Female Labour Force Participation, Infant Mortality and Fertility in Malaysia

Audrey K.L. Siah and Grace H.Y. Lee

Abstract:
In reviewing the population policy in 1984, Malaysian government called for a major shift from family planning to family and human resource development to achieve an ultimate population of 70 million by 2100. However, regardless of the government’s initiatives since the 1984, Malaysia’s fertility rate still declined. This study examines the short-run and long-run relationship and causality between female labour force participation rate, infant mortality rate and fertility in a developing country in Asia – Malaysia. We employ the unit root test which allows for two structural breaks, and the break dates are then used as dummy variables in the bounds testing procedure within an autoregressive distributed lag (ARDL) modelling approach and Granger-causality test. The results indicate that mortality changes have a significant and positive long-run impact on fertility rate and women’s child bearing decisions are unaffected by their employment situation. In addition, we do not find evidence that presence of children hinders re-employment and continuous female employment.

Keywords: Fertility, female labour force participation, bounds testing approach, Granger causality

1 Corresponding author: Department of Economics, School of Business, Monash University, Jalan Lagoon Selatan, Bandar Sunway, 46150 Selangor, Malaysia

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1. Introduction

Malaysia has completed its population transition and has entered the modern population reproduction stage, characterized by low birth rate, low mortality rate and low population growth rate. An investigation into the demographic transition revealed that Malaysia encountered deterioration in total fertility rate from 6.0 per cent in 1960 to 4.9 per cent in 1970, followed by 3.8 per cent and 3.5 per cent in 1980 and 1990 respectively, toward 3.1 per cent in 2000 and continued to decline to 2.6 per cent in 2010 (World Bank indicator, 2012). Malaysia’s total fertility rate, defined as an estimate of the number of children a woman would bear, if she survives to the end of her reproductive years and bear children in accordance with current age-specific fertility rates (United Nation Development Program, Human Development Report, 2010). The continuous decline of total fertility rate and change of family size have exerted a direct effect on the growth of total manpower and the age structure of the economy. Although Malaysia has a relatively young population, the proportion of the population below the age of 15 years has decreased from 44.9 per cent in 1970 to 33.3 per cent in 2000 and the percentage decreased further to 27.2 per cent in 2010. In contrast, the proportion of working age population (15-64 years) has increased to 67.3 per cent in 2010 from 62.8 per cent in 2000. The proportion of population aged 65 years and above has also increased to 5.1 per cent in 2010 as compared with 3.9 per cent in 2000. Consequently, the median age has increased from 23.6 years in 2000 to 26.2 years in 2010, while the dependency ratio has dropped from 59.2 per cent to 48.5 per cent. The trend of these indicators is in line with the transition of age structure and eventually leading to aging population of Malaysia (Country Health Plan, 10th Malaysia Plan, 2011-2015). With sustained fertility decline and an aging population, it is essential for Malaysian policy makers to raise fertility to avoid shortage of labour that is detrimental to economic growth.

Increased participation of Malaysian women in the labour force has been cited as one of the contributors of reduced fertility rates. The Granger causality tests results by Norehan and Nor’Aznin (2011) indicate that there is one-way causality which runs from female labour force participation to total fertility rate in Malaysia. However, Karen and Palan (1980) suggest that an increase in women’s employment would have little effect on fertility in Peninsular Malaysia. Demographers have often cited infant mortality rates as an important explanatory variable of fertility rate. Three mechanisms have often been put forward to link mortality and fertility rates: physiological effect, the replacement effect, and the hoarding
effect (Angeles, 2010). The first two effects provide reasons for an increased chance of pregnancy following the death of a child. The hoarding effect (also called the insurance effect) refers to the practice of bearing more children than the optimal family size in order to protect themselves against future mortality.

This study differs from the literature in two important ways. First of all, this study expands on the scant literature that examines the relationship and causality between female labour force participation rate, infant mortality rate and fertility in a developing country in Asia. The scarcity of such published work for a developing Asian country is emphasized. Secondly, the treatment of the data series is both comprehensive and unique. Given the long span of our sample, it is important to investigate the case structural breaks in order to account for important changes that took place in Malaysia during the sample period. In the presence of structural breaks in the series, the standard unit root test may lead to erroneous inference. We apply the recent two-break unit root test developed by Narayan and Popp (NP, 2010). The appealing aspect of the NP test is that it accurately detects the break dates compared to other competing tests in the presence of two structural breaks. It has the advantage of not requiring the \textit{a priori} specification of the possible timing of structural breaks. The break dates are endogenously determined within the model and we can use the break dates as dummy variables in the cointegration test.

This paper is organized in the following order: Section 2 provides an overview of research conducted in the areas of female labour force participation rate, infant mortality rate, and fertility. Section 3 provides the methodology and empirical findings. Next, it is followed by a section on discussion of results. This paper concludes with policy recommendations and conclusion.

