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Does Fertility Rate Increases Household Debt? An Empirical Investigation

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Does Fertility Rate Increases Household Debt? An Empirical Investigation

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Abstract

Motivation and aim: Many countries around the world have experienced a dramatic increase in their household debt over the past decades. This scenario occurs due to the development of commercial bank and non-banking financial institutions (NBFIs) which have broadened credit accessibility and investment opportunity for the households. A well-developed financial system helps firms to access the credit market and enhance production efficiency as well as to increase wages in the modern market. Households have the options to move from the traditional market (low wages, high fertility rate) or to work in the modern sector (high wages, low fertility rate). This signifies that the increase of women's participation in the financial industry as well as in other economics will also affect the number of children in the household. Consequently, fertility rates how a descending pattern in the society which is a serious cause of concern.

Methods and material: This study uses a dynamic panel data and the estimation method is the General Method of Moments (GMM). This GMM estimator was first proposed by Holztz-Eakin, Dewey and Rosen (1988) and subsequently extended by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). Arellano and Bond (1991) have proposed a dynamic panel GMM estimator which is an instrument variable (IV) estimator that uses all past values of endogenous regressors as well as current values of strictly exogenous regressors as instruments.

Key findings: Generally, the study indicated that fertility (measured by the number of birth) was positive and significantly related to household debt whereby parents with a higher number of children were more influenced to borrow. The development of new financial product, the improved and organised financial market, and the efficiency of financial institutions are likely to reduce the interest rate spread, promote credit to household and induce parents to have more children. In other words, the financial sector development has increased credit accessibilities and facilitated them to borrow for their children's expenditure.

Policy implications: The broadening of financial development has increased the financial access among parents. Easy access to financial borrowing leads to an increase in household debt. Thus, awareness programmes on family financial planning should be introduced and practised. Information about the effects of household debt and how it could be efficiently managed to avoid bankruptcy among households should be clearly conveyed. An informed and knowledgeable society would be a better prepared society. Debt management programmes and financial counselling can be implemented to regain control of household life and debt. Counsellors can work with households to develop personalised debt repayment plan in consultation with financial service providers.

JEL classification: E44, G51, J13

Key words: Developed countries, Fertility, Financial development, Household debt, Number of children.

Does Fertility Rate Increases Household Debt? An Empirical Investigation

1. INTRODUCTION

Household debt and fertility behaviour have shown an intense change in the recent decade as both have demonstrated distinctive patterns. While the financial development across the world has upgraded the conceivable credit and inter-temporal trade for households and firms, the fertility rate has shown a descending pattern which is a cause of concern. The declining fertility rate is expected to be experienced by many nations in the future, especially among developed nations (Adserà, 2004). The total fertility rate (TFR)[1] for the world remained at around five children per woman in the 1960s, but it has declined dramatically from 4.98 in 1960 to 2.46 in 2019 (Figure 1). In 2021, the total fertility rate is expected to be 2.44 children per woman globally (United Nation, 2019). In fact, this trend is expected to decrease to approximately or below 2.0 by 2050 (Ovseiko, 2007).

Generally, the direct and indirect effect of economic growth and the increase in the number of female labour force in the financial sectors cannot be denied. Achievements in education and employment have elevated females' social status and empowerment (Abdullah, Bakar, & Abdullah, 2013; Al-Qudsi, 1998; Bernasek, 2003; Feyer, Sacerdote, & Stern, 2008; María, Rocha, & Fuster, 2003; Upadhyay & Karasek, 2012). Based on the time series analysis in Croatia, the education level among women has significantly and positively influenced women's participation in the labour force which gives a greater negative impact on the fertility rate (Obadic, Cipin, & Pripuzic, 2007). In addition, family planning policies established by the governments in certain countries could have also contributed to the issue of reduced fertility (Ezeh, Mberu, & Emina, 2009). In short, a combination of these factors has caused the decreased pattern of fertility rate in many countries, particularly among developing and developed countries.

Although the decline in the fertility rate is seen as a global phenomenon, the pace of the decline, however, varies widely. In some parts of the world, the fertility rate has continued to decline faster than in other places. Fertility levels dropped slightly in low-income countries where the

[1]Fertility rate can be defined as a measure of fertility that indicates the average number of children born per women over her lifetime.

TFR still exceeds five children per woman from 1960 to 2008. Meanwhile, the fertility rate was noticeably low in high-income countries and upper-middle income countries between 1950-2020 in which the TFR is below replacement level[2]. The highest fertility rate was observed in the low-income countries, followed by lower-middle income countries and middle-income countries. Meanwhile, the lowest fertility rate was observed in high-income countries (Figure 2).

The global household debt-to-GDP ratio has barely increased for the past 10 years. It was reported that in 2008, the ratio was less than 60%, and in 2017, it was slightly increased to 62% (Cochrane, Ell, & Korobkin, 2019). Many countries have experienced a dramatic increase in the household debt over the past few years. For example, the household debt-to-GDP ratio of Norway, New Zealand, Sweden, Korea and France has increased from 95.75%, 89.94%, 82.44%, 83.11% and 56.09% in 2015 to 105.07%, 94.3%, 88.62%, 95.2% and 61.74% in 2019 respectively (IMF, 2020). Norway, Switzerland, Denmark, Netherland and Canada are among those that not only have the fastest-rising household debt-to-GDP ratios but also recorded the highest ratios. Commonly, most emerging markets have lower debt to GDP ratios than developed economies; however, there seems to be a rising risk in Asia since South Korea, Hong Kong and China recorded the highest household debt-to-GDP ratios in the region (Cochrane et al., 2019).

In developing countries such as Malaysia, the Bank Negara's report showed that the household debt was raised to RM1.18 trillion in 2018. From this figure, residential housing loans were accounted for 53.2% or RM628bil of the total household debt while the remaining 46.8% were used for personal consumption expenditure including motor vehicles finance, credit card and personal finance. Bank Negara Malaysia had also identified a growing number of defaults in personal financing in which half of the total outstanding personal financing was held by borrowers with a monthly income of below RM5,000, and they mostly spent it to accommodate a high standard of living cost and luxurious lifestyle choices (BNM, 2018).

The main driving factor for the increased household debt is attributed to the growing number of non-banking financial institutions (NBFIs) that offer similar borrowing instruments as the

[2] Replacement fertility is the total fertility rate at which women give birth to enough babies to sustain the population level. The replacement rate is roughly 2.1 births per woman for most industrialised countries but ranges from 2.5 to 3.3 in developing countries because of higher mortality rates. Taken globally, the total fertility rate at replacement is 2.33 children per woman.

traditional banking sector. This situation is known as a shadow banking system. The development in financial system has played a vital role to facilitate the household access to credit availability from the banking sectors. In fact, a growing shadow banking system around the world has expanded credit availability and accessibility to households and businesses in various communities (Pozsar, Adrian, Ashcraft, & Boesky, 2013) as credit is an important source of income for households and a source of capital for firms. The size of the global shadow banking system has grown to over USD67 trillion as compared to only USD26 trillion 10 years ago, accounting for nearly half of the size of the world financial system (ECB, 2013). These figures represent an accelerated growth of the shadow banking industry. In fact, in recent years, shadow banking activities have also shown a sudden growth among high-income countries especially France and Spain. An assessment on shadow banking industry presented by Ashcraft and Adrian (2012) shows that there was a gradual decline of the traditional funding sources from commercial bank in the form of deposits, but there was a relative increase in market-based funding sources offered by other financial institutions from 1945 to 2011.

