Education is the learning process where a person can accumulate knowledge, skills and values throughout the life. According to Ince (2010), educated women are believed to have the ability to increase their problem solving, life skills, flexibility and will become more open minded. Female who have education are more likely to earn higher income compared to those who do not have and this will encourage them to participate in labor market as well. Hence, education is expected to have a positive relationship with FLFPR (Ogawa & Clark, 1995; Sackey, 2005; Wolfe, 1980). In this case, the rate of advancement to universities (faculty) is used as a proxy for education, where higher rate of advancement to universities (faculty) will induce FLFPR.

Therefore, it is hypothesized that: ***The higher the level of female education, the higher the female labor force participation rates.***

The growth rate of male earning is taken into account as an independent variable in this study too. Male earnings are often seen as core and heart of the income of a household and thus the growth rate of male earnings serves as an important factor in affecting FLFPR as suggested by Bowen and Finegan (1969), and Cain (1966). When the growth rates of male earning is higher, it means that the family will have higher purchasing power and women will be discouraged to work for extra income as thay feel that they have sufficient income to support their life. In short, growth rate of male earning is believed to contribute negatively to FLFPR (Carliner, Robinson & Tomes, 1984; Rosenzweig & Schultz, 1984). Therefore, it is hypothesized that: ***The higher the growth rate of male earning, the lower the female labor force participation rates.***

3.2 Data Sources and Description

Secondary data are being employed in the analysis of this research. Annual time series data for selected variables in Japan are used. The data range from 1961-2005, which consists a total of 45 observations. The time series data in this study (female labor force participation rates (FEM), total fertility rates (TFR), inflation rates (INF), education (EDU) and growth rates of male earning (GRME)) are obtained from various sources.

The data used for FEM, EDU and GRME are compiled from Japan Statistical Yearbook, where FEM is defined as the percentage of the adult female population aged 15 to 65 in the labor force, EDU is described by the rate of advancement to universities (faculty) and GRME is the growth rate of average monthly contractual cash earnings of general employees for male. FEM is used to determine the percentage of female who are taking part in the labor market while EDU represents

the enrollment rate of female into higher education. GRME is used as a proxy for income of the head of the household to look whether the growth rate of male earning support FLFPR or the other way round.

On the other hand, data used for TFR and INF are taken from the World Tables of the World Bank. The TFR is defined as the sum of age specific fertility rates, births per woman whereas INF is classified as annual percentage of consumer prices. TFR provides an idea for whether women with more children (higher fertility rate) will encourage or discourage them to work. Meanwhile, INF is considered in the analysis as it is believed to affect the real wage and purchasing power of female, which are likely to have impact on FLFPR.

3.3 Research Procedure

Different methods for underlying research will be initiated here. Depending on the issues being addressed, a specific methodology will be introduced to each. To appropriately model the long-run equilibrium relationship for the studied variables, this research follows the contemporary integrated time-series methodology. E-view6.0 will be utilized in this study.

Initially, it is crucial to determine the form in which the data can be used for any subsequent estimation. Traditional regressions with time series data are normally with the assumption that the variables in the model are stationary. However, most macroeconomics time series are trended and therefore in most cases are non-stationary (Asteriou & Hall, 2007). Using macroeconomics time series data at their levels may leads to serious econometric problems, thus the properties of the individual series have to be established first and this explain the essential of conducting unit root test before carry on any further investigation.

After the unit root test is being conducted, the analysis of the study will proceed with cointegration test by using Johansen cointegration test to analyze whether there is any long-run relationship between the studied variables. Next, Ordinary Least Square (OLS) test is conducted to find out the relationship between the endogenous and exogenous variables of the model. Following this, diagnostic checking is on progress to examine the stability of the model to see whether the model is appropriately established and suitable for estimation, and stochastic assumption will be implemented. Finally, Engle-Granger causality test will be performed to test for the short-run relationship amongst the studied variables.

3.3.1 Unit Root Test

Firstly, this paper formally examined the time series properties of each univariate series by using Augmented Dickey–Fuller test (ADF) (Fuller, 1976; Dickey & Fuller, 1979, 1981) and Kwiatkowski, Phillips, Schmidt and Shin test (KPSS) (Kwiatkowski, Phillips, Schmidt & Shin, 1992). Both tests are unit root test, which is a formal procedure to check for stationarity of a variable based on formal statistical tests. Formal statistical tests of the unit root hypothesis are of additional interest to economists because it helps to evaluate the nature of the nonstationarity exhibited by most macroeconomic data. ADF test includes extra lagged terms of the dependent variable in order to eliminate autocorrelation as the error term is unlikely to be white noise. The number of lags present in the model is an important element for ADF test as it has been observed to have a great impact on the size and power properties of the ADF test. Therefore, Schwartz's Bayesian Information Criteria (SIC), is utilized for lag length selection. Meanwhile, KPSS test functions in this analysis too, where it is useful for confirmatory analysis in conjunction with the ADF test. The KPSS test, unlike the ADF test, takes stationarity as the null hypothesis, while having the unit root becomes the alternative hypotheses, which is the opposite of ADF test. If both types of

tests lead to the same conclusion, one may have more confidence in the outcomes. Model for the application of unit root test is as below:

$$\boldsymbol{X_t = c + \Phi X_{t-1} + \varepsilon_t} \quad (1)$$

As shown above, $\boldsymbol{X}$ refers to the variables selected for this study which are FEM, INF, TFR, EDU or GRME. $\boldsymbol{c}$ is the constant term while Φ refer to the trend and $\boldsymbol{\varepsilon}$ is the error term. Here, it is mainly testing whether $\Phi = 1$ or $\Phi < 1$. If $|\Phi| < 1$, the series of the variable is stationary with zero order of integration, I (0); whereas if $\Phi = 1$, then the series of the variable is non-stationary with first order of integration, I (1).