2. Literature Review

Since Becker’s (1960) pioneering analysis of fertility based on economic theory, many studies have examined the relationship between fertility and labor market participation decisions. Yet, studies on the effects of fertility on female employment have concluded with mixed results. The studies by Rindfuss et al. (2000), Rica and Ferrero (2003) and Galiani (2007) found a negative correlation between fertility and female labour force participation. Their findings on the association between fertility and women’s labour force activity reflects
the ‘role incompatibility hypothesis’, which posits that fertility and female employment are negatively related due to the difficulties women face in balancing work and parenting duties (Stycos and Weller 1967; Weller 1977; Narayan and Smyth 2006b). However, a positive association between fertility levels and female labour force participation rates has been suggested by several authors such as Bernhardt (1993), Pinnelli (1995), and Rindfuss and Brewster (1996). Bratti (2003) suggested that women with tertiary education participating in the labour force have higher fertility because they could afford to pay for childcare and therefore able to have more children. This finding confirms the ‘societal response hypothesis’, which suggests that a positive work-fertility relationship exists. In addition, the empirical findings by Vlasblom and Schippers (2004) produced mixed support for both ‘role incompatibility hypothesis’ and ‘societal response hypothesis’ in their study for Spain, France, Italy, United Kingdom, Netherlands and West Germany.

The direction of Granger causality between female employment and fertility remains mixed and ambiguous. The presence of children or the opportunity costs associated with child bearing may discourage mothers from seeking employment due to a lack of work-family support in society or by choice. As such, fertility has a negative effect on female labour force participation. On the contrary, the presence of children may encourage women to seek paid employment in order to provide for the children and family. Cramer’s (1980) study was the first to find a reciprocal relationship between fertility and female employment. Employing modified Granger-causality tests, Cheng (1996a) found that African American women’s female labour force participation unidirectional Granger-causes fertility. On the contrary, Cheng (1996b) and Cheng, Hsu and Chu (1997) found that fertility unidirectional Granger-causes female labour force participation. McNown and Ridao-Cano (2005) conducted a study on UK found for females aged 20-24, fertility does not Granger-cause female labour supply in the long-run. On the contrary, for females aged 25-34, fertility negatively Granger-causes female labour supply in the long-run. Mishra and Smyth (2010) found a bi-directional Granger causality between female labour force participation and fertility between 1980 and 2005 on OECD countries. However, from 1995 to 2005, Granger-causality runs from female labour force participation to fertility without feedback. On the contrary, for females aged 15-34, Granger-causality runs from female labour force participation to fertility without feedback.
It has often been hypothesized that the lower the chances of survival of children, the higher will be the level of fertility. This hypothesis is based on the assumption that, in a situation where the incidence of infant mortality is high, parents will be inclined to produce more children that necessary to ensure survival of at least a few into adulthood. Rosenzweig and Schultz (1985) and Schultz (1993) found that there is possible a bi-directional causality between fertility and infant mortality rates. In addition, Ghatak (1995) notes that developing countries do not have a social security programme catering for the elderly; therefore, having more children can be treated as an investment and regarded as some form of insurance in terms of social support for the elderly. More recent work by Narayan and Smyth (2006b) found no support for both hypotheses.

3. **Methodology and Empirical Findings**

3.1 **Data Description and Unit Root Test with Structural Breaks**

The fertility rate is measured by total fertility rate. The measure for infant mortality rate is the annual number of deaths of infants under one year of age per 1,000 live births. The female labour force participation rate is the percentage of employed and unemployed females in the potential labour force. Female education is measured by the female secondary education. The data are for the period 1970-2010. Historical data on total fertility rate and infant mortality rate are obtained from Social Indicator Bulletin, female labour force participation rate is from Labour Force Survey and female secondary education is obtained from Malaysia Education Indicator.

The results of the NP test are reported in Table 1. NP (2010) consider two different specifications for trending data. The optimal lag length $k$ is obtained by procedure suggested by Hall (1994). While $M1$ allows for two breaks in the level of the series, $M2$ accounts for level and slope. $TB1$ and $TB2$ are the detected dates of structural breaks. Results from $M1$ and $M2$ reveal that only the unit root null hypothesis for $LFPR$ can be rejected at the 5 per cent level.
3.2 EXPLAINING THE STRUCTURAL BREAKS


The structural breaks for TFR (1981 and 2001)

The structural breaks in 1981 could be linked to the announcement of the 70 million population policy by Malaysia’s former Prime Minister Dr. Mahathir Mohamad after he took office in mid-1981. The Malays on the whole reacted positively to this pro-natalist policy, this is evidenced by an increased in their fertility levels and their stated fertility expectations (Geok 1990; Leete 1996). This announcement was then followed by a midterm review of the Fourth Malaysia Plan (1981-1985) that announced a new demographic target to achieve a population of 70 million by 2100.