Other contributing factors that encourage the increase of household debt are housing prices (Meng, Hoang, & Siriwardana, 2013), low income level (Abid & Shafiai, 2018) and high cost of living which encompasses childrearing and expenditure (Alias, Azmi, & Yusof, 2018; Anderloni, Bacchiocchi, & Vandone, 2012). This conclusion is based on the fact that households aim to own home and continue to repay car loans and credit cards (Abid & Shafiai, 2018). In most advanced economies, the accumulation of household debt has been influenced by the ease of access to credit which is caused by the financial deregulation in the 1990s and low interest rates during the post global financial crisis (GFC). The crisis has largely helped to offset debt service costs against larger loan outstanding amount (Debelle, 2004). Figure 3 shows the increasing trend of household debt to disposable income ratio in selected developed countries for the years 2005, 2007, 2013 and 2019 where the highest rate is recorded in Netherland, followed by Norway, Australia and Switzerland.

In addition to household debt, the increasing cost of raising children has become a matter of concern to researchers in many nations (Khan, Abdullah, & Samsudin, 2016; Beecham, 2006; Kim, Engelhardt, Prskawetz, & Aassve, 2009; Werding, 2014). Becker's idea that quality children (human capital) are investment goods (as perceived and demanded by parents) are subject to a large variety of parental "investments" in children (Becker, 1960) such as monetary expenditure on food, clothing, shelter, health and medical care. It also includes child care

expenses to provide for a comfortable living standard for children as well as a better education for them. The children's expenses certainly depend on the level of socio-economic status, lifestyle and economic affluence of the parents (Hermeto & Caetano, 2009). Low income families (mostly in developing countries) certainly need financial support to pay for those expenses due to high fertility rate (more children); meanwhile, high income families with low fertility rate (mostly in developed countries) also need to make a loan to support the high cost of living standard (Werding, 2014). Households take up loans to ease their consumption which is expected to increase in the future. The life cycle model of Modigliani and Brumberg (1954) states that household behaviour over a given period by smoothing the consumption through borrowing and saving. Raising the household debt for current consumption is quite worrying as households spend more than their earnings. Looking at the current trends, households take up loans to overcome the financial and economic difficulties (Anderloni et al., 2012). Instead of smoothing their consumption, they lose their savings that can lead to financial vulnerability (Abid &Shafiai, 2018).

Although numerous empirical studies have highlighted the relationship between fertility rate and public debt (Spataro, Fanti, & Pacini, 2019; Fanti & Spataro, 2013), fertility and financial development (Habibullah, Farzaneh, &Din, 2016; Filoso & Papagni, 2015), savings and fertility (Cigno & Rosati, 1992, 1996) pension funds and fertility (Cigno & Rosati, 1992; Faruqee & Muhleisen, 2003), fertility and labor market (Seltzer, 2019), fertility and economic growth (Bucci & Prettner, 2020; Hafner & Mayer, 2012), fertility and crime (Neanidis & Papadopoulou, 2013), fertility and human capital (Varvarigos & Arsenis, 2015), the relationship between fertility and household debts has not been examined. It seems that there is lack of evidence that shows the impact of fertility decisions on household debt. Though there were studies that examined the relationship between housing loan and homeownership to fertility rate, they failed to consider the total household debt.

Thus, despite that household debt and its determinants are often being discussed globally, there are significant gaps in the empirical research that investigate the relationship between household debt and economics of fertility. Thus, the purpose of this paper is to investigate the effects of fertility rate on household debt. Due to data availability, we test our contention that fertility rate has positive effect on household debt on 24 developed countries for the period 2006 to 2013.

The paper is organized as follows. In the next section we discuss the literature that relates financial development, household debt and fertility rate; and in section 3 is the method used in the analysis. Section 4 presents the results, while the last section contains our conclusion.

2. FINANCIAL DEVELOPMENT, HOUSEHOLD DEBT AND FERTILITY

Financial development has facilitated households in many aspects of life including assisting them to access credit and providing investment opportunities. Nevertheless, the growth of banking sector and financial institutions tends to increase the household debt in many countries. The limitation of cash flow in poor households is extremely high, and they have no other options than taking up various financial instruments to support their families' expenses (Banerjee & Duflo, 2007). Alternative sources of obtaining cash such as through kinship support and borrowing are needed to cover expenses especially related to child-care. This is the outcome of previous studies that demonstrated the prevalence of borrowing practice among poor households in low income communities (Ding & Zhang, 2014). For example, 80% of farmers in India are from small or marginal farmer groups, and they often require financial support for their farming activities. Accessibility to financial resources at reasonable terms and conditions from financial intermediaries becomes a crucial parameter for these household' productive activities as well as their well-being since they have insufficient savings (Bhattacharjee & Rajeev, 2014). Likewise, households with high income have also been observed to engage in debt instruments (McKenzie, 2003).

The availability of credit and the easy access to financial sector further increase the opportunities and encourage households to borrow. Household debt is a burden as it reduces monthly income and purchasing power to consume. Although expansion in the household debt is viewed desirable for enhancing growth and smoothing consumption for the families, excessive household indebtedness poses a significant threat and risk to the household balance sheet (Ma, Remolona, & Shim, 2009). Fertility is also placed under pressure during the economic recession due to the rising risks of unemployment and job instability which particularly affect young adults. Additionally, small wages, minimal job opportunities and limited expenditure have reduced the affordability of having kids among these married couples (Goldstein, Sobotka, & Jasilioniene, 2014). Within this society, becoming parents and making

decisions to have more children are irreversible commitments especially in financing the costs of rearing children.

Furthermore, past studies revealed that the unequal treatment of children gender since household has a male heir influences households' financial activities and investment decision making (Agier, Guérin, & Szafarz, 2012; Ding & Zhang, 2014). It is observed that a mother's outstanding debt increases along with her number of daughters while a father's outstanding debt increases along with his number of sons. Nonetheless, the parents' debt is not on the same scale as daughters may motivate their mothers to take up a small amount of loan compared to the amount of loan sons could influence their fathers to take up (Agier et al., 2012). In addition, it is also found that having a son has increased the household's investment in both agricultural activities and family businesses while there is no expenditure increase with the arrival of a son (Ding & Zhang, 2014) .

The relationship between fertility rate and economic stability was also identified during the Mexican Peso crisis in which the fertility rate declined significantly during the crisis with approximately one in 20 households postponing or foregoing having a child. Moreover, the level of education of the households' head and the location of the households' residence were found to influence the impact of the crisis. In this sense, those who were highly educated and came from an urban environment suffered the highest decline of income (McKenzie, 2003). Furthermore, the consequence of economic downturn on fertility rate advocates the knowledge that fertility rate responds negatively to recession in business cycle (Ogawa, 2003). Economic recession and uncertainty tend to increase the unemployment rate and reduce the income of the households. Rising unemployment is the result of male unemployment looks like to be mainly vital, possibly in accordance with the ongoing salience of male income for family formation. In a cross-country comparison by D'Addio and D'Erdole (2005), unemployment rate has been negatively correlated with the total fertility rate in Europe since mid-1990s. The low levels of household wealth have significantly and positively influenced the decision to conceive the first child. The chances of further childbirth were also significantly and negatively influenced by the household income stability (Modena, Rondinelli, & Sabatini, 2014).

On another note, Mulder and Wagner (2001) examined the link between the likelihood of becoming homeowners and the number of children based on 2171 respondents in West German and Netherlands in 1980s and 1990s. The study employed multivariate analysis and logistic

regression analysis, and the finding showed that people with children have a lower likelihood of becoming homeowners than those without children. A few years later, Mulder (2006) discovered that the difficulty to enter the housing market and gain access to homeownership among people in the low-income societies might contribute to a delayed family formation and fertility decision. The study involved European countries in the 1990s, and the analysis used was Pearson correlation analysis. The indicators used in the study were house price, mortgage to GDP ratio, loan to value ratio, mother's age at the first childbirth, GDP per capita, and unemployment rate. Similarly, Mulder and Billari (2010) examined that countries with homeownership regime have the lowest levels of fertility rate. The study that was conducted in 2010 involved European countries using OLS regression analysis proved that the higher the access to mortgage, the lower the fertility rate was.