The hypothesis testing for both unit root tests are shown as below:

Hypothesis	ADF test	KPSS test
H_0	The series has a unit root (non-stationary).	The series is stationary.
H_1	The series does not have a unit root (stationary).	The series is not stationary.

For ADF test, if the value of t-statistic estimated is greater than critical value, the null hypothesis of a unit root is being rejected, otherwise do not reject it. If the null hypothesis is being rejected, the series of variable is in favor of stationarity. On the other hand, for KPSS test, if the null hypothesis of stationarity is being rejected whereby the LM-statistics is greater than critical value, it means that the series is non-stationary. Otherwise if LM-statistics is smaller than its critical value, do not reject the null hypothesis and it signifies that the series is stationary. In short, both tests carry the same objective which is to determine the order of integration of all the series of variables under this research so that further analysis are granted as the order of integration of the series of all variable must be identical in order to conduct cointegration test and causality test.

3.3.2 Cointegration Test

Next, long run relationships among the selected variables in the system are studied. Economic theory often suggests that certain variables with underlying theory should not diverge from one another to a great extent, at least in the long run. According to Engle and Granger (1987), two or more series are cointegrated if they share the same order of integration, I(d) and the linear combination of these series is I(b), where b<d. That is, even the studied variables (FEM, TFR, INF, EDU and GRME) contain a unit root, if these variables are examined to be cointegrated, there will be a long-run relationship between the variables. Cointegration is a property possessed by some non-stationary time series data whereby the series will move together over time or the linear combination of them is stationary. As such, the cointegration technique has been used extensively in the economics study to examine the linear relationship or more specifically long run relationships among various economic variables. The core of this approach is to fit stochastic difference equations, allowing data to play a large part in the short-run dynamics, and to judge the result partly by the consistency of the long-run solution with economic theory (Davidson et al., 1978). If two, or more series, are cointegrated, this indicates that the series will eventually adjust towards equilibrium as there exist common factors that affect their permanent or secular trends.

Most cointegration models require variables integrated to the same degree as variables with differing orders of integration possess are unlikely to be functionally related to each other. Therefore, determinants of the number of unit roots of the individual time series as method mentioned above is a critical step for cointegration analysis. A set of integrated series may be linked by one or more stationary linear combinations called cointegrating equation, which signify that there is long run equilibrium relation, at which it should be consistent with the underlying theory. The implications are, even there is

covariance between two, or more series, in the short run, the series will adjust to equilibrium point which point towards long run relationship between the series. This is an important prerequisite for further analysis of the long run relations among these variables.

Assuming that each series has the same number of unit roots, the cointegration test can commenced. The cointegration tests were performed with the Johansen (1988, 2000) method designed to test the restrictions imposed by cointegration on the unrestricted vector autoregression (VAR) as illustrated below.

$$\boldsymbol{Z_t = A_t\, Z_{t-1} + A_2\, Z_{t-2} + \ldots + A_k\, Z_{t-k} + v_t} \qquad (2)$$

As on top, Z_t is an $\boldsymbol{n}$ x 1 vector of variables that are integrated of order one, I (1) and $\boldsymbol{v_t}$ is an $\boldsymbol{n}$ x 1 vector of innovations. In this case, all the five variables are treated as endogenous, thus the issue of endogeneity and exogeneity of variables can be ignored and so will have $Z_t = [FEM_t, TFR_t, INF_t, EDU_t, GRME_t]$. This VAR from (2) can be reformulated in a vector error-correction model (VECM) as follows:

$$\boldsymbol{\Delta Z_t = \Gamma_1\, \Delta\, Z_{t-1} + \Gamma_2\, \Delta\, Z_{t-2} + \ldots + \Gamma_{k-1}\, \Delta\, Z_{t-k-1} + \Pi\, Z_{t-1} + v_t} \qquad (3)$$

where $\boldsymbol{\Gamma_i = (I - A_1 - A_2 - \ldots - A_k)}$ *(i= 1, 2, ..., k-1)* and $\boldsymbol{\Pi = -(I - A_1 - A_2 - \ldots - A_k)}$. Δ is the difference operator, *k* is the lag length and *t* refers to the time for estimation. According to the Granger representation theorem, if the coefficient matrix $\boldsymbol{\Pi}$ has reduced rank $\boldsymbol{r<n}$, then there exist $\boldsymbol{n}$ x $\boldsymbol{r}$ matrices $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ each with rank $\boldsymbol{r}$ such that $\boldsymbol{\Pi = \alpha\beta'}$ and $\boldsymbol{\beta' Z_t}$ is stationary (Engle & Granger, 1987). $\boldsymbol{r}$ is the number of cointegrating relationships, $\boldsymbol{\alpha}$ are known as the adjustment parameters in the VECM while $\boldsymbol{\beta}$ is the cointegrating vector. The $\boldsymbol{\Pi}$ matrix contains the information regarding the long-run relationships. Any variable that does not have significant adjustment parameters in VECM is said to be

weakly exogenous and the implication is that a weakly exogenous series forms its own stochastic trend.

This approach is utilized as it can find out the number of cointegrating vectors when the model involves more than two time series variables. This test concerned on whether there exists at least one cointegrating vector. The variables might form several equilibrium relationships governing the join evolution of the variables (Asteriou & Hall, 2007). Be aware that, for $\boldsymbol{n}$ number of variables, the cointegrating vectors can only up to $\boldsymbol{n}$-*1*. Before performing this test, an appropriate lag length was determined using SIC, suggested by Enders (2004). The guiding factor was that the lag length must be sufficiently large so that a vector of the error terms, $\boldsymbol{v_t}$ are white noise. Johansen (1988) has proposed two statistics that are trace statistic and maximum eigen statistic, which can be used to evaluate the number of cointegrating relationships based on the propositions about eigenvalues. Critical values for both statistics are provided by Johansen and Juselius (1990). The maximum eigen statistics as shown below, is based on the inspection of each eigen value individual to test how many numbers of the eigenvalues are significantly different from zero.

$$\lambda_{max}\,(r, r+1) = -\,T \ln\,(1-\lambda_{r+1}) \qquad (4)$$

Here, $\boldsymbol{T}$ is the sample size and $\boldsymbol{\lambda}$ is the estimated value for the $\boldsymbol{i}$th ordered eigenvalue from the $\boldsymbol{\Pi}$ matrix. The null hypothesis is the number of cointegrating vectors, $\boldsymbol{r}$ versus the alternative hypothesis of $\boldsymbol{r+1}$ vector. If the results imply that null hypothesis of the number of cointegrating vectors equals 0, is being rejected, it suggest that there is at least one cointegration equation at the appropriate significant level. Thus, it can conclude that there is a stable long-run relationship between the two variables being analyzed. In short, it means that two series will stay close to each other and will not differ apart even though all the series diverge from each other in the short run.

