

The Effect of Demographic Change on Financial Stability

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ABSTRACT

This study investigates the effect of fertility on financial stability and its determinant particularly the relevance of demographic changes. This is motivated by the huge impact of demographic changes (increasing ageing population and low fertility level). Population ageing and low fertility tend to lower both labour-force participation and saving rates (change bank business model), thereby raising concerns on a future slowing economic growth and financial instability. The system GMM results show that the fertility level somehow acts as a buffer and reflects to the degree of stability to the financial system. An increase in fertility and old-age population will contribute to lowering the financial stability. As a matter of policy implication, the nations, financial sectors, and economies should take pro-active active steps and enhance policies in handling the inter-related issue of the ageing population, decreasing fertility, and financial stability especially in developed countries, but not necessarily to overlook the impact of the issues in developing countries.

Keywords: Demographic change, old-age population, fertility, financial stability

INTRODUCTION

Since the late 1990s, research on demographic change has gained significant attention from economists and researchers. The demographic structure is known as a population age structure as it describes the age distribution of a population. Usually, it is measured by the total dependency ratio (ratio of the total number of the dependent population, aged below 15 and above 65 years, to that of the working-age population). The ratio of the dependent population number above 65-year-old is referred to as the elderly dependency ratio. On the other hand, for under 15-year-old, the working-age population is referred to as the youth dependency ratio. Lower dependency ratio is parallel to a less dependency burden on a particular economy.

Most countries will experience substantial demographic shifts in these coming decades due to changes in fertility, life expectancy, and migration. The increasing rate of the old aged population is an issue of concern and is being investigated seriously. Globally, the number of people over the age of 60 is projected to grow by 56 percent, reaching 1.4 billion by 2030 and nearly 2.1 billion by 2050, representing more than double its size in 2015, which is 901 million. There were 607 million old-aged people in 2000 with an increase of 48 percent (United Nations, 2015)

Meanwhile, the total fertility rate (TFR) for the world remained at around five children per woman in the 1960s but it has declined dramatically from 4.98 in 1960 to 2.48 in 2011 (United Nations, 2015). It is expected to fall from an average of 2.5 live births per woman in 2019 to 2.2 in 2050 and to 1.9 in 2100 (United Nations, 2017).

In sub-Saharan Africa, total fertility has fallen from 6.3 births per woman in 1990 to 4.6 in 2019. Over the same period, fertility levels also fell in Northern Africa and Western Asia (from 4.4 to 2.9), Central and Southern Asia (4.3 to 2.4), Eastern and South-Eastern Asia (2.5 to 1.8), Latin America and the Caribbean (3.3 to 2.0), and Oceania (4.5 to 3.4). In Australia/New Zealand and in Europe and Northern America the levels of fertility in 1990 were already below replacement level and remain, with 1.8 live births per woman, in Australia/New Zealand in 2019 and 1.7 in Europe and Northern America (United Nations, 2019).

Demographic Change and Financial Stability

The concern regarding declining fertility is its impact on financial stability. The implications of declining fertility rate are profound as they disturb the global age structure. Combined with the dynamic evolution of past birth and death rates, a recent decline in fertility rates and increase in life expectancy are profoundly changing the global age structure. Increased life expectancy has risen the ageing population or elderly dependency ratios in the world population. It is approximated that the amount of individuals above 60 years old will be 1 billion by the year 2020 and 2 billion by 2050, which equates to 22 per cent of the global population. Between today and the year 2050, the ratio of people above 80 years old is anticipated to increase from 1 per cent to 4 per cent of the worldwide population (Bloom, Canning, & Fink, 2011).

Figure 1 illustrates the increasing rate of ageing population from 2005 to 2010 in developed and developing countries. Surprisingly, the projected data on dependency rate (old-age population and young-age population) for developed countries is more than the rate of youth (working-age population) in 2030. Youth are the highest taxes contributors. However, they have decreased in number since 2005 and they are further expected to reduce the next few decades. The high level of dependency rate may increase countries' expenditure on health expenditure, pension funds and child-rearing. Meanwhile, in developing countries, the dependency ratio rate decreased as the estimated rate of the young-age population becomes smaller. This young-age population will become youth in the future, and a few decades later, developing countries will face a lower rate of working-age population.

Demographic changes can influence bank's long-term interest rate by flattening of the yield curve that gives a negative effect on banking profit. This is attainable by decreasing the revenue from liquidity and duration transformation by affecting the interest margins over fixed costs. Again, the net income interest in the profit and loss account will be negatively influenced. Therefore, this factor would reduce bank stability by increasing exposure to shocks or whenever banks adapt to the new environment (Imam, 2013).