The high fertility rate among the Malays throughout the 1980s and 1990s was not sustainable, however, they began to fall in the late 1990s. Between 1997 and 2005, the fertility rate fell by one child from 3.8 to 2.8 (Jones, 2011). This constitutes the main reason for the overall Malaysian fertility to fall below 3 after 2001, and this could explain the structural break experienced by the Malaysian total fertility rate in 2001.

The structural breaks for LFPR (1986, 1992 and 1995)

The female labour force participation rate in Malaysia has been on the rise since the country gained independence in 1957. During the sample period (1970-2010), the participation rate rose from 38.9 per cent in 1970 to 46 per cent in 2010. Despite the rising trend, participation rate of Malaysian women is still relatively low compared to developed countries. Statistics from the OECD (2010) show that the female labour force participation rate for the OECD countries is 61.74 per cent on average with Iceland having the highest participation rate of 82.67 per cent, followed by Switzerland (76.43 per cent) and Sweden (76.21 per cent).

Starting from the Fifth Malaysia Plan (1986-90) and with the adoption of National Policy on Women (NPW) in 1989, the role of women in development has been increasingly reflected in national development plans. The formulation of the NPW in 1989 marked a turning point, providing for the first time clear guides for the effective integration of women
into the country’s development process. Thereafter, the Government formulated the National Policy on Women as a guide to integrate women into the country’s development process. The position of women became one of the main objectives of the Sixth Malaysian Plan (1991-1995) in accordance with the objectives of the National Policy on Women to integrate women in the institutional process for planning, implementation, and monitoring. It was the first time that a five-year development plan had included programmes and projects aimed at development of women. This effort had brought about more coherent and focused programmes to integrate women in development and further advance their position in the society (Ministry of Women and Family Development, 2003). In 1995, the Government also ratified the United Nation convention on the Elimination of All Forms of Discrimination Against Women (CEDAW).

The 1986, 1992 and 1995 structural breaks detected in the results coincide well with the pioneering efforts to enhance women’s status in Malaysia in the 1980s and 1990s; Specially, the Fifth Malaysian Plan (1986-1990), the formulation of the NPW in 1989, the Sixth Malaysia Plan (1991-1995), and the CEDAW in 1995.

*The structural breaks for MOR (1985, 1986 and 2001)*

Malaysia has experienced dramatic decline in the infant mortality rates over the past decades. The infant mortality rate had halved between 1970 and 1983, dropping from 43 to 21.9 per 1,000 live births. In another 15 years from 1983, the country again halved the infant mortality rate. By 2010, the rate declined further to 5.4 per 1,000 live births, a level similar to that of most of the developed countries. According to the United Nations Children's Fund (UNICEF), Malaysia’s remarkable experience in reducing infant mortality has been the result of a synergy of a wide range of policies, strategies, and programs that have addressed access to services through socio-economic, cultural, educational, gender, and poverty dimensions.

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According to the United Nation, the key causes of child mortality were through the nutrition and immunization programmes. The detection of structural breaks in 1985 and 1986 coincide with the time when Malaysia employed the oral rehydration therapy for the treatment of childhood diarrhea since the mid-1980s. In addition, measles immunization for infants has been made a national programme since 1986. The Early Intervention Programmes (EIP) was initiated in 1986 to improve the quality of life of children aged 0-6 years with disabilities. The health clinics examined and monitored children’s growth and development. If any form of abnormality is detected, the child would be referred by a doctor to hospital specialist for further treatment. The government’s pro-poor policies in the 1980s have also contributed to further reduction infant mortality (United Nations Development Programme, 2005). The inclusion of health programmes, quality water and improved sanitation has greatly reduced child deaths.

The structural break in 2001 could be resulted from the first National Plan of Action for Children (1991–2000) which had led the way for further protection for Malaysian children during the 1990s. After the 1990s, the second National Plan of Action for Children (2001-2020) focuses on the issues of development, protection and participation of all children. The Eighth Malaysia Plan (2001-2005) had also focused on improving equity and quality with regards to the public health facilities.

Table 1: NP (2010) two-break unit root test

<table>
<thead>
<tr>
<th></th>
<th>M1</th>
<th></th>
<th>M2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test Statistics</td>
<td>$T_B^1$</td>
<td>$T_B^2$</td>
<td>$K$</td>
</tr>
<tr>
<td>TFR</td>
<td>-0.239</td>
<td>1981</td>
<td>2001</td>
<td>4</td>
</tr>
<tr>
<td>LFPR</td>
<td>-5.742 **</td>
<td>1986</td>
<td>1995</td>
<td>4</td>
</tr>
<tr>
<td>MOR</td>
<td>2.835</td>
<td>1986</td>
<td>2001</td>
<td>4</td>
</tr>
</tbody>
</table>