3. METHODOLOGY

Modelling Household Debt

A starting point for examining trends in household debt borrowing is presented by the life cycle/permanent income model of Modigliani (1986) and Friedman (1957). It refers to household choice of consumption path to maximise utility over its lifetime subjected to inter-temporal budget constraints. Tudela and Young (2005)used Overlapping Generation (OLG) model developed by Barnes and Young (2003) for a few decades. They proposed a framework to understand aggregate indebtedness regarding individual optimising decisions and further adopted the model to explain the rise in borrowing.

The model introduced consumption-income and housing-finance motives for borrowing using the adapted life cycle model of household consumption behaviour with standard constant relative risk aversion (CRRA) preference in a partial equilibrium overlapping generation model framework. The model consists of six major motives: household consumption, housing-finance motive, consumption income motive, old-age borrowing constraints, household behaviour and aggregation (Barnes & Young, 2003). The model for household debt can be expressed as the following fixed effects model,

$$\mathrm{hhdebt}_{it} = \alpha_0 + \beta_1 \mathrm{hhdebt}_{it-1} + \beta_2 \mathrm{tfr}_{it} + \beta_3 \mathrm{rgdppc}_{it} + \beta_4 \mathrm{r}_{it} + \beta_5 \mathrm{hp}_{it}$$

$$+\beta_6 s_{it} + \beta_7 \pi_{it} + \beta_8 w_{it} + \beta_9 u_{it} + \nu_i + \mu_{it} \quad (1)$$

where hhdebt_{it} is household debt; tfr_{it} is total fertility rate; rgdppc_{it} is real GDP per capita; r_{it} is short term interest rate; hp_{it} is house price index; s_{it} is saving; $\pi_{it}$is inflation rate; w_{it} is total wealth; and u_{it} is unemployment rate; while i and t represent country and time, respectively. Lagged dependent variable, hhdebt_{it-1} is included in the model to take into account of habit persistence (Duesenberry, 1949; Pollack, 1970; Abel, 1990). υ_i is the country fixed-effect and μ_{it} is the error term. It is expected that previous level of debt affect the current level of debt. All variables are in natural logarithms.

The Independent Variables

Fertility rate, tfr : Fertility represents the total fertility rate or the number of children born per woman. The rate of fertility is low in developed countries, and it is further decreasing in developing countries. The high cost of living standard, education expenditure, childcare and childbearing is important factors taken into consideration by parents in order to decide how many children they should have (Filoso & Papagni, 2015). The literatures have revealed two finding for the relationship between fertility and household debt either positive or negative. Parents who prefer quality rather than quantity will reduce the number of children due to these factors. Shand (2008) hypothesized that the presence of debt in the household budget constraint will produce delays in fertility as there is a trade-off between own debt and child quality, in addition to the traditional Becker-Lewis type trade-off. The data indicate that consumer debts may lead to smaller family size and educational debt leads to pronounced delays in entering fertility. Mulder and Wagner (2001) and Mulder and Billari (2010) found that nations with lower access to mortgage have higher fertility level. On the other point of view, parents with more children tend to borrow more for consumption and education expenditure. Nau, Dwyer and Hodson (2015) stated that debt allows young adults household to move forward consumption, and this can facilitate costly transitions such as having a child although it is risky which is liability must be repaid (with interest). Parents are willing to make borrowing for the purpose of childrearing, education expenditure and consumption. Improved and organised financial market is likely to reduce the interest rate spread promote credit to household for

support the increasing cost of living (Rubaszek & Serwa, 2014). This induces parents to have more children in high-income countries (Filoso & Papagni, 2015).

Real GDP per capita, rgdppc : Real GDP per capita is a proxy for national income, which was measured by dividing the total economic output (real GDP) of a country with the total population. Household uses debt as a substitute for income to finance the increasing consumption expenditure due to increase cost of living (Meng et al., 2013). Thus, high-income level households are associated with high rate of household debt (Meniago, Mukuddem-Petersen, Petersen, & Mongale, 2013). The expected sign is positive.

Interest rate, r : Short-term interest rate of money market instruments is important and it is a significant determinant of debt and a crucial tool in monetary policy that stimulates economic growth. Pollin (1988) observed that a rise in debt-to-income ratio is caused by the cost of borrowing and needs of credit demand. It is supported by other authors who find significant positive relationship between debt and interest rate (Kearns, 2003; Perveen & Munir, 2017). On the other hand, previous literature examined the negative relationship between interest rate and household debt (Debelle, 2004; Martins and Villanueva, 2003). The expected sign can be either positive or negative.

House price, hp : In developed countries, the increase in house price is associated with the household debt. Turinetti and Zhuang, (2011) observed that the rising housing price increased the household debt of the United States based on quarterly time series data from 1980 to 2010. Besides, Khan et al. (2016) highlighted that housing price would have a positive impact on mortgage debt in the long run. However, Meniago et al. (2013) reveals that the relationship is statistically insignificant, but the house price is found to be positively related to the increase in household debt. The expected sign is positive.

Saving, s : Savings represent the amount of money left over after spending. Saving has for long time being identified as one of the key determinants of household debt especially in developed countries. Household indebtedness has risen significantly in most developed countries over the past 25 years due to growing consumption and compensating the decline in the housing saving rate (Barba & Pivetti, 2008). Manchester and Poterba (1989) viewed that increased access to second mortgages has reduced personal saving. Family planning policies

in China in 1970s and 1980s has reduced the number of children complemented by the rapid increase in the household savings rate. The change in family leads to substantial changes of household savings through the effect of dependency ratio (Modigliani & Cao, 2004). The expected sign is negative.

Inflation rate, π : Inflation, as measured by the consumer price index, reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods. Inflation is included in the model since the increasing cost would affect the household purchasing power. Inflation may influence household either negatively or positively. It has different effects on borrowing and lending. In regards to borrowing, inflation will devalue debt, thus, creating a strong motivation for households to borrow (Meng et al., 2013). On the other hand, the significant negative effect on the supply side, inflation will grind down the principal and discourages lending. During high inflation, household debt would decrease due to fewer funds being lent (Debelle, 2004).

Wealth, w : This variable is one of the important indicators of household debt as wealth represent asset of a household. The expected sign is either positive or negative. A household with a high level of assets does not tend to borrow more as compared to households with fewer assets. Household tend to borrow when there is declining in income (Pollin, 1988). Nevertheless, in contrast with the finding of Brown and Taylor, (2008), who observed a positive association between financial asset and liabilities at the household level.

Unemployment rate, u : Unemployment rate is one of the important macroeconomic variables associated with household debt. In general, higher rate of unemployment level will reduce the household debt. Household demand for credit is limited when unemployed as they are discouraged from borrowing due to the concern about on their ability to repay the loan. Another reason is that unemployment puts them in the financial constraint (Meng et al., 2013). From the other side of viewpoint, high unemployment rate means that there is less income in the household, and thus, a greater desire for loans to finance the consumption (Keese, 2012; Meniago et al., 2013).

Method of Estimations

This study uses a dynamic panel data and the estimation method is the General Method of Moments (GMM). This GMM estimator was first proposed by Holztz-Eakin, Dewey and Rosen (1988) and subsequently extended by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). In panel estimation, neither the Generalized Least Squares (GLS) estimator nor the Fixed Effect estimator will produce consistent estimates in the presence of dynamics (lagged dependent variable) and endogenous regressors (Baltagi, 1995). Arellano and Bond (1991) have proposed a dynamic panel GMM estimator which is an instrument variable (IV) estimator that uses all past values of endogenous regressors as well as current values of strictly exogenous regressors as instruments. Estimates can be based on first difference, or on orthogonal deviations.