On the other hand, the trace statistic is a joint test based on likelihood ratio test about the trace of the matrix as shown below.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} ln\,(1-\lambda_i) \quad (5)$$

The trace statistic considers whether the trace is increased by adding more eigenvalues beyond the ***r***th eigenvalue. It tests the hypothesis of at most ***r*** cointegrating vectors is used in detecting the presence or absence of a cointegrating relationship between variables in the system. If the test statistic is greater than the critical value, rejects the null hypothesis that there are ***r*** cointegrating vectors in favor of the alternative hypothesis that there are more than ***r*** cointegrating vectors.

The hypothesis testing for both test statistics for Johansen cointegration test is summarized as column below:

Hypothesis	Maximum eigen statistics	Trace statistic
H_0	The number of cointegrating vectors is ***r.***	There are ***r*** cointegrating vectors.
H_1	The number of cointegrating vectors is ***r+1.***	There are more than ***r*** cointegrating vectors.

3.3.3 Ordinary Least Square

Ordinary Least Square, normally known as OLS, is a standard linear regression procedure. It is used to estimates a parameter from the data given. The regression of the model as shown in equation (6) will be generated by using OLS.

$$\boldsymbol{FEM}_t = \beta_0 + \beta_1 \boldsymbol{TFR}_t + \beta_2 \boldsymbol{INF}_t + \beta_3 \boldsymbol{EDU}_t + \beta_4 \boldsymbol{GRME}_t + \varepsilon_t \qquad (6)$$

When t-statistic value for each independent variable is larger than its critical value, the null hypothesis of there is no relationship between the selected independent variable and the dependent variable will be rejected.

The hypothesis testing for OLS is shown as below:

Hypothesis	OLS test
H_0	$\beta_i = 0$ (There is no relationship).
H_1	$\beta_i \neq 0$ (There is relationship).

where i = TFR, INF, EDU and GRME**.**

3.3.4 Diagnostic Checking

To ensure the validity and credibility of the short-run regression model, various diagnostic tests is computed. These approaches are to test whether the residual is normally distributed, is there autocorrelation, is there heteroskedasticity problem in the error term, and if there misspecification errors of the estimated model. Diagnostic checking is essential for an accurate analysis of investigation.

Appropriate diagnostic tests with their null and alternative hypothesis are listed in table below:

Diagnostic Test	Null Hypothesis	Alternative Hypothesis
Jarque-Bera test	H_0: Normality of error term.	H_1: Non-normality of error term.
Breusch-Godfrey Serial Correlation LM test	H_0: No autocorrelation problem.	H_1: Autocorrelation problem.
ARCH test	H_0: No heteroskedasticity problem.	H_1: Heteroskedasticity problem.
Ramsey RESET test	H_0: The model is correctly specified.	H_1: The model is not correctly specified.

The decision rule for all the stated diagnostic tests are the same, that is, reject the null hypothesis when the probability value (*p-value*) is less than 0.05, otherwise, do not reject it.

Jarque-Bera test is a normality test, which measure the departure between observed distribution and a normal distribution (Jarque & Bera, 1980). Breusch-Godfrey Serial Correlation LM test, on the other hand, is an autocorrelation test which regress the original residuals and lagged of the residuals up to specific lag order. While for Autoregressive Conditional Heteroscedasticity (ARCH) test, it concerned with an explicit specification of

heteroskedasticity disturbance. Last but not least, for Ramsey RESET test, according to Ramsey (1969), it is mainly discussed on the specification of the estimated model that access on the matters of the parameters of the estimated model.

3.3.5 Causality Test

Finally, causality test is employed after the cointegration test. A Granger-causality analysis will be carried out in order to assess whether there is any potential predictability power of one indicator for the other among the FEM, TFR, INF, EDU and GRME. The existence of cointegrating relationship among the variables suggests that there must be Granger causality at least in one direction, though it does not indicate the direction of temporal causality between the variables (Jayaraman & Choong, 2007). Granger causality method is proposed by Granger (1969) to test the causal links between all the selected variables as the cointegration test only deals with the presence of the relationship and does not necessarily imply causation. Causality test needed to know whether changes in a variable will have an impact on changes other variables which can examines short-run and long-run causality link within vector error correction model (VECM). In other words, Granger causality test is used to recognize the long run equilibrium relationship between the studied variables and the short run adjustments are estimated by using error correction model. More precisely, variable ***X*** is said to Granger-cause another variable, ***Y***, if the current value of ***Y*** (y_t) is conditional on the past values of ***X*** (x_{t-1}, x_{t-2}, ..., x_0) and thus the history of ***X*** is likely to help in the prediction of ***Y***.

For an unbiased estimation of Granger causality, it is essential that all variables are integrated of the same order. Moreover, the Granger causality test is very sensitive to the selected number of lags in the analysis, following that reasonable lag lengths are selected based upon SIC. Once the

cointegrating vectors has been determined, make use of ordinary least square (OLS) to estimate the multiple cointegrating equations separately and at each multiple cointegrating equations, standard Wald test on coefficient restrictions is applied to detect which variables have relationships by using the Vector Error Correction Model (VECM) estimation. Identifying restrictions must be imposed to determine the coefficients in the multiple cointegrating equations with cointegrating vectors (Johansen and Juselius, 1994).