Notes: Critical values are obtained from NP (2010). The 5% critical values obtained from NP (2010) are -4.514 and -5.181 for model 1 and model 2, respectively. ** denotes the rejection of the null hypothesis of unit root at the 5% significance level.
3.3 COINTEGRATION

We investigate the existence of a long-run relationship between total fertility rate, female labour force participation, and infant mortality rate using the bounds test procedure within an ARDL (autoregressive distributed lag) approach, developed by Pesaran et al. (2001). We include the break dates detected in the NP (2010) test as dummy variables in the cointegration test. In addition, we also include education as one of the control variables. The bounds test method is chosen over the conventional methods as Engle-Granger (1987) and Johansen (1988) as it is considered more appropriate for small sample size studies. Another advantage of this approach is that while other cointegration techniques require all of the series to be integrated of the same order, the ARDL allows testing for the existence of a cointegrating relationship between variables in levels irrespective of whether the underlying regressors are $I(0)$ or $I(1)$.

The unrestricted error correction model (UECM) will be applied within a bounds testing framework:

\[
\Delta TFR_t = a_{TFR} + \sum_{i=1}^{n} b_{TFR} \Delta TFR_{t-i} + \sum_{i=1}^{n} c_{TFR} \Delta LFPR_{t-i} + \sum_{i=1}^{n} d_{TFR} \Delta MOR_{t-i} + \sigma_{TFR} TFR_{t-1} + \sigma_{LFPR} LFPR_{t-1} + \sigma_{MOR} MOR_{t-1} + \epsilon_t
\]  
\[
\Delta LFPR_t = a_{LFPR} + \sum_{i=1}^{n} b_{LFPR} \Delta LFPR_{t-i} + \sum_{i=1}^{n} c_{LFPR} \Delta TFR_{t-i} + \sum_{i=1}^{n} d_{LFPR} \Delta MOR_{t-i} + \sigma_{LFPR} LFPR_{t-1} + \sigma_{TFR} TFR_{t-1} + \sigma_{MOR} MOR_{t-1} + \epsilon_t
\]  
\[
\Delta MOR_t = a_{MOR} + \sum_{i=1}^{n} b_{MOR} \Delta MOR_{t-i} + \sum_{i=1}^{n} c_{MOR} \Delta TFR_{t-i} + \sum_{i=1}^{n} d_{MOR} \Delta LFPR_{t-i} + \sigma_{MOR} MOR_{t-1} + \sigma_{TFR} TFR_{t-1} + \sigma_{LFPR} LFPR_{t-1} + \epsilon_t
\]  

Where $\Delta$ is the first difference operator and $TFR_t$ is the natural log of total fertility rate, $LFPR_t$ is the natural log of total female labour force participation rate and $MOR_t$ is the natural log of infant mortality rate. To identify evidence of a long-run relationship in Equations 1-3, the $F$-test is applied to determine whether coefficients of one-period lagged levels of the variables are jointly significant.

Table 2 presents results of the ARDL bounds test corresponding to Equations 1-3. Following Narayan and Smyth (2006a), we report the bounds test results with and without a deterministic trend. First, the bounds test is applied with an unrestricted intercept, but without
a trend, which is Case III in Pesaran et al. (2001). Subsequently, in accordance with Case IV in Pesaran et al. (2001), an unrestricted intercept and a restricted trend is also applied to these equations. The lag order of the bounds test is selected using the Schwarz Bayesian Criteria (SBC) over the Akaike Information Criteria (AIC) as SBC yields a more parsimonious specification based on the smallest lag length (Pesaran and Shin 1999; Sbeiti and Alshammari 2010). Due to the annual observation of time series data employed in this study, a maximum of two lags is used, as recommended by Pesaran and Shin (1999). Cointegration is said to exist if the computed $F$-statistic exceeds the upper bound critical value. However, the critical values reported in Pesaran et al. (2001) are generated for large sample sizes of 500 and 1000 observations. Narayan and Narayan (2005) warned that these critical values based on large sample sizes cannot be used in small sample model. Since the sample size for this study is small, the critical values for bounds test are therefore taken from Narayan (2005).

The model is found to have a time trend. The bounds test results indicate the existence of cointegrating relationship when TFR is treated as dependent variable in the Model. This implies that long run Granger causality exists in at least one direction among the variables in the cointegrating relationship. Further, we apply the Lagrange-Multiplier (LM) test to ensure that the cointegrating relationships are free of autocorrelation. As evidenced in Table 2, the LM test for autocorrelation indicates that the null of no autocorrelation up to lag order 2 cannot be rejected at 1% significance level. Therefore, all of the cointegrating relationships fulfill the required condition of no autocorrelation. While the presence of cointegrating relationships suggests that Granger-causation may exist between TFR, LFPR and MOR, the bounds test does not indicate the causal direction between the three variables. To determine the causal direction between TFR, LFPR and MOR, the Granger causality test is applied.
Table 2: Bounds test and Lagrange-Multiplier test