Arellano- Bond estimation starts by transforming all regressors, usually by differencing, and uses the GMM (Hansen, 1982), and is called Difference GMM. The Arellano-Bover and Blundell-Bond estimator augments Arellano-Bond by making an additional assumption, that first differences of instrument variables are uncorrelated with the fixed effects. This allows the introduction of more instruments, and can dramatically improve efficiency. It builds a system of two equations-the original equation as well as the transformed one- and is known as System GMM. It is preferred to difference GMM since finite sample bias problem caused by weak instruments in first differenced GMM will be addressed by using system GMM. It also offers forward orthogonal deviations, an alternative to differencing that preserves sample size in panels with gaps. And it allows finer control over the instrument matrix.

Both Difference GMM and System GMM are general estimators designed for situations with a) “small T, large N" panels, meaning few time periods and many individuals; b) a linear functional relationship; c) a single left-hand-side variable that is dynamic, depending on its own past realizations; d) independent variables that are not strictly exogenous, meaning correlated with past and possibly current realizations of the error; e) fixed individual effects; and f) heteroskedasticity and autocorrelation within individuals but not across them.

The standard approach on panel data dynamic GMM estimator is as shown in Equation (2):

$$\mathrm{hhdebt}_{i,t} - \mathrm{hhdebt}_{i,t-1} = (\alpha - 1)\mathrm{hhdebt}_{i,t-1} + \beta' X_{i,t} + \gamma_i + \varepsilon_{i,t} \quad (2)$$

where X represents the set of explanatory variables, γ is a non-observable and country-specific term, ε is error term, and subscripts i and t refer to country and time. The presence of lagged dependent variables as one of the explanatory variables captures the dynamic relationship and can be re-written as:

$$\mathrm{hhdebt}_{i,t} = \alpha \mathrm{hhdebt}_{i,t-1} + \beta' \mathrm{X}_{i,t} + \gamma_t + \varepsilon_{i,t} \quad (3)$$

The Equation (3) is the basic regression model which can be estimated by using GMM estimator. The estimator known as system GMM has a specific set of instrumental variables that joins in the single system of the regression equation in differences and levels. The country-specific and the non-observable term γ is removed once we apply the first difference to Equation (3).

$$\mathrm{hhdebt}_{i,t} - \mathrm{hhdebt}_{i,t-1} = \alpha\left(\mathrm{hhdebt}_{i,t-1} - \mathrm{hhdebt}_{i,t-2}\right) + \beta'(\mathrm{X}_{i,t} - \mathrm{X}_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (4)$$

For the GMM estimator to yield unbiased and consistent estimates, the validity of the moment conditions is required as follows:

$$\mathrm{E}[\mathrm{hhdebt}_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0, \text{ for all } s \geq 2; t = 3, \ldots, T \quad (5)$$

$$\mathrm{E}[\mathrm{X}_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0, \text{ for all } s \geq 2; t = 3, \ldots, T \quad (6)$$

The moment conditions (5) and (6) are called GMM Difference. The lagged levels of X and hhdebt are weak instrument when the regressors in Equation (3) are persistent. Hence, the variance of the coefficient increases, and the small samples of the coefficient can be biased. The system of regression in differences and levels is made to decrease the potential bias and inaccuracy associated with the use of Difference GMM estimator (Arellano & Bover, 1995; Blundell & Bond, 1998). The instruments for regression in differences are the lagged levels of the explanatory variables, and the regressions in levels are the lagged differences of explanatory variables. These are appropriate instruments under an additional assumption. However, although there may be correlation between the levels of explanatory variables and

the country-specific effect (γ) in Equation(3), there may still be no correlation between those variables in the differences and the country-specific effect (γ). This can be represented as:

$$E[\text{hhdebt}_{i,t+p}\gamma_i] = E[\text{hhdebt}_{i,t+q}\gamma_i] \text{and } E[x_{i,t+p}\gamma_i] = E[x_{i,t+q}\gamma_i] \text{ for all p and q.} \quad (7)$$

The second part of the system is the moment for the regression in level which can be described as follows:

$$E[(\text{hhdebt}_{i,t-s} - \text{hhdebt}_{i,t-s-1})(\gamma_i + \varepsilon_{i,t})] = 0, \text{ for } s = 1 \quad (8)$$

$$E[(X_{i,t-s} - X_{i,t-s-1})(\gamma_i + \varepsilon_{i,t})] = 0, \text{ for } s = 1 \quad (9)$$

The moment conditions (5), (6), (8), and (9) are GMM System estimators. The GMM estimator's consistency depends on the validity of the conditions. It involves two specification tests: 1) Hansen test is a test of overidentifying restriction, and the joint null hypothesis that instruments are valid and uncorrelated with the error term; and (2) Arellano-test tests the hypothesis of no serial order correlation in the error term (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998). These two tests check the accuracy of the system GMM estimator, and the system GMM approach is considered consistent if there is no evidence of significant second-order serial autocorrelation in the residuals.

Sources of Data

The data set consists of a set of balanced panel data for 24 developed countries (OECD) for the period 2005 to 2013. The data were collected from OECD Factbook Statistics and World Development Indicator (WDI) published by the World Bank. Data on house price index, savings and wealth are obtained from OECD Factbook Statistics. Meanwhile, data on fertility, real GDP per capita, interest, inflation, and unemployment rate are compiled from the World Development Indicator published by the World Bank. Household debt data are extracted from Eurostat (see Table 1). This study only captured data from developed countries due to data constraints. Data on wealth, house price and household debt are not available for developing countries. The list of countries included in the study is listed in Table 2.

4. DISCUSSION ON EMPIRICAL FINDINGS

Table 3 shows the result of fertility, socioeconomic and macroeconomic factors associated with household debt in developed countries. The analysis consisted of nine models in which Model 1 indicates the basic econometric specification with no control variable while the other control variables was added one at a time in the rest of the models (Models 2 to 9). The adding of control variable is to check on the robustness of the impact of fertility on household debt. The lagged dependent variable was positive and highly significant with high coefficients in all specifications. The positive coefficients of the lagged dependent variable suggest that household debt is persistence, in that previous level of debt tends to increase the amount of current debt level.

The results suggested that fertility (tfr) has a positive and statistically significant relationship with household debt. The estimated coefficient implies that an increase in fertility for developed countries tends to increase household debt. According to Nau et al. (2015), debt allows young adults' household to move forward their consumption, and this can facilitate costly transitions such as having a child although it is risky as liability must be repaid (with interest). Parents are willing to make borrowing for the purpose of childrearing, education expenditure and consumption. According to Khan et al. (2016), the study supported that households use debt as a substitute for income to finance the rising consumption because of a higher living cost. In addition, the increasing efficiency of financial institutions and the development of new financial products make borrowing easier and accessible for parents (Filoso & Papagni, 2011). Improved and organised financial market is likely to reduce the interest rate spread which promotes credit to households in the economy (Rubaszek & Serwa, 2014). This induces parents to have more children in high-income countries (Filoso & Papagni, 2015). This also reflects that the development of financial sector has increased credit accessibilities which facilitate borrowing for the children's expenditure (Habibullah et al., 2016).

Real GDP per capita (rgdppc) show significant and positive effects on the household debt in all specifications which is consistent with the findings of Meniago et al. (2013) who confirmed the existence of long-run cointegration between household debt and macroeconomic variable especially income. Moreover, Khan et al. (2016) found that GDP has positive impact on

household debt. Households use debt as a substitute for income to finance the increasing consumption due to higher cost of living. Other previous studies suggest that as the income rises, the household debt level will increase since it raises consumers' confidence in making loans (Meng et al., 2013; Mokhtar & Ismail, 2013).