The null and alternative hypothesis for Granger causality test is:

H_o: $\boldsymbol{X_t}$ does not granger cause $\boldsymbol{Y_t}$.

H_1: $\boldsymbol{X_t}$ does granger cause $\boldsymbol{Y_t}$.

If the value of F-statistic is greater than the F-critical value, do reject the null hypothesis of $\boldsymbol{X_t}$ does not granger cause $\boldsymbol{Y_t}$, it brings to the meaning of $\boldsymbol{X_t}$ is Granger causal for $\boldsymbol{Y_t}$ where $\boldsymbol{X}$ is one of the variables and $\boldsymbol{Y}$ is the other variable. Otherwise do not reject it. If $\boldsymbol{X_t}$ Granger causes $\boldsymbol{Y_t}$ and $\boldsymbol{Y_t}$ do Granger causes $\boldsymbol{X_t}$ as well, this shows there is a bi-directional relationship of the variables. However, when the $\boldsymbol{X_t}$ Granger causes $\boldsymbol{Y_t}$, while $\boldsymbol{Y_t}$ is not Granger caused $\boldsymbol{X_t}$, this indicates there is only a unidirectional of the relationship between the variables. There is also possibility where there is independent relationship between the variables whereby in such case there is no Granger causality in any direction.

After the discussion of different analytical tools that will be carried out in the analysis of this study, here comes the end for this chapter. The following chapter will present the research findings and results.

Chapter 4: EMPIRICAL RESULTS AND INTERPRETATIONS

4.1 Introduction

This chapter discussed about the data analysis and the results obtained from the test. In the first part, the unit root test is being used to examine whether the model include any non-stationary variables by using Augmented Dickey-Fuller test (ADF) and Kwiatkowski, Phillips, Schimdt and Shin (KPSS) test. The optimal number of lag for the ADF test is determined by using Schwarz Information Criterion (SIC) while the optimal number of lag for the KPSS test is determined by using Newey-West Bandwidth. In addition, Johansen-Juselius cointegration test is used to identify whether the long-run relationship exist among the female labour force participation rates (FEM), total fertility rates (TFR), inflation rates (INF), female's education level (EDU), and growth rate of male earning (GRME). After that, the coefficient of exogenous variables in relation to the endogenous variable will be identified by using Ordinary Least Square (OLS) test. Furthermore, diagnostic checking will be conducted to check for heteroscedasticity in the error term, autocorrelation between successive error terms, misspecification errors of the estimated model and whether the residuals are normally distributed. Lastly, Granger Causality test is conducted to examine whether there is any short-run and long-run causality between the variables under vector error correction model (VECM).

4.2 Unit Root Test

In this paper, tests used to detect unit root in the variables are Augmented Dickey-Fuller (ADF) test and Kwiatkowski, Phillips, Schimdt and Shin (KPSS) test. ADF test is an augmented version of the Dickey Fuller test which includes extra lagged terms of the dependent variable in order to eliminate autocorrelation. Meanwhile, KPSS test is conducted to overcome the criticism of ADF that the explaining power of the test is low when the process is stationary but with a root that is close to the non-stationary boundary. Both of these tests are use to test for the stationarity of the macroeconomic series at level and the first difference. The null hypothesis for ADF test indicates that the variables contain unit root which means that the time series data consists of non-stationary variables. For KPSS test, however, the null hypothesis shows that the variables are stationary. Results for both ADF test and KPSS test at level and first difference are displayed in Table 4.1.

Table 4.1: Result of Unit Root Tests

	Augmented Dickey Fuller Test		KPSS Test	
	At Level	At 1st Different	At Level	At 1st Different
	Constant without trend	Constant without trend	Constant without trend	Constant without trend
FEM	-2.7119	-4.1811***	0.3930*	0.4244
TFR	0.0148	-7.0036***	1.1423***	0.1506
INF	-2.3208	-6.6695***	0.7545***	0.1066
EDU	1.4222	-3.1823**	1.1012***	0.3613
GRME	-1.7001	-5.9170***	0.6637**	0.1248

Note: *, **, *** indicates the rejection of the null hypothesis at 10%, 5% and 1% significance levels. For ADF, the optimal lag is selected on the basis of Akaike Information Criterion (AIC). For KPSS, the optimal lag is selected on the basis of Newey-West bandwidth.

From Table 4.1, the t-statistic for all series (female labor force participation rate, total fertility rate, inflation rate, female's education level and growth rate of male earnings) at level form in the ADF test is smaller than the ADF critical values at 1%, 5% and 10%. This indicates that all variables are not stationary at their level form. After taking first difference, the null hypothesis of non-stationary for ADF test is rejected at the 1% significance level for FEM, TFR, INF and GRME, and 5% significant level for EDU. The result for ADF test tells that all the variables has a unit root under level form and is stationary under first difference form.

In order to confirm the result of ADF test, KPSS test is conducted. In KPSS test, the individual series of TFR, INF and EDU are statistically significant at 1% whereas the series of FEM and GRME are significant at 10% and 5%, respectively. The null hypothesis of stationarity for all variables is rejected at level form, suggesting that the variables are not stationary at level form.

Since these series of data are not stationary, KPSS test is conducted at first difference for all variables. At first difference, all series failed to reject the null hypothesis, indicating that all the series are stationary at first difference. Results obtained from both ADF and KPSS test are consistent, which is all the time series variables consists of one unit root. Hence, it can be said that all variables are of first order of integration, I(1).