<table>
<thead>
<tr>
<th>Without a time trend</th>
<th>With a time trend</th>
<th>LM(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F-statistics</td>
<td>Outcome</td>
</tr>
<tr>
<td>Model 1: TFR, LFPR, MOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(TFR</td>
<td>LFPR, MOR)</td>
<td>5.3251</td>
</tr>
<tr>
<td>(LFPR</td>
<td>TFR, MOR)</td>
<td>4.0110</td>
</tr>
<tr>
<td>(MOR</td>
<td>TFR, LFPR)</td>
<td>0.8296</td>
</tr>
</tbody>
</table>

F-test critical values

<table>
<thead>
<tr>
<th></th>
<th>1%</th>
<th>5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No trend</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.14</td>
<td>7.607</td>
</tr>
<tr>
<td>Trend</td>
<td>7.643</td>
<td>9.063</td>
</tr>
</tbody>
</table>

Notes: The critical values for bounds test are taken from Narayan (2005). If the estimated F-statistic is higher than the upper bound of the critical values then the null hypothesis of no cointegration is rejected. If the estimated F-statistic is less than the lower bound of the critical values then the null hypothesis of no cointegration cannot be rejected.

3.4 Granger Causality

If the bounds test indicates that cointegration does not exist when LFPR_t or MOR_t is treated as dependent variable, the short-run causal relationships between LFPR_t and MOR_t will be modelled using a vector autoregressive framework (VAR) as follows (Narayan and Smyth 2006b):

\[
\Delta LFPR_t = \phi_0 \Delta LFPR_{t-1} + \sum_{i=2}^{P} \phi_i \Delta LFPR_{t-i} + \sum_{j=1}^{F} \psi_j \Delta TFR_{t-j} + \epsilon_{1t} \\
\Delta MOR_t = \psi_0 \Delta MOR_{t-1} + \sum_{i=2}^{P} \psi_i \Delta LFPR_{t-i} + \sum_{j=1}^{F} \psi_j \Delta TFR_{t-j} + \epsilon_{2t}
\]

where \( \epsilon_{1t}, \epsilon_{2t}, \) and \( \epsilon_{3t} \) are serially uncorrelated error terms.

In the stationary model, the error correction term is included to capture the short-run deviations of MOR_t, LFPR_t or TFR_t from their long-run equilibrium path. The following vector error correction model (VECM) will be applied to conduct Granger-causality tests:

\[
\Delta TFR_t = \psi_0 \Delta TFR_{t-1} + \sum_{i=2}^{P} \psi_i \Delta LFPR_{t-i} + \sum_{j=1}^{F} \psi_j \Delta MOR_{t-j} + \pi ECT_{t-1} + \epsilon_{4t}
\]

where \( ECT_{t-1} \) is the lagged error correction term, and other variables are as defined above.

Table 3 presents the short-run and long-run Granger-causality results. These results are summarized in Figure 1. The optimal lag length used in the VAR and VECM are selected using SBC.
Beginning with the short-run effects, while none of the variables are significant in the female labour force participation equation, the fertility rate and female labour force participation rate are significant at the 1 per cent level in the mortality rate equation. We also find causality running from female labour force participation to infant mortality in the short run without feedback. Turning to the long-run results, childbearing decision is Granger caused by the infant mortality rate (the sign of the effect is discussed in the next section). The statistically significant (at the 1 per cent level) coefficient of the lagged error correction term in Equation 6 with the correct negative sign confirms the bounds test for cointegration. It also indicates the significance of the long-run causal effects. The coefficient –0.0598 indicates the speed of adjustment of fertility due to changes in female labour force participation rate and infant mortality rate. If fertility deviates from its long run equilibrium in the current period, 5.98% of the deviation will be corrected in the subsequent period.

While the Granger-causality test results specify the causal direction between fertility, female labour force participation, and infant mortality rate, it does not indicate whether these variables have a positive or negative effect on each other. Therefore, the long-run elasticities of fertility, female labour force participation, infant mortality as well as the female education as a control variable were computed using the ARDL approach.
Table 3: Short-run and long-run Granger causality test results

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>$ΔTFR$</th>
<th>$ΔLFPR$</th>
<th>$ΔMOR$</th>
<th>$ECT_{t-1}$</th>
<th>$t$-stats</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ΔTFR$</td>
<td>-</td>
<td>0.0305[0.8610]</td>
<td>6.0753[0.014]***</td>
<td>-0.0598***</td>
<td>-11.1613[0.000]</td>
</tr>
<tr>
<td>$ΔLFPR$</td>
<td>0.0301[0.862]</td>
<td>-</td>
<td>0.4299[0.512]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$ΔMOR$</td>
<td>6.8130[0.009]***</td>
<td>9.5774[0.0020]***</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: ***, **, * denotes statistical significance at the 1%, 5% and 10% levels respectively. Figures in parenthesis are the $p$-values.