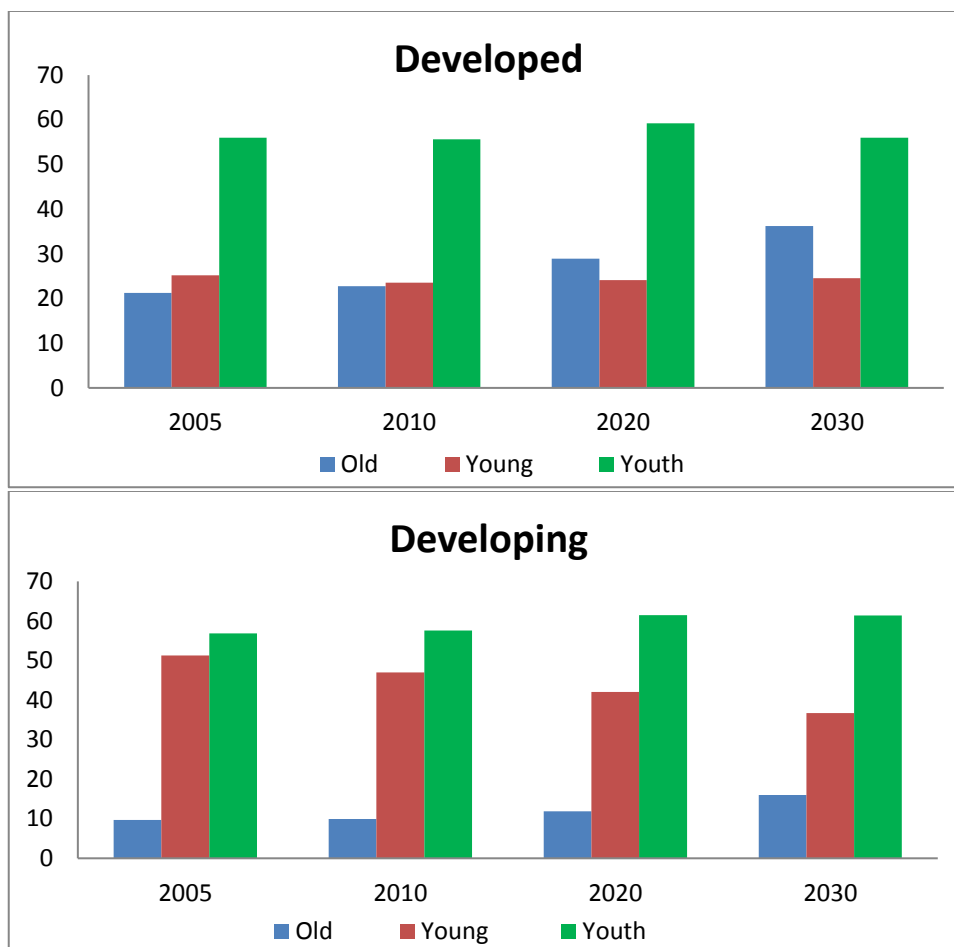


Figure 1 : Old, young and youth for selected developed and developing countries in 2005, 2010, estimated 2020 and 2030.

Source: World Development Indicator (WDI), World Bank and United Nation Database.

Note: Old: Old dependency ratio, people over 64 relative to the working population between 15-65 years. Young: Young dependency ratio: people younger than 15 relative to working population between 15-65 years. Youth: Working population ratio: people employed more than 15 years relative to total population.

The balance sheet of banks is closely connected to the life-cycle of consumers' behaviour and organizations, with liabilities and assets thoroughly mirroring the evolution of households' balance sheets. Hence, excess liquidity is obtained by banks from a comparatively huge, stable and rising deposit base originating from the wealthy old-age population, as approximately 60 percent of household savings are seized in deposits. The decline in credit demand echoes a reduction in the labour-capital ratio, as the number of employees retiring is larger than the number of employees entering the workforce. Also, older people do not borrow for housing debt or durables goods, and firms not demand more credit in a shrinking market. Rising shares of firms have ceased borrowing. This has brought about a remarkable low loan to deposits ratio. This recommends that the gap between the demand for credit and the supply for saving, known as liquidity trap may be caused driven in large part by demographic changes (Imam, 2013).

Another impact of the demographic change is saving behaviour of household that directly affects credit institutions' activities and profitability by influencing the assets and liability side of banks' balance sheets. On the asset side of banks' balance sheet, the shrinking proportion of young customers will reduce demand for loans to household, for example borrowing for consumption. On the liability side of the banks' balance sheet, the old-age population favours the development of new long-term saving product which demands households to first save up to retirements and then turn to dissaving. In this case, many governments have been observed to provide tax incentives and subsidies to raise the conversion of long-term savings into annuities at retirement age (Chikada et al., 2012; Fanti & Spataro, 2013; Bielecki et al., 2015). This limits the ability of fiscal policy of the government, owing to the demand for increased health care expenditure and welfare for the old-age population during their retirement age (Faruquee & Muhleisen, 2003; Tosun, 2008). Bloom, Canning, and Fink (2007) examined the capacity of Sub-Saharan African nations to reach their planned demographic dividend if the policy and institutional context are well-suited. Nevertheless, after several decades, the baby boomers shifted towards an ageing population, and this cohort increased in numbers as compared to the actively working young population. This has become alarming as a young population is among the major economic agents, which contribute to the countries' productivity and economic growth.

Nevertheless, there has been a marked increment in demographic changes studies by looking at the number of studies being conducted. Existing literature on demographic studies emphasised investigating the effect of ageing population to the economic growth (Bloom et al., 2011; Wei and Hao, 2010), pension (Bielecki, Goraus, Hagemeyer, and Tyrowicz, 2015), saving (Epure, 2012) and fiscal challenge (Muhleisen and Faruquee, 2001). Currently, available literature utilises the inter-jurisdictional difference within a nation, which then creates a gap to bridge. Therefore, this study attempts to add value to the literature by observing a wide range of countries' data. The research also concentrates on the effect of demographic factors; old-age population, working-population, and fertility on financial stability; an issue which still lacks information and still not a well-discussed issue in the economic literature.