Next, the estimated coefficient of interest rate (r) show a significant and positive relationship between household debts. This indicates that the increase in the cost of borrowing will increase the household debts in developed countries. The result can be supported by the finding of Pollin (1988) which observed that the primary causes of increased net borrowing to income ratio was the credit cost and rising needs for credit demand. It is supported by another study by Kearns (2003) which examined that the modest rise rate of interest rate would result in a substantial repayment burden for a significant number of newly mortgaged households. He concluded that it could lead to a higher rate of mortgage arrears among households. On the other hand, Perveen and Munir (2017) revealed that positive relation exists between external debt and nominal interest rate in the short run.

On the other hand, house price (hp) show a significant and negative relationship between household debts. The result was inconsistent with Turinetti and Zhuang (2011) who supported that rising housing price raised household debt of the United States based on a quarterly time series data over the period of 1980-2010. Similarly, Khan et al. (2016) exert that housing price would have a positive impact on mortgage debt in the long run. Nevertheless, the finding shows that the negative impact of house price on household debt is due to the sub-prime mortgage crisis from 2006 to 2008. The sub-prime mortgage crisis occurred when banks sold too many mortgages to feed the demand for mortgaged-backed securities (MBS) sold through the secondary market (Vitaly, 2019). When the home price fell in 2006 (home worth less than mortgage), it triggered defaults. The value of MBS declined, thereby banks incurred losses, and bank capital declined and started to restrict lending. The risk spread into mutual funds, pension funds and corporations which owned these derivatives. The banking crisis that started in 2007/2008 produced the worst recession (Dunn & Mirzaie, 2016). The impact of the collapsing housing and credit markets on housing market was that homeowners were unable to pay their mortgage debts, thereby increased household debts (Davidson, 2010). It explained the reason for the negative relationship between house price and household debt in the study which covers the sample period from 2005 to 2011.

As indicated in Table 3, the coefficient of saving (s) for developed countries reveals a negative impact on fertility which is significant at 1% level. These results are similar with the findings from Cigno and Rosati (1992, 1996), Debelle (2004) and Abid, Ouertani and Zouari-Ghorbel (2014). Parents perceive children as an important source of old-age support where decreased fertility increases household debt (Cigno & Rosati, 1992, 1996; Modigliani & Cao, 2004). Substantial reduction in the number of children due to family planning policies in China in 1970s and 1980s was accompanied by a rapid increase in the household savings rate. It means that changes in the fertility rate can lead to significant change of household savings through the effect of dependency ratio (Modigliani & Cao, 2004).

The estimated coefficient for inflation (π) is consistent as in the previous estimation whereby the result shows that inflation is highly significant at 1% level and has negative impact on the household debt. The result implies that higher level of inflation will result in less people being affected by debt. Debelle (2004) argues that low inflation leads to lower interest rate, thus reduces the cost of borrowing as less money is needed for scheduled payment, and this subsequently encourages lending among households. Consequently, it leads to an increase in household debt. In the face of high inflation, fewer funds are to be loaned out, thus decreasing household debt. Meanwhile, if households have fluctuated in income due to high inflation rate, they will be more exposed to shock due to the high aggregated debt over income ratio (Stevens, 1997).

As for the case of wealth (w), the estimated coefficient was positive and significant at 5% level. The result showed that greater level of household wealth contributed to an increase in household debt. This suggests that rich households tend to have mortgage loan or other types of financial instruments as they have more wealth that could be collateral for loan. The observed finding is supported by Brown and Taylor (2008) where a positive association between financial assets and liabilities at the household level reveals that households targeting to reduce financial risks hold a diversified financial portfolio in Germany, Great Britain and the United States. However, the nature of this relationship is different for both household income and age quartiles. Meanwhile, the finding of Pollin (1988) suggested that high household debt is associated with low income.

Table 3 also reveals a negative relationship between unemployment (u) and household debt at 5% significant level. It indicates that an increase in unemployment rate will decrease household debt. A household with a high rate of debt level certainly comes from people who are employed and earn a monthly income that allows them to borrow from financial institutions (Meng et al., 2013; Turinetti & Zhuang, 2011). The results were not consistent with the previous study by Keese (2012) and Meniago et al. (2013) which found that high unemployment rate relates to less household income, and thus promotes a greater desire for loans to finance the consumption.

5. CONCLUSION

Generally, the study indicated that fertility (measured by the number of birth) was positive and significantly related to household debt whereby parents with a higher number of children were more influenced to borrow. The development of new financial product, the improved and organised financial market, and the efficiency of financial institutions are likely to reduce the interest rate spread, promote credit to household and induce parents to have more children. In other words, the financial sector development has increased credit accessibilities and facilitated them to borrow for their children's expenditure. In addition, Real GDP per capita, wealth, and interest have direct relationship with the number of children parents decide to have. Meanwhile, saving, inflation, unemployment and house price have inverse relation with fertility.

The broadening of financial development has increased the financial access among parents. Easy access to financial borrowing leads to an increase in household debt. Thus, awareness programmes on family financial planning should be introduced and practised. Information about the effects of household debt and how it could be efficiently managed to avoid bankruptcy among households should be clearly conveyed. An informed and knowledgeable society would be a better prepared society. Debt management programmes and financial counselling can be implemented to regain control of household life and debt. Counsellors can work with households to develop personalised debt repayment plan in consultation with financial service providers.

In addition, policy makers can implement social programmes such as child benefits, back to school allowance, family tax payments and youth allowance to reduce parents' burden with the cost of raising children. These programmes are a social security payment which is distributed

among parents or guardians of children, teenagers and in some cases, young adults. A number of countries especially developed countries operate different versions of the programme. Government can impose child benefit programme which is a tax-free monthly payment made to eligible families to assist them with the cost of childrearing under 18 years of age. It can be claimed as fortnightly payments or as an annual lump sum. It may be payable to dependent children from birth up to the age of 24. Children who are 16 years or older may alternatively be eligible for youth allowance. Parents of dependent children under the age of 16, single parents (parents who are raising their children alone) and children with disability may also be eligible for income support payment such as Parenting Payment, Back to School Allowance, New Start Allowance for Primary Carers of Children and Supplement for Disabled Children. Furthermore, policy makers can impose tax reduction to families according to the number of children living in the household.

REFERENCES

Abdullah, N., Bakar, N.A., & Abdullah, H. (2013). Fertility model and female labour force participation in selected ASEAN countries. *Journal of Economics, Business and Management*, *1*(3), 1–4.

Abel, A. 1990. Asset prices under habit formation and catching up with the Joneses. *American Economic Review*, *80*, 38–42.

Abid, A., & Shafiai, M.H.M. (2018). The determinants of household financial vulnerability in Malaysia and its effect on low-income groups. *Journal of Emerging Economies and Islamic Research*, *6*(1), 32–43.

Abid, L., Ouertani, M.N., & Zouari-Ghorbel, S. (2014). Macroeconomic and bank-specific determinants of household's non-performing loans in Tunisia: A dynamic panel data. *Procedia Economics and Finance*, *13*, 58–68.

Adserà, A. (2004). Changing fertility rates in developed countries: The impact of labor market institutions. *Journal of Population Economics*, *17*(1), 17–43.

Agier, I., Guérin, I., & Szafarz, A. (2012). Child gender and parental borrowing: Evidence from India. *Economics Letters*, *115*(3), 363–365.

Alias, Z., Azmi, R., &Yusof, R.M. (2018). The effects of macroeconomics determinants and secured financing of Islamic banks on personal insolvency: An empirical investigation on Malaysia. *International Journal of Economics, Management and Accounting*, *26*(2), 475–497.

Al-Qudsi, S. (1998). The demand for children in Arab countries: evidence from panel and count data models. *Journal of Population Economics*, *11*(3), 435–452.

Anderloni, L., Bacchiocchi, E., & Vandone, D. (2012). Household financial vulnerability: An empirical analysis. *Research in Economics*, *66*(3), 284–296.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277–297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*, 29–51.