3.5 AUTOREGRESSIVE DISTRIBUTED LAG (ARDL)

To investigate the long-run properties of fertility, female labour force participation, infant mortality and female education, the following ARDL equations will be applied:

$$TFR^* = k_0 + \sum_{i=1}^{p} a_i TFR_{t-i}^* + \sum_{j=0}^{q} b_j LFPR_{t-j}^* + \sum_{k=0}^{r} c_k MOR_{t-k}^* + \epsilon_i$$

The ARDL-based long-run elasticity results in Table 4 suggest that fertility falls with lower infant mortality at the 5 per cent significance level.

Table 4: ARDL-based long-run elasticities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>$t$-stats</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFPR</td>
<td>-0.1687</td>
<td>-1.9378[0.062]</td>
</tr>
<tr>
<td>MOR</td>
<td>0.6416**</td>
<td>2.2194[0.034]</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.0654</td>
<td>-0.0586[0.954]</td>
</tr>
</tbody>
</table>

Notes: ** indicates statistical significance at the 5% level. Figures in parentheses are the $t$-statistics.

4. DISCUSSION OF RESULTS

4.1 THE CAUSAL RELATIONSHIP BETWEEN FERTILITY AND MORTALITY

Chowdhury (1988) outlines several versions of fertility-mortality proposition based on the demographic transition, the choice theory (which suggests child replacement hypothesis and child survival hypothesis), the Ricardian theory and the modern economic theory of population.
Mortality $\rightarrow$ fertility

Our long-run ARDL result is consistent with the theory of demographic transition which suggests a positive lagged causal relationship between infant mortality and the fertility rate. It is argued that the necessity to preserve a pre-industrial society that experiences high infant mortality rates encourages high fertility rates. Parents have a desired number of children. With high infant mortality rates, couples tend to have more children to account for the possibility of child deaths. This finding corroborates the ideas of Rosenzweig and Schultz (1985) as well as Schultz (1993), who suggested that parents would be inclined to produce more children than necessary to ensure survival of at least a few into adulthood. This long-run causality result is also consistent with Soares’s (2005) argument that reduction in mortality tends to reduce fertility and increase investment in the human capital (Ehrlich and Lui 1991, Meltzer 1992, Galor and Weil 1999, Kalemli-Ozcan et al. 2000, Tamura 2002, Boldrin et al, 2005).

In order to become a fully developed industrial country by the year 2020, industrialisation was the cornerstone in Malaysia’s New Economic Policy (1971-1990) and the subsequent successors for New Economic Policies (NEP). Infant mortality rate falls in Malaysia due to an increase in industrialisation and urbanisation, rise in living standards and improvement in medical practices. This fall in the death rates in turn reduces the need for high fertility. As infant mortality falls over time, fertility rates eventually adjusts to the lower mortality rate.

Fertility $\rightarrow$ mortality

The short-run Granger causality finding that fertility rate Granger causes infant mortality rate indicates support for the Ricardian theory which is based on the proposition that economic development is neither necessary nor sufficient for fertility reduction (Chowdhury, 1988). Our result is consistent with van de Walle and Knodel’s (1968) results which suggest that parts of France experienced fertility decline before the spread of industrialization and urbanization and simultaneous with or prior to infant mortality reduction. They also find that voluntary control of fertility in Hungary and Bulgaria before any major shift toward industrialization. Similarly, Freedman (1979) argues that Sri Lanka and South India experienced significant fertility declines before modernization.
4.2 The Causal Relationship Between Fertility and Female Labour Force Participation Rate

The absence of role incompatibility in Malaysia

The empirical results in Table 3 do not support the proposition that working women tend to have fewer children. In addition, we find no evidence which suggests that having more children at home discourages female from participating in the labour force. In contrast to earlier findings, we find no evidence of role incompatibility hypothesis” (Rindfuss et al. 2000, Rica and Ferrero 2003, Narayan and Smyth 2006b and Cruces and Galiani 2007) and “societal response hypothesis” (Bernhardt 1993, Pinnelli 1995, and Rindfuss and Brewster 1996, Bratti 2003 and Vlasblom and Schippers 2004). Our findings, however, supports previous literature which found the absence of work-family conflict in Malaysia and Taiwan (Mahpul and Abdullah 2011; Cheng 1999). Our result is also consistent with Jensen’s (1995) ‘third wave’ which suggested women continued to participation in the labour force with the presence of preschool children. According to Jensen (1995), this phenomena could be due to today’s expectation that women share responsibility in supporting the financial needs of the family and therefore employment is not interrupted after the maternity leaves. Other factors that reduced incompatibility between childbearing and female labour force participation include the rising demand and preference for female workers; falling real wages for men in the lower middle and working classes; the rising opportunity costs of homemaking as women’s real wages rose; and rising consumption aspirations (Chafetz 1995, England & Farkas 1986, Hoem and Hoem 1989, Reskin and Padavic 1994).