The predicted effect of demographic transition, declining fertility, and smaller young cohort can influence the financial institution's business model by pressuring banking institutions on demands for loans and deposit (saving). The saving behaviour of households directly affects credit institutions' activities and profitability by influencing the assets and liabilities of banks' balance sheets. On the asset aspects of banks' balance sheet, the shrinking proportion of young customers will reduce the household demand for loans, for example borrowing for consumption. On the liability aspect of the banks' balance sheet, the old-age population will favour the development of a new long-term saving product which demands households to save first up to retirements and finally proceed to dissaving.

In fact, many countries experienced lower population growth which resulted from a decreased fertility rate and a smaller rate of young cohorts. This might increase the competitiveness of banks to secure new customers by increasing the acquisition costs per customer. In the meantime, banks should be aware of the competition for existing customers due to the previous trend of shadow banking which increases the customer retention cost and higher marketing expenditure. This will cause pressure on cost and efficiency, which is significant for banks to keep a sound cost-income ratio. Besides, banks may take more competitive strategies to maintain their revenue and growth which might put pressure on interest margins. The downward pressure of on interest margins could contribute to a negative impact on interest receivable and payable as well as net interest income in the profit and loss account. Consequently, banks may expand their services internationally to penetrate the emerging market. However, this strategy could expose banks to the increased exchange rate and political risk. On the other hand, demographic changes can influence the bank's long-term interest rates by flattening the yield curve. This negatively affects banking profit by decreasing revenue from liquidity and duration transformation by affecting interest margins over fixed costs. Again, the net income interest in the profit and loss account will be negatively influenced. This factor would reduce bank stability by increasing the exposure to shocks or whenever

banks adapt to the new environment. Therefore, based on the previous literature which is still lacking, another question arises in our study; does fertility matter to financial stability?

LITERATURE REVIEW

The empirical literature on the association between demographic change and financial stability is limited. Imam (2013) suggested that ageing population can affect banking sector significantly. In other words, old-age dependency ratio has a significant and adverse impact on financial stability. On the contrary, youth dependency ratio tends to influence the index of financial stability positively although the results are not always significant. This was estimated using fixed effect model from 1990 to 2007 for 144 countries. Similarly, the work done by Borio and Drehmann (2009) found that instability, in particular, was affected by demographic change.

Following, the work done by Christelis et al. (2009) concerned the effects of demographic ageing on elderly households, such as adequacy of saving at retirement, indebtedness and financial fragile of the elderly households in Europe. The economic conditions of the elderly and the incidence of financial distress among ageing households are of major social and policy interest. Older households have less ability to offset income and expenditure shocks by varying their labour supply or by borrowing against future income. Only households in countries with more developed financial markets (such as Scandinavian countries and Switzerland) are more likely to access debt to smooth their consumption expenditure and thus less vulnerable from a financial point of view. The study, done by estimation of cross-sectional features of the income and wealth distribution using the data drawn from the Survey of Health, Ageing and Retirement in Europe, a survey that represent population aged over 50 years of age conducted in 11 countries in 2004. According to Davis (2002), the process of population ageing involve a major shift in financing, which may give rise to financial turbulence and systematic risk. Findings from this study extend the empirical literature on ageing and financial instability, including macroeconomic effects on ageing.

In fact, according to the life-cycle hypothesis, young adulthood initially dissaves, and then saves for retirement during adulthood, and finally carries on to dissaving after retirement. Most empirical literature estimates that ageing population saves less. Masson and Tryon (1990) found that an elasticity of 1 from the dependency ratio to the saving rates using pooled cross-section and time-series data for industrial countries. The study is supported by other studies, Horioka (1991) and Masson, Bayoumi, and Samiei (1995). Meanwhile, Borsch-Supan (1996) found the impact of dependency ratio on saving was close to zero. On the other hand, public saving is affected by the ageing population since it is driven by the public pension fund system and the type of financing implemented. The rapid increase in old aged population threatens national stability, as the pressure is enhanced by the increase in public health expenditure (Turner, Giorno, De Serres A, and Richardson, 1998).

METHODOLOGY

The study applied a Dynamic Panel General Method of Moments (GMM). The GMM estimator was first proposed by Holtz-Eakin, Newey, and Rosen (1988) and extended by Arellano & Bond (1991) and Arellano and Bover (1995) and Blundell and Bond, (1998) This method was selected as a tool of analysis for this study because GMM methodology well suited the following criteria. The first criteria being, short time scope (t) and large sampled countries (n) dimension, meaning a few time period and many individual; second, criteria highlighted a functional relationship; the third underlined the possibility that all explanatory variables are endogenous; the forth emphasised non-observable country-specific effects;

the fifth, lagged dependent variable among the explanatory variables: and lastly, heteroscedasticity and autocorrelation within the individual but not across them. This study used several period lengths with non-overlapping three-year periods, as has been used in many previous studies.

The GMM estimator is practical in one-step, two-step and system GMM. The one-step taking the residuals from one-step estimate in existence of heteroscedasticity and serial correlation which uses a consistent estimation of the weighting matrix. While, the two-step is more efficient because of the presence estimation of the standard errors that prompt to be strictly downward biased. The system GMM estimator is the most efficient as compared to one-step and two-step GMM, because the number of instruments is small and there is a finite sample (Blundell & Bond, 1998).