4.3 Cointegration test

From the previous section, the authors had found that all the series of data is stationary at first difference, and they have the same order of integration which is I(1). Next, the authors use Johansen cointegration test to examine the linear relationship, or more specifically long-run relationships among the chosen variables (FEM, TFR, INF, EDU and GRME). If these variables are proved to be cointegrated, there will be a long-run relationship between these variables whereby the series will eventually adjust towards equilibrium as there are common factors that affect their permanent or secular trends. For this study, there is a possibility of having more than one cointegrating vector and the most is four cointegrating vector as there are five variables in this study. The results acquire from the Johansen cointegration test is shown in Table 4.2.

Table 4.2: Johansen Cointegration Test Results

Null hypothesis	Eigenvalue	Trace Statistic	Max-Eigen Statistic	Critical Value 95% (Trace)	Critical Value 95% (Max-Eigen)
$r = 0$	0.8499	197.6398*	75.8550*	69.8189	33.8768
$r \leq 1$	0.7519	121.7848*	55.7690*	47.8561	27.5843
$r \leq 2$	0.6540	66.0158*	42.4554*	29.7971	21.1316
$r \leq 3$	0.4079	23.5604*	20.9656*	15.4947	14.2646
$r \leq 4$	0.0628	2.5948	2.5948	3.8415	3.8415

Notes: *r* stands for the number of cointegrating vectors.
* indicates significance at 5% level.

Table 4.2 shows the result of Johansen cointegration test. From this table, the computed value of Trace test is 197.6398, which is larger than the 5% critical value of 69.8189. Hence, reject the null hypothesis that there is no cointegrating vectors (r=0) among the studied variables that are FEM, TFR, INF, EDU and GRME. This

result was also consistent with the Max-Eigen test where the computed value of 75.8550 is larger than the 5% critical value of 33.8768. The null hypothesis of there is no cointegrating vectors (r=0) for Max-Eigen test is rejected.

As shown in the table, the result clearly demonstrates that all the null hypothesis of r cointegrating vectors (r=0, $r \leq 1$, $r \leq 2$, $r \leq 3$) are being rejected regardless of which test (Trace test or Max-Eigen test) the authors used. The Trace test rejects the null hypothesis that there is at most one cointegrating vectors ($r \leq 1$) with the computed value of 121.7848, which is greater than the 5% critical value of 47.8561. At the mean time, the result obtained by using Max-Eigen test also reject the null hypothesis of there is one cointegrating vectors ($r \leq 1$) where the computed value of 55.7690 is greater than the critical value of 27.5843 at 5%.

For the null hypothesis that there are at most two cointegrating vectors ($r \leq 2$), both Trace test and Max-Eigen test also produce consistent result. For the Trace test, the computed value is 66.0158 and the critical value at 5% significant level is 29.7971; whereas for the Max-Eigen test, the computed value of 42.4554 is bigger than the critical value of 21.1316 at 5% significant level, signify that the null hypothesis that there are at most two cointegrating vectors ($r \leq 2$) is being rejected.

The null hypothesis of at most three cointegrating vectors ($r \leq 3$) was also rejected by both the Trace test and Max-Eigen test. For this hypothesis, the computed value for Trace test is 23.5604 that is greater than its critical value of 15.4947 and the Max-Eigen statistic is 20.9656 that is also greater than its critical value of 14.2646 at 5% significant level. This proposes that there are more than three cointegrating vectors amongst the variables. However, both Trace test and Max-Eigen test fail to reject the null hypothesis of there is at most 4 cointegrating vestors ($r \leq 4$). The trace computing value is 2.5948, which is smaller than 5% critical value of 3.8415 and the Max-Eigen computing value of 2.5948, which is smaller than 5% critical value of 3.8415.

Therefore, it can be concluded from Table 4.2 that the model has at most four long-run relationships between FEM, TFR, INF, EDU and GRME in Japan. Since there are long run relationships amongst the variables, the cointegrating variables may converge in the long run equilibrium where the series move closely together and will not diverge too far away from each other in the long run.

Table 4.3 shows the normalized cointegrating coefficient of long-run function for the model of female labor force participation rate. This result shows that total fertility rates, inflation rates and female's education level have negative relationship with female labour force participation rates whereby only the total fertility rates is consistent with the theory. On the other hand, it shows that growth rates of male incomes have positive relationship with female labour force participation rates.

Table 4.3: Normalized Cointegrating Coefficients

Parameter Normalized	Cointegrating Vector
FEM	-1.0000
TFR	-13.2039
INF	-0.0405
EDU	-0.2695
GRME	29.8363

4.4 Ordinary Least Square Regression

From the previous section, the authors had confirmed the presence of long-run relationship among the variables in this study. Hence the Ordinary Least Square (OLS) regression is conducted. Table 4.4 shows the results of the OLS regression for this study.

Table 4.4 Ordinary Least Square Regression Results

Independent Variable	Coefficient	Standard Error	t-statistic
TFR	-3.4510	1.8649	-1.8504*
INF	-0.3022	0.0979	-3.0882***
EDU	-0.1490	0.0339	-4.3925***
GRME	14.0588	10.0007	1.4058
C	57.8020	3.1155	18.5530
R-squared : 0.3193		Adjusted R-squared : 0.2513	
Durbin –Watson stat : 0.3848			
F-statistic (*p-value*) : 4.6911 *(0.0034)*			

Note: *, **, *** indicates the rejection of the null hypothesis at 10%, 5% and 1% significance levels.

From the table above, the results demonstrate that the INF and EDU are statistically significant at 1% significant level while TFR is statically significant at 10%. However, GRME is insignificant at all level. The adjusted R-squared is 25.12 per cent which is considered low and it indicates that the regression line does not perfectly fit the data. Furthermore, the coefficient of the TFR, INF and EDU are in negative value, indicating that these variables have a significant negative effect on FEM. However, the positive coefficient of GRME indicates that it has a positive but insignificant effect on FEM.