To understand how Malaysian women make their fertility and employment decisions, one must take into consideration of the social, economic and policy context within which these decisions are made (Brewster and Rindfuss, 2000). Stycos and Weller (1967) stated that job characteristics and the availability of childcare determine the degree of role compatibility. Our findings which show the absence of role incompatibility in Malaysia may be explained by the job characteristics and childcare availability in the country.

Job characteristics

The extent of role conflict faced by employed mothers is determined by the degree of flexibility of a job. In a study of first-time mothers, Desai and Waite (1991) observed that the timing of work exit and re-entry is determined by the degree of job flexibility, which
subsequently establishes the ease of combining mother-employee roles. In Malaysia, the absence of women’s work-fertility interrelationship could be explained by the various measures undertaken to improve women’s participation in the labour force. For instance, the Employment Act 1955 was reviewed in 1998 to provide for flexible work hours. This move serves as a testimony that Malaysia accepts that the concept of the workplace now is different from what it was in 1955 (Subramaniam et al. 2010). In addition, the amendment also empowered the Minister of Human Resources to make rules on statutory benefits to be paid to part-time workers proportionate to those accorded to full-time employees (Economic Planning Unit, 2001). This amendment prevents women who re-enter the labour force for part-time work after child birth from being treated less favourably, while allowing them to balance work and family obligations. In 1998, women in the public sector were also allowed maternity leave up to 60 days (from 42 days) for a maximum of five children. In 2003, paternity leave was extended to seven days (from 3 days).

**Childcare Availability**

The absence of interrelationship between fertility and female labour force participation does not support the claim that women could be constrained in their participation in the labour force by the lack of childcare support. According to Malaysia’s Social Welfare Department, the number of registered childcare centres has surged from 245 in 2008 to 1,962 in 2012. There are also at least 1,600 unlicensed childcare centres. Changes in the quality of childcare have taken place in the country since the formulation of the Child Care Centre Act in 1984 which established minimum standards of management and administration of child care centres. The Association of Registered Child Care Providers Malaysia (ARCPM) was set up in 1986 to ensure quality alternative childcare in Malaysia. The Income Tax Act 1967 was amended in 1971 to allow women income earners to file for tax assessments separately (they may also choose to file jointly). In addition, tax reliefs were granted to employers who established childcare centres near or at the workplace for the benefits of their employees. This reduces the need for women to leave the labour force due to the inherent rigid work hours of full-time jobs that disallows women from picking and leaving their children at childcare centres.

The absence of interrelationship between fertility and female labour force participation could also be explained by the prevalence of informal childcare in Malaysia which helps to
alleviate the burden of working mothers who decide to return to work after childbirth. The National Family and Population Board in Malaysia reported that working mothers rely heavily on family members (37.5 per cent) and neighbours (14.8 per cent). The availability of such alternative childcare arrangement provides a significant savings in time spent on commuting, allowing women to return to the labour market after their childcare leave is exhausted.

4.3 The Causal Relationship between Mortality and Female Labour Force Participation

The results show causality running from female labour force participation to infant mortality in the short run without feedback. This result is consistent with those of other studies which suggested that it was more difficult for working women to breastfeed and employment negatively affected the children’s health (Lindberg, 1996; Blau et al., 1996; Roe et al., 1998). This finding is also in agreement with Narayan and Smyth’s (2006b) findings which showed that shocks to infant mortality lead to an increase in female labour force participation.

On one hand, there is possibility to have the adverse impact of female labour force participation on child health. The adverse impact can be in the form of less attention being paid by the working mothers to their children. The mothers may even forgo the benefits of breastfeeding, especially in those families where they must participate in the work-force soon after delivery due to financial reasons. On the other hand, women’s increased earning capacity has a positive effect on child nutrition and health. Thus, the eventual outcome of female labour force participation on child mortality depends on the relative strength of these two courses of causation.

5. Policy Recommendation

Our results indicate that the presence of children at home does not hinder female employment but falling infant mortality does. The theory of the demographic transition postulates that industrialisation, increase in literacy, improvement in living standards and healthcare reduces infant mortality rates. As Malaysia continues to modernise, existing

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1 The survey was based on the type of child care parents used for children below 7 years of age in 2006.
The problem of low fertility is expected to be exacerbated. These results provide important implications for policy interventions aiming at increasing the number of births.

The fertility incentives introduced by Malaysia have not been substantial enough to generate a fertility reversal. With modifications to Heitlinger’s (1991) classifications of existing fertility policies used in the literature, McDonald (2000) provides three categories of fertility policy: (i) financial incentives (i.e., periodic cash payments, lump sum payments or loans, tax rebates, credits or deductions, free or subsidised services or goods for children, housing subsidies); (ii) support for parents to combine work and family (i.e., maternity and paternity leaves, childcare, flexible work arrangements, gender equity in employment practices and work hours); and (iii) broad social change supportive of children and parenting (i.e., employment initiative, child-friendly environments, gender equity, marriage and relationship supports, development of positive social attitudes towards children and parenting). Some of these suggested policies may be more relevant to Malaysia than others, McDonald (2000) emphasises that the nature of the society as a whole matters the most.