In this study, demographic changes and specifically the ageing of the world population can affect economic dynamics in many ways. The most commonly used tool to model demographic changes on the economy is the life cycle model of savings, initiated by Modigliani and Brumberg (1954).

The model of financial stability as follows:

$$finstab = \{fert, old, youth, rgdppc, unemp, privcred, finopen, bankeff\}$$

The econometric model for financial stability can be shown below as:

$$\ln FINSTAB_{it} = \alpha_0 + \beta_1 \ln FERT_{it-1} + \beta_2 \ln FERT_{it} + \beta_3 \ln OLD_{it} + \beta_4 \ln YOUTH_{it} + \beta_5 \ln RGDPpc_{it} + \beta_6 \ln UNEMP_{it} + \beta_7 \ln PRIVCRED_{it} + \beta_8 \ln FINOPEN_{it} + \beta_9 \ln BANKEFF_{it} + v_i + \mu_{it} \quad (1.1)$$

Whereby, FINSTAB is financial stability of commercial banks, FERT is fertility, YOUTH is working-age population, OLD is old-age population, RGDP per capita is real GDP per capita, UNEMP is unemployment rate, PRIVCRED is private credit, FINOPEN is financial openness and BANKEFF is bank efficiency. All variables are in natural logarithm.

Variable Description and Expected Sign

Financial stability: The stability of financial institutions can be measured by looking at variables such as capital adequacy, liquidity ratio, and z-score where these variables consist of assets and liabilities. This study used z-score¹, a variable that explicitly compares buffers (capitalisation and returns) with the potential for risk (volatility of returns). Z-score is the best measurement of stability since it has gained traction as a measure of individual financial institutions' soundness (Cihak and Hesse, 2010). The popularity of the z-score stems from the fact that it is inversely related to the probability of a financial institution's insolvency, whereby there is a probability that the value of its assets becomes lower than the value of its debt. A higher z-score, therefore, implies lower probability of insolvency.

Fertility and old dependency: Fertility represents the number of children per woman. Meanwhile, old dependency represents an age-population over 65 years old and is not in the labour force anymore. These variables are key determinants of financial stability as they become crucial topics against the financial stability of banking sector especially in OECD countries and some emerging market economies (EMEs) (Davis, 2005; Imam, 2013). The decreasing number of fertility rate has changed the demographic structure, as a higher number of the ageing population as compared to young adults causing

¹ The z-score defined as $z = (k + \mu) / \sigma$, where k is equity capital as percent of assets, μ is return as percent of assets and σ is standard deviation of return on assets as proxy for return volatility.

the financial instability (Davis and Stone, 2004; Davis, 2002; Borio and Drehmann, 2009; Chikada et al., 2012; Imam, 2013). According to the life-cycle risk aversion hypothesis, the old-age population tends to become risk-averse, as they are unable to cope with the losses thus, they avoid both investing and borrowing money (Bakshi and Chen, 1994). The old-age population triggered by the falling birth rates and rising life expectancy in old age which can affect financial stability negatively as they reduce investment in the financial market to avoid losses (Bakshi and Chen, 1994), affect the demand for financial assets (Poterba, 2001) and house price (Engelhardt and Poterba, 1991). Both expected signs are negative.

Youth population: The youth population represents the population who are working in the labour force. The inclusion of youth to the model is significant to measure to what extent the youth aged population affects financial stability; since banking sectors depend a lot on the depositors' fund to run the banking operation. As the youth population increases, the pooling of funds or money from customers increases, hence, banks could lend more money, earn more profit and increase the index of bank stability (Imam, 2013). The expected sign is positive.

Real GDP per capita: The association between economic well-being and financial stability has been widely discussed in economics. This variable is inclusive in the model as real GDP per capita is the indicator for standard of living and economic well-being, as many researchers use GDP to measure. Empirically, real GDP per capita affected financial stability positively in the Romanian banking sector (Diaconu and Oanea, 2014). While, Creel, Hubert, and Labondance, (2015) found that financial instability has a negative impact on economic performance in the European Union from 1998 to 2011. The expected sign is positive.

Unemployment: Unemployment is an important issue for the stability of the country and banking sector as well. High unemployment rate affects productivity and economic growth. The inclusion of this variable is because unemployment is related to the degree of solvency or hazard which measure the stability of the banking sector in a country (Charpe and Flaschel, 2013; Mare, 2015). In the other viewpoint, unemployment caused lower rate of non-performing loans as people who are unemployed definitely could not borrow (Meng, Hoang, & Siriwardana, 2013) and they do not contribute to the instability of the bank. Expected sign is positive.

Private credit, financial openness and bank efficiency: Private credit, financial openness and bank efficiency are proxies for financial development variables which are given much concern by the current financial development studies. Most studies relate financial development indicators with economic growth (Jung, 1986; Liu, 2003; Abu-Bader and Abu-Qarn, 2008; Yang and Hoon, 2008; Menyah, Nazlioglu, and Wolde-rufael, 2014). Ahmed, Bodjongo, Juliot, and Abid (2015) investigated the interaction between financial development, financial instability and economic growth in the Maghreb countries. To achieve this well-developed financial development, financial markets require depth, access, efficiency, and stability. Depth reflects that financial institutions and financial markets are a sufficient size. Access means the degree to which economic agents use financial services. Efficiency refers that financial institutions can successfully intermediate financial resources and to facilitate transactions. Finally, mentions to low market volatility plus low institutional fragility (Cihak et al., 2012). The result revealed that financial development has a positive impact on financial stability and economic growth promotes financial development and financial instability. The expected sign is positive.