The OLS regression model is identified as below:

$$\boldsymbol{FEM}_t = \beta_0 + \beta_1 \boldsymbol{TFR}_t + \beta_2 \boldsymbol{INF}_t + \beta_3 \boldsymbol{EDU}_t + \beta_4 \boldsymbol{GRME}_t + \varepsilon_t$$

$$\boldsymbol{FEM}_t = 57.8020 - 3.4510 \boldsymbol{TFR}_t - 0.3022 \boldsymbol{INF}_t - 0.1490 \boldsymbol{EDU}_t + 14.0588 \boldsymbol{GRME}_t$$

Where,

FEM = female labour force participation rates,

TFR= total fertility rates,

INF = inflation rates,

EDU= rate of advancement to universities (faculty) for female,

GRME = growth rates of male earning.

The regression above explains that for every 1 percentage point increase in TFR, it will lead to 3.45 percent decrease in FEM, holding other factors constant; every 1 percentage point increase in INF will lead to 0.30 percent decrease in FEM, holding other factors constant; and every 1 percentage point increase in EDU will lead to 0.15 percent decrease in FEM, holding other factors constant. From the OLS regression, it illustrates that the TFR has the largest negative impact on FEM, followed by INF and EDU. GRME is the only variable which is found to be positively related to FEM, but it is statistically insignificant.

From the results shown, the significant negative relationship between TFR and FEM is consistent with the role incompatibility hypothesis (Cotter, Hermsen & Vanneman, 2001 and Mishra & Smyth, 2009) where the role of mother and paid work cannot be performed simultaneously. However, on the other hand, the negative sign of the significant relationship of INF and EDU with FEM are inconsistent with the review of the study which showed positive relationship.

For the case of INF with FEM, if the inflation rate is too high, the cost of childcare or cost of hiring maid to do the housework will be too high and hence will discourage the entering of female into labor force as their wage rates remains the same and it is hard to cover these cost. Whilst for EDU with FEM, the existing

traditional concept of husband work outside and women stay at home as well as the importance of the family concept in Japan may drive women just to become wife doing house chores and mother who looks after children at home rather than joining the labor market. On the other hand, less educated female may come from poor family, and hence they are force to work for their family living expenses compared to those with higher education which afford to pay their school bills.

Lastly, the growth rate of male incomes is insignificant under this study. This may be due to the reason that divorce rates are growing nowadays, female want to have an independent financial account for their own good and safety. Even males are having an independent financial account as well, thus male incomes have no effect on female labor force participation rates. Thus, the inconsistent study of the relationship between GRME and FEM can be ignored.

4.5 Diagnostic checking

The validity and reliability of the long-run regression models is important. Therefore, diagnostic tests such as the normality test, the test for autocorrelation and heteroskedasticity as well as the test for misspecification error are conducted. Table 4.5 shows the result of diagnostic checking.

The results of the diagnostic tests show that the test statistics for both Jarque-Bera test and Ramsey RESET Test are insignificant at 1% significant level, where it fail to reject the null hypothesis. This indicates that in this study, the error term is normally distributed and the model is correctly specified. However, both Breusch-Godfrey Serial Correlation LM test and Autoregressive Conditional Heteroscedasticity (ARCH) test produce a significant test statistics and thus fail to hold the null hypothesis of no autocorrelation problem and homoskedasticity of error terms in the model. Therefore, reject the null hypothesis for both Breusch-Godfrey Serial Correlation LM test and ARCH test, indicating that the model convey autocorrelation and heteroskedasticity problem.

Table 4.5 Diagnostic Test Results

Diagnostic Test	Null Hypothesis	Statistics	Decision
Jarque-Bera test	H_0: Normality of error term	χ^2 =4.0831 [0.1298]	Do not reject Ho.
Breusch-Godfrey Serial Correlation LM test	H_0: No autocorrelation	F(4)=7.3804 [0.0001]	Reject Ho.
ARCH Test	H_0: Homoskedasticity	F(4) =3.8509 [0. 0072]	Reject Ho.
Ramsey RESET Test	H_0: The model is correctly specified	F(4) =0.2792 [0.6002]	Do not reject Ho.

Note: Figures in brackets representing probability values of the test statistics. Figure in parentheses representing the lag length used for the appropriate diagnostic tests.

From Table 4.5, it shows that the model consists of autocorrelation and heteroscedasticity problem. The authors did not solve for this problem due to the nature of the data set. One of the reasons is because there is limitation in obtaining a larger time series data set. If the authors solve the autocorrelation and heteroscedasticity problem by including more lags in the model, it will run out of the degree of freedom as the sample size in this analysis is not very big. Therefore, the authors tolerate for these problem within the study.

4.6 Granger Causality test

The existence of cointegration relationships among female labour force participation rates (FEM), total fertility rates (TFR), inflation rates (INF), rate of advancement to universities (faculty) for female (EDU) and growth rates of male incomes (GRME) suggests that there must be Granger causality at least from one direction to another, though it does not indicate the direction of temporal causality between these variables. A summarize of the examination of short-run and long-run Granger Causality tests within the vector error correction model (VECM) is shown in table 4.6 below.

(a) Long-run causality link

Based on Table 4.6, the coefficient on the error correction term (ECT) for equation with FEM as dependent variable is negative and significant at 10 % level. A significant ECT is an indicative of long-run causality running from total fertility rates (TFR), inflation rates (INF), rate of advancement to universities (faculty) for female (EDU) and growth rates of male incomes (GRME) to female labour force participation rates (FEM).

However, when TFR, INF, EDU and GRME are being analyzed as the dependent variable, the ECT for all these equations are found to be insignificant, which indicate the absence of any long-run causality running from the respective

independent variables to the respective dependent variables. Hence, there is only one long-run causal relationship within the VECM in this study. The magnitudes of ECT in the FEM regression, implies that adjustment towards the long-run relationship is about 0.3478 % per annum whereby any deviation from long run equilibrium is corrected to the extent of about 0.3478 % in the following year.

Table 4.6: Granger Causality Tests.