Ashcraft, A.B., & Adrian, T. (2012). *Shadow Banking: A Review of the Literature*. Federal Reserve Bank of New YorkStaff Report No. 580, Federal Reserve Bank of New York, New York, USA.

Banerjee, A.V, & Duflo, E. (2007). The economic lives of the poor. *Journal of Economic Perspectives*, *21*(1), 141–167.

Barba, A., & Pivetti, M. (2008). Rising household debt: Its causes and macroeconomic implications - A long-period analysis. *Cambridge Journal of Economics*, 33(1), 113–137.

Barnes, S., & Young, G. (2003). The rise in US household debt: Assessing its causes and sustainability. Working Paper No. 206, Bank of England, England.

Baltagi, B. H. (1995). *Econometric Analysis of Panel Data.* Wiley: New York, NY

Becker, G. S. (1960). *An Economic Analysis of Fertility*. Priceton: Princeton University Press.

Beecham, J. (2006). Why costs vary in children's care services. *Journal of Children's Services*, *1*(3), 50–62.

Bernasek, A. (2003). Banking on social change : Grameen Bank lending to women. *International Journal of Politics, Culture and Society*, *16*(3), 369–385.

Bhattacharjee, M., & Rajeev, M. (2014). Accessibility to credit and its determinants: A state-level analysis of cultivator households in India. *The Journal of Applied Economic Research*, *8*(3), 285–300.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115–143.

BNM. (2018). *Financial Stability and Financial System Report 2018*. Kuala Lumpur: Bank Negara Malaysia.

Brown, S.B., & Taylor, K.B. (2008). Household debt and financial assets: Evidence from Great Britain, Germany and the United States. *Journal of the Royal Statistical Society. Series A (Statistics in Society)*, *171*(3), 615–643.

Bucci, A., & Prettner, K. (2020). Endogenous education and the reversal in the relationship between fertility and economic growth. *Journal of Population Economics*, *33*, 1025–1068.

Cigno, A., & Rosati, F.C. (1992). The effects of financial markets and social security on saving and fertility behaviour in Italy. *Journal of Population Economics*, *5*(4), 319–341.

Cigno, A., & Rosati, F.C. (1996). Jointly determined saving and fertility behaviour : Theory and estimates for Germany, Italy, UK and USA. *European Economic Review*, *40*, 1561–1589.

Cochrane, S.G., Ell, K., & Korobkin, M. (2019). Some rising pressure points in global debt. Moody's Analytics, New York, USA.

D'Addio, A.C., & D'Erdole, M. . (2005). Policies, institutions and fertility rates: A panel data analysis for OECD countries. *OECD Economic Studies*, *9*(2), 7–45.

Davidson, S. (2010). Imprudent lending and the sub-prime crisis: An Austrian School Perspective. *Griffith Law Review*, *19*(1), 105–116.

Debelle, G. (2004). Macroeconomic implications of rising household debt. Working Paper No. 153, Monetary and Economic Department, Bank for International Settlements, Switzerland.

Ding, W., & Zhang, Y. (2014). When a son is born: The impact of fertility patterns on family finance in rural China. *China Economic Review*, *30*, 192–208.

Duesenberry, J. 1949. *Income, Saving, and the Theory of Consumer Behavior*. Cambridge, MA: Harvard University Press.

Dunn, L.F., & Mirzaie, I.A. (2016). Consumer debt stress, changes in household debt, and the great recession. *Economic Inquiry*, *54*(1), 201–214.

ECB. (2013). *Annual Report Federal Financial Supervisory Authority (BaFin)*. European

Central Bank, Brussels.
Ezeh, A.C., Mberu, B.U., & Emina, J.O. (2009). Stall in fertility decline in Eastern African countries: Regional analysis of patterns, determinants and implications. *Philosophical Transactions: Biological Sciences*, *364*(1532), 2991–3007.
Fanti, L., & Spataro, L. (2013). On the relationship between fertility and public national debt. *Economic Modelling*, *33*, 843–849.
Faruqee, H., & Muhleisen, M. (2003). Population aging in Japan: Demographic shock and fiscal sustainability. *Japan and the World Economy*, *15*, 185–210.
Feyer, J., Sacerdote, B., & Stern, A.D. (2008). Will the stock return to Europe and Japan? Understanding fertility within developed nations. *Journal of Economic Perspectives*, *22*(3), 3–22.
Filoso, V., & Papagni, E. (2011). Fertility choice and financial development. EERI Research Paper Series, No. 02/2011, Economics and Econometrics Research Institute, Belgium.
Filoso, V., & Papagni, E. (2015). Fertility choice and financial development. *European Journal of Political Economy*, *37*, 160–177.
Friedman, M. (1957). The permanent income hypothesis(pp. 20–37). In M. Friedman (Ed.).*A Theory of the Consumption Function*. Princeton: Princeton University Press.
Goldstein, J.R., Sobotka, T., & Jasilioniene, A. (2014). The end of "lowest-low" fertility? *Population and Development Review*, *35*(4), 663–699.
Habibullah, M.S., Farzaneh, N., & Din, B.H. (2016). Declining fertility and financial development in high income and low-income countries. *International Journal of Applied Business and Economic Research*, *14*(1), 277–290.
Hafner, K.A., & Mayer-Foulkes, D. (2013). Fertility, economic growth and human development causal determinants of the developed lifestyle. *Journal of Macroeconomics, 38*(Part A), 107-120.
Hansen, L., (1982). Large sample properties of generalized method of moments estimators. *Econometrica* 50**,** 1029-1054.
Hermeto, A.M., & Caetano, A.J. (2009). Socioeconomics status, family structure and child outcomes in Brazil: Health in the childhood. *International Journal of Social Economics*, *36*(10), 979–995.
Holtz-Eakin, D., Newey, W., & Rosen, H. (1988). Estimating vector autoregressions with panel data. *Econometrica*, *56*, 1371–1395.
IMF. (2020). Global Debt Database. Retrieved from https://www.imf.org
Kearns, A. (2003). Mortgage arrears in the 1990s: Lessons for today. Quarterly Bulletin (Vol. Autumn). Central Bank and Financial Services Authority of Ireland, Ireland.
Keese, M. (2012). Who feels constrained by high debt burdens? Subjective vs. objective measures of household debt. *Journal of Economic Psychology*, *33*(1), 125–141.
Khan, H.H.A., Abdullah, H., & Samsudin, S. (2016). Modelling the determinants of Malaysian household debt. *International Journal of Economics and Financial Issues*, *6*(4), 1468–1473.
Kim, J., Engelhardt, H., Prskawetz, A., & Aassve, A. (2009). Does fertility decrease household consumption? An analysis of poverty dynamics and fertility in Indonesia. *Demographic Research*, *20*(26), 623–656.
Ma, G., Remolona, E., & Shim, I. (2009). Household debt: Implication for monetary policy and financial stability. BIS Paper, No. 46, Bank of International Settlement. Switzerland.
Manchester, J.M., & Poterba, J.M. (1989). Second mortgages and household saving. *Regional Science and Urban Economics*, *19*(2), 325–346.
María, J., Rocha, D., & Fuster, L. (2006). Why are fertility and female participation rates positively correlated across OECD countries? *International Economic Review*, *47*(4),