Variables, measurement and sources

The study determined the impact of demographic change (old-age dependency, fertility and youth) on financial stability and other determinants such as, income, unemployment, private credit, financial openness and bank efficiency. The study consists of 64 countries, consisting of 30 developed

and 34 developing countries. Table 1 show the detail of sources of data and period availability for the dependent variables and the independent variables.

Table 1: Variables, measurement and sources

Variables	Measurement	Sources
Ltfr	Total fertility rate (total birth rate per women)	World Development Indicator (WDI), World Bank
Ldebt	Household debt to disposable income ratio	Eurostat
Lfinsta	Financial stability, Z-score of country's commercial banks as proxy of financial stability	Global Financial Development Database, World Bank
Lprivcred	Private credit by deposit money banks and other financial institutions to GDP (%)	Global Financial Development Database, World Bank
Ldeposit	Deposit money banks' assets to GDP (%)	Global Financial Development Database, World Bank
Lliqliab	Liquid liabilities to GDP (%)	Global Financial Development Database, World Bank
Lfememp	Female employment (% of total labor force)	World Development Indicator (WDI), World Bank
Ltop	Foreign trade (% of GDP); ratio of export plus imports of goods and non-factor services to GDP	World Development Indicator (WDI), World Bank
Lhd	Human development index (HDI)	United Nation Development Programme, United Nations
Lfinopen	Financial openness index	Chinn-Ito Index
Lbocta	Bank efficiency: bank overhead cost per total assets	Global Financial Development Database, World Bank
Lhp	House price index	OECD Factbook Statistics
Lsav	Saving rate; household saving relative to disposable income	OECD Factbook Statistics
Lint	Short interest money market interest rate (%)	World Development Indicator (WDI), World Bank
Linf	Inflation rate, consumer price (annual percent change)	World Development Indicator (WDI), World Bank
Lwealth	Household financial asset; currency and deposit as a percentage of total financial asset	OECD Factbook Statistics
Lyouth	Working ratio; population above 15 relatives to total population	World Development Indicator (WDI), World Bank
Lod	Old-age dependency ratio; population over 65 relative to population between 15-65 years	World Development Indicator (WDI), World Bank
Ly	Real GDP per capita	World Development Indicator (WDI), World Bank
Lue	Unemployment rate (%)	World Development Indicator (WDI), World Bank
Lva, lpsv, lge, lrg, lrl, lcc (Governance)	Set of governance indicators; voice and accountability (VA), political stability and absence of violence (PSV), government effectiveness (GE), and regulatory quality (RQ), rule of law (RL) and control of corrupt (CC).	World Development Indicator (WDI), World Bank

RESULT AND DISCUSSION

Table 2 (please refer to the appendix) shows the results of demographic variables (old dependency, fertility and working population age) and other control variables include financial and economic factors affecting financial stability for 64 countries, consisting of 30 developed and 34 developing countries. The

measures of demographic variables as an independent variable were the logarithm of total fertility rate per woman (Ltfr), the logarithm of old-age dependency (Lod), the logarithm of working population age (Lyouth). The macroeconomic factors consist of two variables; real GDP per capita (Ly), unemployment (Lue). Meanwhile, the financial factors include financial depth (Lprivcred), financial access (Lliqliab), financial openness (Lfinopen) and banks' efficiency (Lbocta). Model 1 indicated a typical econometric specification with no control variable, while control variables are added in the rest of the models. The lagged dependent variable is significant and positive with high coefficients in all specifications. High coefficient of lagged fertility suggests significant persistence, indicating the dynamic GMM is an appropriate estimator and therefore the estimations of interesting hypothesis carried out by employing this method can be relied upon.

The result of the analysis is clearly and overwhelmingly indicating that the old dependency population (Lod) and fertility (Ltfr) is an important determinant of financial stability. The coefficients of fertility were negative and highly significant. The result suggested that an increase in both the old dependency population and fertility contributes to reducing financial stability. It would not be off the mark to say that they are somehow acting as a buffer and reflect the degree of stability to the financial institutions. As for the old dependency population, the finding was consistent with Imam (2013) which stated that the old dependency ratio has an adverse effect on banking sector stability in Japan. Bakshi and Chen (1994) found that according to the life-cycle risk aversion hypothesis, older people tend to become risk-averse, explained that a rise in average age leading to arise in predicted risk premiums with the fact that an old individual cannot cope with the losses over time. Borio and Drehmann (2009) suggested that instability may support demographic change.

Meanwhile, as for fertility, it can be interpreted that the lesser children will increase the financial stability as parents spend too much portion of their income for childrearing and other consumption expenditure as compared to parents who have more children. Thus, the remaining income can be saved in the banks, functioning as a deposit for banks. The parents' saving allows banking institutions to operate and earn profits, thus contributing to the stability of the banks. On the other hand, a number of children raise household debt, as parents substitute for income due to high living costs and childrearing expenditure. According to a study done among Swiss, German and Australian families, smaller children are found to reduce saving mostly through income losses whilst older children reduce saving through higher expenditure (Ravazzini and Kuhn, 2018). This situation is risky especially during economic uncertainty when parents are not able to pay the debt obligation thus leads to a higher level of non-performing loan (NPL) for the banks (Cucinelli, 2015).