Dependent Variable	F-statistic					Error Correction Term (t-statistics)
	ΔFEM	ΔTFR	ΔINF	ΔEDU	ΔGRME	
ΔFEM	-	0.4121	0.2423	0.6787	0.7113	-0.3478* [-2.7738]
ΔTFR	1.0091	-	4.1603**	1.1559	4.5622**	-0.0238 [-1.1580]
ΔINF	0.5659	0.8718	-	0.4459	1.0783	-0.1990 [-0.3166]
ΔEDU	2.1126	0.4186	1.8971	-	1.4023	0.1779 [1.3753]
ΔGRME	1.0549	4.5365**	0.5262	1.1998	-	0.0109 [2.1929]

Note:* and ** indicate significant at 10% and 5% levels, respectively. Figure in parentheses represents t-statistics.

(b) Short-run causality link

Meanwhile, in the short run, there is a bi-directional relationship between TFR and GRME in this study. For this reason, any changes in both total fertility rates and growth rates of male incomes will reflect to each other's changes over time. In other words, growth rates of male incomes may affect the total fertility rates and total fertility rates may affect growth rates of male incomes too.

When male income is high, men are able to provide their families with a better living lifestyle and higher standards of living. With a sound and stable financial status of the men, women are induced to increase their fertility as they have less worry on the higher expenses after giving birth. Thus, GRME has a significant and positive impact on TFR. On the other hand, if a family consists of more children, then the cost to sustain the family living expenses will be higher, depending on how many children a family has. Due to this reason, men, who are usually the head in a Japanese society, possess higher responsibility to earn more in order to maintain or to uplift the family's living standard. Hence, higher fertility rate motivate men to earn higher salary, suggesting that TFR has a significant positive effect on GRME.

Furthermore, Table 4.6 illustrates that there is evidence of a unidirectional causal relationship of inflation rates on total fertility rates in which the F-statistic is significant and positive. It pointed out that any changes in inflation rates will have an impact on total fertility rates. In other words, inflation rate plays an important role in promoting total fertility rates. When inflation increases, if employees demand for higher wage rate that offset the increase in price level, then real wage may also increase. If this is the case, higher real wage received by either the husbands or the wives will encourage women to increase their fertility. This supports the positive short run causality that runs from INF to TFR. Thus, the Granger causality has showed both the long-run and short-run causality relationship between the studied variables.

Next, chapter 5 will make a summary of the results obtained from this study. Chapter 5 will also discuss on some of the policy implications based on the findings of this research. Then, the authors will list the limitations encountered during this research and suggest a few recommendations for future research.

CHAPTER 5: CONCLUSION

5.0 Introduction

First of all, the summary of the present study will be conducted in this chapter. Next, the policy implications that can facilitate Japan in a better development of female labor force participation will be provided in the next section. In addition, the limitation and recommendations of the present study will be highlighted in the following section for future researchers who intend to do research on the similar topic.

5.1 Summary

The objective of this study is to examine the relationship between female labor force participation rates and total fertility rates in Japan whether total fertility rates affects female labor force participation rates negatively or vice versa by using data from year 1961 to 2005. The background of the studied topic has been discussed in Chapter 1. Reviews of past studies related to the issues of this paper are brought up in Chapter 2. The reviews of previous studies and their result are essential as they serve as guidance to the analysis of this paper.

Other than female labor force participation rates (FLFPR) and total fertility rates, the issue of inflation rates, female's education and growth rate of male incomes are also taken into consideration in this paper to look at their impact on FLFPR. The linear relationship of FLFPR with the total fertility rate, inflation rates, female's education and growth rate of male incomes are examined in the long run. Additionally, the short-run and long-run causal relationships between the studied variables are observed too.

Different analytical tools used in the analysis of this study are discussed in chapter 3 while the findings are reported in chapter 4. Investigation of the unit root tests, Johansen cointegration tests, ordinary least square (OLS) test and Granger

causality tests are carried out to ascertain the relationship between the FLFPR, inflation rates, female's education and growth rate of male incomes in Japan. Initially, the unit root tests is conducted on each of the series individually and it concluded that each of the time series data is stationary at first difference where the series are integrated at first order, I(1). With the same properties of order of integration for all the series, cointegration test is run in order to test the cointegration relationship between the studied variables. According to the results obtained from the analysis, there are at most four long-run cointegrating relationships between FLFPR, inflation rates, female's education and growth rate of male incomes.

Besides that, by using the OLS test, three independent variables are statistically significant in which the inflation rates and female's education are significant at the 1% significance level and total fertility rates is significant at the 10% significance level. These three variables are proved to have negative and significant effect on FLFPR. However, growth rate of male incomes was found to be positively related to FLFPR but statistically insignificant.

After that, Granger causality method is performed to inspect the short-run and long-run causal relationship between the variables under vector error correction model (VECM). Long-run causal relationship is detected by the error correction term (ECT) whereby the dependent variable has to be negative and significant. From the results, it has confirmed the long-run causal relationship running from all other variables to FLFPR. However, the Granger causality test did not show any short-run causal relationship between the variables when FLFPR is the dependent variable. In addition, there is a uni-directional short-run causal relationship running from inflation rate to total fertility rate, indicating that any changes in inflation will have an impact on total fertility rate. Meanwhile, for total fertility rate and growth rate of male incomes, the analysis shows evidence that there is bi-directional relationship between them. Any changes in either variable will affect the other variable.

5.2 Policy Implications

This section will discuss on the policies that can be implemented by the government based on the results obtained in the analysis of this paper in order to achieve the goals of the country and for future development for the country as well.

5.2.1 Total Fertility Rates

This paper mainly focuses on finding of the relationships between total fertility rates and female labor force participations rates. The results showed that total fertility rates is significant and is negatively related to female labor force participations rates in the long-run. That is, female with lesser children are more willing to join the labor market. It seems that total fertility rates really play an important role in promoting female labor force participation. Thus, the government could targets on those females with lesser children or concerns on the issue of giving birth of women for the policy to increase the number of females that participates in the labor force. The equality of men and women are fully achieved in practice, the traditional concept that women are to stay at home to look after children is common. As a result, women with children are more likely being asked to take care of their children at home rather than work outside. Therefore, in order to increase female labor force participation rates, government should think firstly, to change the mindset of those with traditional thinking and further implement some policy that can encourage women's involvement in labor market like giving some incentives to firms that provides facilities of childcare in office so that women can work without leaving their children alone at home or company that are willing to offer longer maternity leave for pregnant women after giving birth without sacrificing their jobs.