1187–1222.
Martins, N., & Villanueva, E. (2003). The impact of interest-rate subsidies on long-term household debt: Evidence from a large program. Economic Working Paper 713, Department of Economics and Business, Pompeu Fabra University, Spain.
McKenzie, D.J. (2003). How do households cope with aggregate shocks? Evidence from the Mexican Peso Crisis. *World Development*, *31*(7), 1179–1199.
Meng, X., Hoang, N.T., & Siriwardana, M. (2013). The determinants of Australian household debt: A macro level study. *Journal of Asian Economics*, *29*, 80–90.
Meniago, C., Mukuddem-Petersen, J., Petersen, M.A., & Mongale, I.P. (2013). What causes household debt to increase in South Africa? *Economic Modelling*, *33*, 482–492.
Modena, F., Rondinelli, C., & Sabatini, F. (2014). Economic insecurity and fertility intentions: The case of Italy. *Review of Income and Wealth*, *60*, S233–S255.
Modigliani, F. (1986). Life cycle, individual thrift, and the wealth of nations. *The American Economic Review*, *76*(3), 297–313.
Modigliani, F., & Brumberg, R. (1954). Utility analysis and the consumption function: An interpretation of cross-section data. In K.K. Kurihara (Ed.).*Post-Keynesian Economics*. New Brunswick: Rutgers University Press.
Modigliani, F., & Cao, S.L. (2004). The Chinese saving puzzle and the life-cycle hypothesis. *Journal of Economic Literature*, *42*(1), 145–170.
Mokhtar, M., & Ismail, A. (2013). Shariah issues in managing household debt: The case of Malaysia. *Jurnal Pengurusan*, *37*, 63–76.
Mulder, C.H. (2006). Home-ownership and family formation. *Journal of Housing and the Built Environment*, *21*(3), 281–298.
Mulder, C.H., & Billari, F.C. (2010). Homeownership regimes and low fertility. *Housing Studies*, *25*(4), 527–541.
Mulder, C.H., & Wagner, M. (2001). The connections between family formation and first-time home ownership in the context of West Germany and the Netherlands. *European Journal of Population*, (17), 137–164.
Nau, M., Dwyer, R.E., & Hodson, R. (2015). Can't afford a baby? Debt and young Americans. *Research in Social Stratification and Mobility*, *42*, 114–122.
Neanidis, K.C., & Papadopoulou, V. (2013). Crime, fertility, and economic growth: Theory and evidence. *Journal of Economic Behavior & Organization*, *91*(0), 101–121.
Obadic, A., Cipin, I., & Pripuzic, D. (2007). Female labour force participation and fertility in Croatia-What causes what? Presented in 7th International Conference Enterprise in Transition, Split-Bol, Hrvatska, Croatia. Mei 2007.
Ogawa, N. (2003). Japan's changing fertility mechanisms and its policy responses. *Journal of Population Research*, *20*(1), 89–106.
Ovseiko, P. (2007). *Fertility Decline: Trends, Drivers and Differences*. Oxford: Oxford Institute of Ageing.
Perveen, A., & Munir, K. (2017). Impact of total, interbal and external government debt on interest in Pakistan. MPRA Paper No. 83427,Munich Personal RePEc Archive, Munich, Germany.
Pollak R. 1970. Habit formation and dynamic demand functions. *Journal of Political Economy*, 78, 745–63.
Pollin, R. (1988). The growth of U.S. household debt: Demand-side influences. *Journal of Macroeconomics*, *10*(2), 231–248.
Pozsar, Z., Adrian, T., Ashcraft, A., & Boesky, H. (2013). *Shadow banking*. FRBNY Economic Policy Review, Federal Reserve Bank of New York, Ney York, USA.
Rubaszek, M., & Serwa, D. (2014). Determinants of credit to households: An approach using the life-cycle model. *Economic Systems*, *38*(4), 572–587.

Seltzer, N. (2019). Beyond the great recession: Labor market polarization and ongoing fertility decline in the United States. *Demography*, *56*, 1463–1493.

Shand, J.M. (2008). The impact of early-life debt on household formation: An empirical investigation of homeownership, marriage and fertility. Unpublished Doctoral Dissertation. Ohio State University, Ohio, USA.

Spataro, L., Fanti, L., & Pacini, P.M. (2019). Saving, fertility and public policy in an overlapping generations small open economy. *Economic Modelling*, *81*, 16–29.

Stevens, G.R. (1997). Some observations on low inflation and household finances. *Reserve Bank of Australian Bulletin, October*, 38-47.

Tudela, M., & Young, G. (2005). *The determinants of household debt and balance sheets in the United Kingdom*. Working Paper Series, No. 266, Bank of England, England.

Turinetti, E., & Zhuang, H. (2011). Exploring determinants of U.S. household debt. *Journal of Applied Business Research*, *27*(6), 85–91.

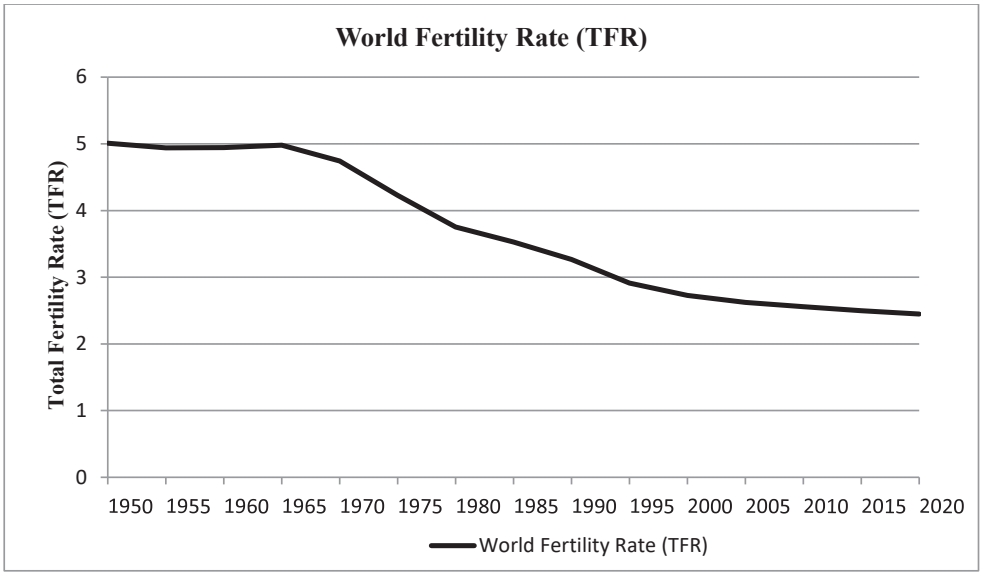
United Nation. (2015). *World Fertility Patterns 2015*:*Data Booklet*.Geneva: United Nations.

Upadhyay, U., & Karasek, D. (2012). Women's empowerment and ideal family size : An examination of DHS empowerment measures in Sub-Saharan Africa. *International Perspectives on Sexual and Reproductive Health*, *38*(2), 78–89.

Varvarigos, D., & Arsenis, P. (2015). Corruption, fertility, and human capital. *Journal of Economic Behavior & Organization*, *109*, 145–162.

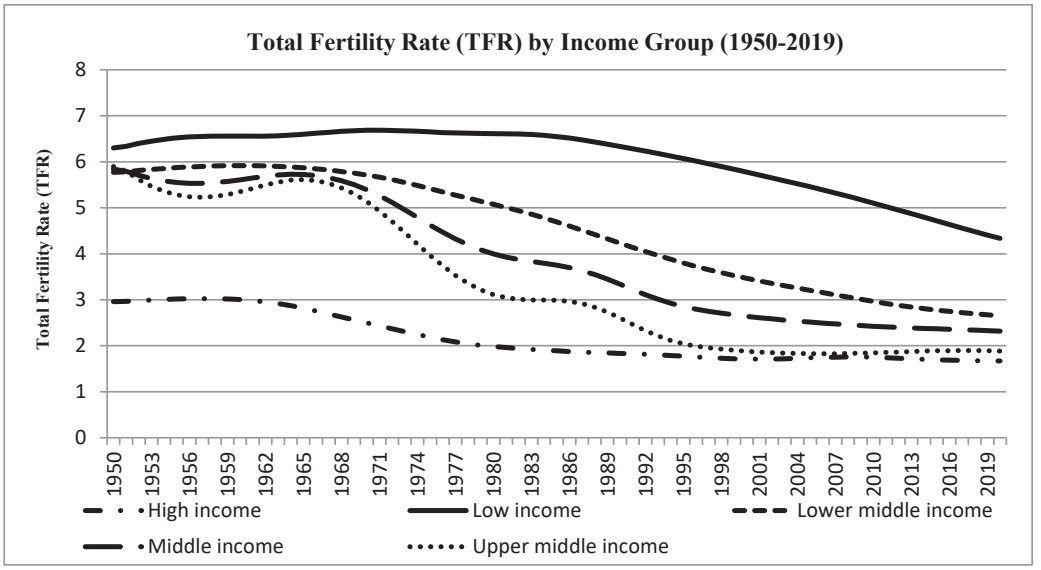
Vitaly, K. (2019). Before, during and after the sub-prime mortgage crisis in Israel. *Israel Affairs*, *25*(2), 256–280.