Most studies find that low rate of fertility and rise in the old-age dependency rate tend to lower domestic saving rates because older people save less and that which lead to lower capital accumulation, which, in turn, reduce domestic investment opportunities and growth (Chawla, Betcherman, and Banerji, 2007). A direct theoretical relationship between ageing and saving behaviour is explained by the life-cycle hypothesis (Modigliani and Brumberg, 1954). Individuals change their mix of consumption and savings over their expected life span, the theory implies that older people, who are closer to the end of their lives, and younger people, who are educating themselves or earning low level of income, save less than middle-age individuals.

Additionally, Table 2 reveals a positive and statistically significant relationship between financial openness (Lfinopen) and financial stability, indicating that the impact of financial openness will indeed increase financial stability. Whenever the respective country increases financial freedom, this could mean a better level of protection and security from the instability. The result implies that the larger the degree of financial openness, the more financial stability in the country, which strengthened the financial globalization and maximizing the impact of financial stability. Capital account liberalization facilitates the transfer of foreign technological, encourages competition and financial development, thus promoting economic growth. Remarkably, the paybacks of capital account openness in terms of higher growth and

lower volatility seem to be most evident for industrial economies, which also typically have the most open capital accounts (Kose and Prasad, 2007).

CONCLUSION

Overall, our study revealed that financial stability was influenced negatively and significantly by fertility choices (measured by the number of birth). The increase in the number of births reduces the stability of the financial system. More precisely, the fertility level somehow acts as a buffer and reflects to the degree of stability to the financial institutions. Low fertility level translates to fewer children (unproductive population); in the coming years, this causes the number of dependency populations (children and older population) to be lesser than the young-adult (productive) population. As far as we concern, the increasing number of old populations, also defined as unproductive population, become a threat to the country's financial stability as they are risk-averse household. This group of the population is often less or not involved in high-risk investment and purchase of physical assets which contributes to the profit of the financial sector. Thus, the lower level of fertility rate reduces the level of dependency rate, which in turn affects the stability of the financial system, as the number of dependencies cannot exceed the working population. In contrast, a higher level of fertility reduces financial stability, as there is a more dependent (unproductive) population as compared to working (productive) population.

As for the old dependency, our finding suggested that old dependents had an adverse and significant effect on financial stability. The result indicated that an increase in old-aged dependencies decreases financial stability. It can be translated that, instability may stand with the demographic change, as old dependency population is people who tend to become risk-averse person (according to life-cycle risk aversion hypothesis), described as a rise in average age leading to arise in predicted risk premiums with the fact that old individual cannot cope with the losses. Thus, it reduces the level of investment in the financial market and the real estate market. Additionally, when old-aged dependents are more than the working population due to low fertility, this reduces productivity and trade; consequently, increasing the fiscal burden on health cost and retirement incomes which are partially tax-financed. These changing behaviours of saving and investment could result in financial instability of the nation.

The findings in the study were subject to several limitations. Firstly, data set on financial development indicators were limited. The sample sizes were strictly dependent on the availability of complete data sets. The data sets on private credit were not available on continuous time series. Acknowledgments to the advance of dynamic panel estimators, we could still conduct the study although, the data sets were available on long term series, enabling many other analyses to be done, discussed and explained.

In our study, we know that the effect of fertility on financial stability cannot be seen immediately. However, we can predict or estimate it so that the extent of the economic impact of fertility could be either lessened, mitigated or minimized. In our analysis, we only focused on several factors such as demographics, financial and macroeconomic as the explanatory variables. Perhaps, further research using different tools and methods can be done to explain the variable in more detail on how the government and policymakers play a crucial role in mitigating the effect of declining fertility worldwide.

REFERENCES

Abu-Bader, S., & Abu-Qarn, A. S. (2008). Financial development and economic growth: The Egyptian experience. *Journal of Policy Model*, 30(5), 887–898.