5.2.2 Inflation Rates

On the other hand, inflation rates also play a significant role in affecting female labor force participation rates negatively. Therefore, government should take control of the inflation rates in the economy in order to boost up the participation rate of female in labor force. If the inflation rate is too high, the cost of childcare or cost of hiring maid to do the housework will be too high which will discourage the entering of female in labor force as their wages rates remains the same and hard to cover it. Moreover, the rise in inflation rates is forcing workers to ask for higher wages. This will lay more pressure on the employers and if employers are unable to pay higher salary, they will choose to lay off some workers especially those married women with children because they are categorized under group that have higher probability of taking leave for their children. Worst still, if the economy keeps on increasing the high inflation rates, there will be higher chances of causing crisis to the country and will thus dampen the economy, which in turn will further depress female labor force participation rates.

5.2.3 Education

In addition, education is also found to be negatively significant to female labor force participation rates. As mentioned before, the traditional concept is still deeply present. The family concept is quite important in Japan. Accordingly, although female with higher education are more towards joining the labor market in common, both concepts driving women just to become wife doing house chores and mother who looks after children at home, thus making them stayed outside the labor force. As mentioned above, the old way of thinking should be eliminated first so that community can accept and induce female to take part in labor market. Besides that, less educated female may come from poor family, and hence they mostly have to work for their

family living expenses compared to those with higher education which afford to pay their school bills. Less educated female are preferred by employer as they are low-skilled whereby the firm can offer them lower wages compared to those higher educated female. For these reason, less educated female are more willing to work and more demanded by employers. Hence, government should focus more on female with lower education to bring them on to the labor force. Training and incentive of upgrading their skills should be offered as well so that they get attracted and their skills can be enhanced. When they are well-trained and more experience, they may get higher wages and others female may get attracted too since they feel that they are more guaranteed to a better life.

5.2.4 Male incomes

Lastly, the growth rate of male incomes is insignificant under this study. This may be related to the growing divorce rates in Japan throughout these decades. According to the Ministry of Health, Labor and Welfare of Japan, divorces have shown an upward trend since the 1960s, hitting a peak of 290,000 in 2002. Graph in Appendix A (Figure A1) shows the changes in marriage rate and divorce rate in Japan from 1970 to 2009. Given this phenomenon, some female want to have an independent financial account from their spouses for their own good and safety. In other words, husband and wife are having separate and independent financial account. This causes male incomes to have no effect on female labor force participation rates. Hence, government can ignore it in solving the problems of female labor force participation rates.

In short, Japan government should focus on aspect of total fertility rates, inflation rates and education in implementing the policy for issue of female labor force participation rates.

5.3 Limitation and Recommendation for Future Research

In the study of this paper, there are several limitations. The first limitation that the researchers faced is regarding to the collection of data. The researchers faced some problems in collecting data as some variables are not available before year 1961 and latest data after year 2005. The limited time span of the data made the sample size relatively small which might lead to a biased and misleading result. Besides that, the limited and small sample size might not truly reflect the results of the Johansen cointegration test as cointegration test is meant for model with big sample size (Pesaran, Shin & Smith, 2001). Therefore, the autoregressive distributed lag (ARDL) model is recommended for future research. Unlike Johansen cointegration test, ARDL model is appropriate to use and produce more reliable results even if the model has small sample size. Moreover, ARDL model does not require all the time series data to have the same order of integration. In other words, even if the series of data have different order of integration, ARDL model can be run, unlike the Johansen cointegration test which requires all data series to have the same order of integration.

The second limitation that the researchers encountered is pertaining to the availability of data. A few past studies had discussed on the importance of childcare cost in affecting female working decision (Heckman, 1974; Graham & Beller, 1989; Wetzels, 2005). Heckman (1974) showed that the price of child care is a determinant of the decision to work and of the actual hours worked for female. Meanwhile, Wetzels (2005) give evidence that the length of the work week, and the choice of the mode of child care are jointly determined and mutually dependent on the wage rate and the prices of formal and informal childcare. Nevertheless, Graham and Beller (1989) pointed out that women with child support income tend to work longer hours than women without child support. However, these authors examined the effect of childcare cost on female labor force participation at the micro level. This means that the data and information obtained for these researches were collected from individual working women but not the aggregate data of female labor force participation rate. Even though the authors of the present paper know the importance of childcare cost in

affecting female working decision, aggregate data of childcare cost is unobtainable. Hence, this had caused the authors to withhold the use of childcare cost as one of the independent variable as the study in this paper focus on the macro perspective of female labor force participation. The authors suggest that future researchers can use relevant proxy which is closely related to childcare cost in future researches so that the effect of childcare cost on female labor force participation rate can be observed.

Other than that, female educational level is found to be negatively related to female labor force participation rate, which is inconsistent with the theory and previous studies. The authors suggest that this can be explained by the traditional and conservative thinking of Japanese where male are considered as the head of the family who are responsible to work and female should stay at home to take care of the children. This conservative thinking had caused prejudices towards working women, especially those who are highly educated and holding a higher position in work. However, whether or not this is the real situation in Japanese labor market is beyond the scope of this paper. Hence, in order to enhance the explanation for the negative relationship between female labor force participation rate and female education, perhaps this is the avenue for future research in studying the extent of gender discrimination in Japanese labor market.

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APPENDICES

Appendix A

Figure A1: Changes of marriage rate and divorce rate in Japan from 1970 to 2009

Source: Ministry of Health, Labor and Welfare, Japan.