Werding, M. (2014). Children are costly, but raising them may pay. *Demographic Research*, *30*(8), 253–276.



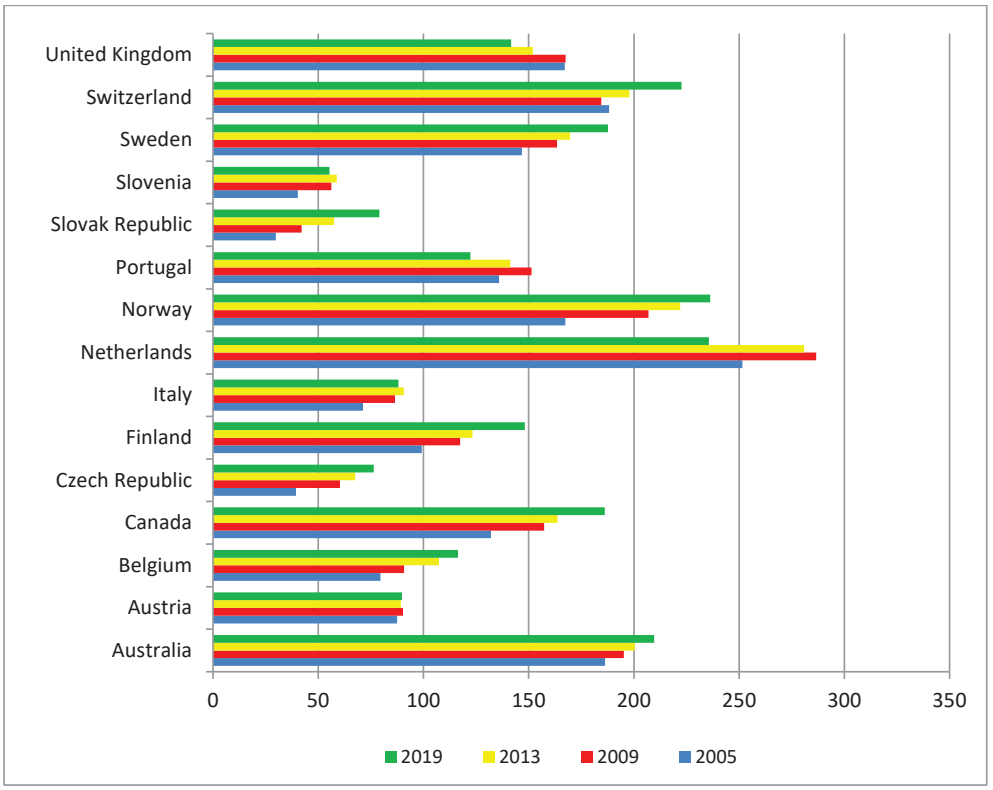
Source: World Population Prospect, United Nation (2019)

Figure 1: Trends in World Total Fertility Rate (TFR) in 1950-2020



Source: World Population Prospect, United Nation (2019)

Figure 2: Total fertility rate (TFR) by income group (1950-2019)



Note: total household debt/disposable income ratio
Source: OECD Data (2020), http://www.data.oecd.org

Figure 3: Household debt for developed countries in years 2005, 2007, 2013 and 2019

Table 1: Variables, measurement and data sources

Variables	Measurement	Sources
tfr	Total fertility rate (total birth rate per women)	World Development Indictor (WDI), World Bank
hhdebt	Household debt to disposable income ratio	Eurostat
hp	House price index	OECD Factbook Statistics
s	Savings; household saving relative to disposable income	OECD Factbook Statistics
r	Money market short-term interest rate (%)	World Development Indictor (WDI), World Bank
π	Inflation rate (%)	World Development Indictor (WDI), World Bank
w	Household financial asset; currency and deposit as a percentage of total financial asset	OECD Factbook Statistics
rgdppc	Real GDP per capita	World Development Indicator (WDI), World Bank
u	Unemployment rate (%)	World Development Indicator (WDI), World Bank

Table 2: List of developed (OECD) countries (2005-2013)

Australia	Czech Republic	France	Ireland	Poland	Spain
Austria	Denmark	Germany	Japan	Portugal	Sweden
Belgium	Estonia	Hungary	Norway	Slovak Republic	Switzerland
Canada	Finland	Italy	Netherlands	Slovenia	United Kingdom

Table 3: Estimations of the effect of fertility on household debt in developed countries

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
$hhdebt_{it-1}$	0.867***	0.823***	0.971***	0.834***	0.977***	0.758***	0.814***	0.827***	0.865***
	(57.46)	(28.63)	(64.60)	(25.04)	(73.48)	(21.45)	(26.71)	(24.41)	(25.79)
tfr_{it}	0.456***	0.244**	0.0981***	0.217	0.0720**	0.302**	0.232**	0.396***	0.435**
	(8.15)	(2.08)	(3.35)	(1.83)	(2.09)	(2.28)	(2.29)	(2.84)	(2.48)
$rgdppc_{it}$		0.0613***	-0.0226*	0.0634***	-0.0240**	0.140***	0.109***	0.104***	0.00144
		(3.15)	(-1.86)	(3.40)	(-2.11)	(8.89)	(8.42)	(6.31)	(0.07)
r_{it}			0.00997***		0.0113***	-0.00160	0.00582***	0.00649**	0.00183
			(4.73)		(6.18)	(-0.72)	(3.84)	(2.71)	(0.39)
hp_{it}				0.0409	0.0282	-0.123***	-0.0140	-0.0276	-0.0952**
				(1.76)	(1.79)	(-3.06)	(-0.56)	(-1.02)	(-2.46)
s_{it}						-0.131***	-0.143***	-0.135***	-0.115***
						(-7.37)	(-8.20)	(-6.27)	(-5.32)
π_{it}							-0.0362***	-0.0335***	-0.0438***
							(-5.96)	(-4.85)	(-6.64)
w_{it}								0.0478**	0.0767**
								(2.61)	(3.32)
u_{it}									-0.0665**
									(-3.52)
constant	0.443***	0.102	0.343***	-0.143	0.211	0.525**	0.193	-0.0208	1.149***
	(8.81)	(0.77)	(4.97)	(-0.71)	(1.74)	(2.13)	(0.93)	(-0.10)	(4.70)
Observations	192	192	192	192	192	192	192	192	192
AR(1)	0.0266**	0.0168**	0.0168**	0.0117**	0.0128**	0.0320**	0.0352**	0.0216**	0.0321**
AR(2)	0.112	0.144	0.130	0.131	0.102	0.275	0.244	0.110	0.126
Hansen test	0.193	0.101	0.197	0.0641	0.136	0.191	0.168	0.130	0.176

Notes: Dependent variable is $hhdebt_{it}$.Number of countries is 24. Figures in parenthesis are t-statistics. Asterisk (***), (**) denotes statistically significant at 1% and 5% level, respectively. AR(1), AR(2) and Hansen test are p-values.

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