- Ahmed, K., Bodjongo, M., Juliot, M., & Abid, I. (2015). Financial development, Financial instability and economic growth: The case of Maghreb countries. *International Journal of Economics and Financial Issues*, 5(4), 1043–1054.
- 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.
- Bakshi, G., & Chen, Z. (1994). Baby boom, population aging, and capital markets. *Journal of Business*, 67(2), 165–202. Retrieved from <http://www.jstor.org/stable/2353102>
- Bielecki, M., Goraus, K., Hagemeyer, J., & Tyrowicz, J. (2015). Decreasing fertility vs increasing longevity: Raising the retirement age in the context of ageing processes. *Economic Modelling*, 52(Part A), 125–143. doi:10.1016/j.econmod.2015.02.020
- Bloom, D. E., Canning, D., & Fink, G. (2007). Realizing the Demographic Dividend: Is Africa Any Different? In African Economic Research Consortium.
- Bloom, D. E., Canning, D., & Fink, G. (2011). Implications of population aging for economic growth. NBER Working Paper, No. 16705, National Bureau of Economic Research, Cambridge. doi:10.1093/oxrep/grq038
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143. doi:10.1016/S0304-4076(98)00009-8
- Borio, C., & Drehmann, M. (2009). Assessing the risk of banking crises – revisited. *BIS Quarterly Review*, (March), 29–46. Retrieved from http://www.bis.org/publ/qtrpdf/r_qt0903e.pdf
- Borsch-Supan, A. (1996). The impact of population ageing on savings, investment and growth in the OECD area. In *Future Global Capital Shortages -Real Threat or Pure Fiction?* OECD, Paris.
- Bosworth, B. P., Bryant, R. C., & Burtless, G. (2004). The impact of aging on financial markets and the economy: A survey. The Brookings Institution.
- Charpe, M., & Flaschel, P. (2013). Workers' debt, default and the diversity of financial fragilities. *Structural Change and Economic Dynamics*, 27(C), 48–65. doi:10.1016/j.strueco.2013.07.001
- Chawla, M., Betcherman, G., & Banerji, A. (2007). From red to gray. The World Bank, Washington, D.C.
- Chikada, K., Eich, F., Imam, P., Kiff, J., Kisser, M., & Soto, M. (2012). Chapter 4: The Financial Impact of Longevity Risk. *Global Financial Safety Report*. International Monetary Fund, Washington, D.C.
- Christelis, D., Jappelli, T., Paccagnella, O., & Weber, G. (2009). Income, wealth and financial fragility in Europe. *Journal of European Social Policy*, 19(4), 359–376. doi:10.1177/1350506809341516
- Cihak, M., Demirguc-Kunt, A., Feyen, E., & Levine, R. (2012). Benchmarking financial systems around the world. Policy Research Working Paper, No. WPS 6175, The World Bank Group.
- Cihak, M., & Hesse, H. (2010). Islamic banks and financial stability: An empirical analysis. *Journal of Financial Services Research*, 38(2), 95–113.
- Creel, J., Hubert, P., & Labondance, F. (2015). Financial stability and economic performance. *Economic Modelling*, 48, 25–40. doi:10.1016/j.econmod.2014.10.025
- Cucinelli, D. (2015). The impact of non-performing loans on bank lending behaviour: Evidence from the Italian banking sector. *Eurasian Journal of Business and Economics*, 8(16), 59–71. doi:10.17015/ejbe.2015.016.04
- Davis, E. P. (2002). Ageing and Financial Stability. In A. J. Auerbach & H. Herrmann (Eds.), *Ageing, Financial Markets and Monetary Policy* (pp. 191–227). Springer-Verlag Berlin Heidelberg.
- Davis, E. P. (2005). Challenges posed by ageing to financial and monetary stability. *The Geneva Paper*, 30, 542–564.

- Davis, E. P., & Stone, M. R. (2004). Corporate financial structure and financial stability. *Journal of Financial Stability*, 1, 65–91. doi:10.1016/j.jfs.2004.06.003
- Diaconu, R.-I., & Oanea, D.-C. (2014). The main determinants of bank's stability. Evidence from Romanian banking sector. *Procedia Economics and Finance*, 16, 329–335. doi:10.1016/S2212-5671(14)00810-7
- Engelhardt, G., & Poterba, J. M. (1991). Demographics and house prices: The Canadian evidence. *Regional Science and Urban Economics*, 21, 539–546.
- Epure, M. (2012). Population ageing - A demographic trend with various consequences. *Review of Applied Socio-Economic Research*, 4(2), 97–107.
- Fanti, L., & Spataro, L. (2013). On the relationship between fertility and public national debt. *Economic Modelling*, 33, 843–849. doi:http://dx.doi.org/10.1016/j.econmod.2013.06.003
- Faruquee, H., & Muhleisen, M. (2003). Population aging in Japan: Demographic shock and fiscal sustainability. *Japan and the World Economy*, 15, 185–210.
- Holtz-Eakin, D., Newey, W., & Rosen, H. (1988). Estimating vector autoregressions with panel data. *Econometrica*, 56, 1371–1395.
- Horioka, C. Y. (1991). The determinants of Japans private saving rate, the impact of the age structure of the population and other factor. *Bank of Japan Economic Studies Quarterly*, 42, 237–253.
- Imam, P. (2013). Demographic shift and the financial sector stability: The case of Japan. *Journal of Population Ageing*, 6(4), 269–303. doi:10.1007/s12062-013-9089-9
- Jung, W. S. (1986). Financial development and economic growth: International evidence. *Economic Development and Cultural Change*, 34, 333–346.
- Kose, M., & Prasad, E. (2007). Liberalizing Capital Account Restrictions. In *Finance globalization: The impact on trade, policy, labor, and capital flows* (pp. 6–8). Washington DC, United States of America: International Monetary Fund Publication Services.
- Liu, L. (2003). The direction of causality between financial development and economic growth, 72, 321–334. doi:10.1016/S0304-3878(03)00079-8
- Mare, D. S. (2015). Contribution of macroeconomic factors to the prediction of small bank failures. *Journal of International Financial Markets, Institutions and Money*. doi:10.1016/j.intfin.2015.05.005
- Masson, P., Bayoumi, T., & Samiei, H. (1995). International evidence on the determinants of private saving. IMF Working Paper, W95/51, International Monetary Fund.
- Masson, P., & Tryon, R. W. (1990). Macroeconomic effects of projected population ageing in industrial countries. IMF Staff Paper, 37, 453–485.
- 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. doi:10.1016/j.asieco.2013.08.008
- Menyah, K., Nazlioglu, S., & Wolde-rufael, Y. (2014). Financial development, trade openness and economic growth in African countries: New insights from a panel causality approach. *Economic Modelling*, 37, 386–394. doi:10.1016/j.econmod.2013.11.044
- Muhleisen, M. and, & Faruquee, H. (2001). Japan: Population ageing and the fiscal challenges. *Finance and Development*, 38, 10–13.
- Poterba, J. (2001). Demographic structure and asset returns. *Review of Economics Statistics*, 83, 565–584.
- Ravazzini, L., & Kuhn, U. (2018). Wealth, Savings and Children Among Swiss, German and Australian Families. In R. Tilmann, M. Voorpostel, & P. Farago (Eds.), *Social Dynamics in Swiss Society. Life Course Research and Social Policy Vol 9* (pp. 161–174). Springer, Cham. doi:10.1007/978-3-319-89557-4_11