Evidence from Germany, Sweden, France and Israel indicates that a set of pro-natal policies are effective in raising the fertility rates (Buttner and Lutz 1990, Hoem 1990, Salanie and Laroque 2008; Cohen et al. 2007). Finch and Bradshaw (2003) also find strong positive relationship between fertility rates and the strength of the child benefit package. This suggests that the Malaysian government should look into policies aiming at reducing child-rearing costs such as personal tax exemption for children, childcare subsidies, child tax credit and family allowances. The recent introduction and extension of child welfare benefits in Malaysia (tabled in the budget 2014) is commendable, however, such policy is targeted mainly at the lower income groups. One policy recommendation is to increase the tax deduction in Malaysia which currently allows only RM1,000 tax relief for every child in a family.\textsuperscript{2} The 2012 Household Income Survey found that the average monthly income of Malaysian households was RM5,000 in 2012, which puts an average household in the 19 per cent tax bracket – RM1,000 tax relief amounts to RM190 tax saving per year on average. Malay Mail (2014) reported that childcare centres charge between RM380 to RM2,200 per child a month and a private babysitter charges an average of RM750 per month, RM190 of tax incentive could be insufficient to promote greater fertility.

\textsuperscript{2} For each dependent children below 18 years, RM1,000 tax relief given to the family.
An additional benefit of further tax deduction is that it reduces childcare fees relatively. Subsequently, the decrease in relative childcare cost will encourage women to have children and to utilize childcare services in the reconciliation of work-family roles (Martínez and Iza, 2004). With increased compatibility in mother-worker roles, a positive relationship will exist between fertility and female labour force participation, as posited by the societal response hypothesis (Rindfuss & Brewster, 1996; Martínez and Iza, 2004).

Another policy recommendation is to look into reforming the paid parental leave scheme to increase fertility among working women. The current entitlement of 60 days of maternity leave at full pay is among the lowest compared to other developing and developed countries in the region. Longer maternity leave would be an effective incentive to promote childbearing among working women. There is an extensive literature on assessing the role of maternity leave policies for women labor supply and return-to-work decisions of mothers. Ruhm (1998) as well as Ruhm and Teague (1997) show that parental leave is associated with increases in women’s employment and that female’s attachment to the labour force increases with the duration of parental leave mandates. In addition to the positive effect on return-to-work behaviour, Lalive and Zweimüller (2005) also find significant causal effects of parental leave provisions on fertility.

Further, our findings that Malaysian women’s childbearing decisions are unaffected by their employment status suggest that policy makers can implement policies to increase female labour force participation without having to worry about its potential negative effect on fertility. Encouraging greater female labour force participation also allows the women to be able to afford childcare and therefore able to have more children.

6. CONCLUSION

This study contributes to the ongoing research effort in understanding the demographic transitions in the context of a developing country in Asia for the period 1970-2010. This study also makes a methodological contribution. Specifically, it differs from previous research by employing the unit root tests which allows two structural breaks. A further implication of this test is that we use the break dates as dummy variables in our bounds

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3 Women in Indonesia, Thailand and South Korea are entitled to 90 days of fully paid maternity leave; Singaporean women are entitled to 16 weeks of fully paid maternity leave.
testing procedure within an autoregressive distributed lag (ARDL) modelling approach and Granger-causality tests to examine short-run and long-run causal relationships between female labour force participation, infant mortality and fertility in Malaysia.

We do not find evidence that presence of children hinders re-employment and continuous female employment. This could be due to the country’s traditional support system provided for by family groups from both sides and the various measures undertaken by the government to improve Malaysian women’s participation in the labour force. In addition, the results indicate that mortality changes have a significant and positive long-run impact on fertility rate. Turning back to the theoretical literature, our results support the large part of the literature emphasising the role of falling mortality in reducing fertility. The findings lend support to the theory of physiological effect, the replacement effect, and the hoarding effect. The absence of Granger-causal effect running from female labour force participation to fertility suggests that women’s child bearing decisions are unaffected by their employment situation. The findings that mortality rate is the main determinant of fertility rather than female participation in Malaysia has important policy implications. Our results underline the urgent needs for the government to address the issue of falling fertility.

It is important to note that recommended pro-natalist policies and parental leave legislation are just one subset of a broad set of fertility-related family policies. The policy makers need to conduct extensive survey among the young people to investigate factors affecting their return-to-work and fertility decisions before defining the broad fertility policy.

**Word Count: 8665 words (including tables, figures and references)**

**References**


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