- Tosun, M. S. (2008). Endogenous fiscal policy and capital market transmissions in the presence of demographic shocks. *Journal of Economic Dynamics and Control*, 32(6), 2031–2060. doi:10.1016/j.jedc.2007.09.013
- Turner, D., Giorno, C., De Serres A, V. A., & Richardson, P. (1998). The macroeconomic implications of ageing in a global context (No. 193). Economic Department Working Paper, OECD, Paris.
- United Nation. (2015). World Fertility Patterns 2015. Data Booklet.
- United Nations. (2015). World population ageing 2015. United Nations, Department of Economic and Social Affairs, Population Division (Vol. United Nat). New York. doi:ST/ESA/SER.A/390
- United Nations. (2017). World Population Ageing 2017 - Highlights. Department of Economic and Social Affairs, Population Division, New York. Retrieved from http://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Highlights.pdf
- United Nations. (2019). World Population Prospects 2019 - Highlights. Department of Economic and Social Affairs. Department of Economic and Social Affairs, Population Division, New York. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12283219>
- Yang, Y. Y., & Hoon, M. (2008). Does financial development cause economic growth? Implication for policy in Korea. *Journal of Policy Modelling*, 30(5), 827–840. doi:10.1016/j.jpolmod.2007.09.006

Table 2: The effect of demographic change on financial stability

Dependent Variable	Financial Stability											
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
L.linsta	0.306** (2.87)	0.117*** (6.53)	0.116*** (6.43)	0.337*** (17.56)	0.0833*** (4.76)	0.0772*** (4.20)	0.357*** (20.70)	0.119*** (6.55)	0.117*** (6.36)	0.337*** (17.52)	0.102*** (5.66)	0.0975*** (5.22)
Ltfr	-0.276 (-2.02)	-0.222 (-1.17)	-0.224 (-1.18)	-0.360** (-3.05)	-0.558 (-2.38)	-0.595 (-2.51)	-0.139 (-1.84)	-0.267 (-1.39)	-0.292 (-1.50)	-0.360** (-2.96)	-0.567 (-2.46)	-0.618** (-2.63)
Lod				-0.173** (-2.58)	-0.287** (-3.26)	-0.361** (-3.27)				-0.173 (-2.12)	-0.222 (-1.70)	-0.268 (-1.96)
Lyouth							0.296 (1.88)	0.752 (1.46)	1.023 (1.78)	0.00144 (0.01)	0.765 (1.31)	0.945 (1.56)
Ly		-0.0659 (-1.11)	-0.0625 (-0.99)		-0.0154 (-0.28)	0.0244 (0.37)		-0.0770 (-1.29)	-0.0617 (-0.99)		-0.0172 (-0.29)	0.0111 (0.17)
Lue		-0.0352 (-1.38)	-0.0323 (-1.22)		0.0229 (0.74)	0.0349 (1.06)		0.0669 (0.91)	0.113 (1.32)		0.131 (1.64)	0.164 (1.93)
Lprivcred		-0.0449 (-0.87)	-0.0517 (-0.99)		-0.0803 (-1.46)	-0.0669 (-1.19)		-0.0133 (-0.24)	-0.00328 (-0.05)		-0.0627 (-1.04)	-0.0492 (-0.78)
Lfinopen		0.171*** (4.18)	0.168*** (3.88)		0.153*** (3.76)	0.135** (3.08)		0.191*** (4.37)	0.184*** (4.22)		0.151*** (3.57)	0.141*** (3.31)
Lbocta			-0.00642 (-0.15)			0.0596 (1.14)			0.0254 (0.52)			0.0453 (0.87)
_cons	2.362*** (6.77)	3.511*** (6.39)	3.517*** (5.84)	2.708*** (11.83)	4.175*** (6.64)	3.949*** (6.00)	0.860 (1.37)	0.246 (0.11)	-1.099 (-0.41)	2.701** (3.15)	0.610 (0.22)	-0.344 (-0.12)
Observation	381	381	381	381	381	381	381	381	381	381	381	381
No of Countries	64	64	64	64	64	64	64	64	64	64	64	64
AR(1)	0.0225	0.0462	0.0473	0.0267	0.0530	0.0598	0.0276	0.0544	0.0609	0.0267	0.0492	0.0570
AR(2)	0.348	0.189	0.189	0.335	0.179	0.168	0.356	0.183	0.177	0.335	0.184	0.172
Chi2 - Sargan test P-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Chi2 - Hansen test P-value	0.143	0.204	0.170	0.254	0.225	0.230	0.253	0.229	0.219	0.220	0.224	0.225

Dependent variable: Financial stability (Lfinsta), two-step system GMM. Figures in parenthesis are t-statistics. Asterisk (***), (**) denote statistically significant at the 1% and 5% level, respectively.