



## Youthful or Aged: Age Dependency and Inflation in ASEAN Countries

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### Article Information      Abstract

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There has been a growing interest to understand inflation through demographic lens using a critical key indicator known as the dependency ratio. However, studies investigating this nexus in terms of ASEAN nations are limited, despite ASEAN undergoing a demographic transition. Therefore, this paper aims to investigate the impact of age-population ratio on the inflation rate across 8 ASEAN countries during 2000-2020. This research uses Feasible Generalized Least Squares (FGLS) estimation, as it is robust to groupwise heteroskedasticity, serial and cross-sectional correlations. The result reveals that population aging is deflationary. However, the elderly dependence successfully explains the price dynamic after controlled by monetary and macro variables. It means that aging matters for inflation along with the macro variables dynamic. In addition, the analysis also sheds light on the impacts of the young dependency, which does not significantly impact the inflation rate when macro variables are taken into account. This research also underlines the importance of considering demographic dynamics in the future monetary policy decisions.

## INTRODUCTION

Inflation, or the overall rise in the price level of goods and services over time, is a major macroeconomic indicator that affects individual purchasing power and macroeconomic stability. Economists have traditionally examined the causes influencing inflation through the lenses of monetary policy, fiscal policy, and external shocks. Conceptually, fluctuations in the money supply, changes in government expenditure levels, and unexpected events impacting global demand and supply can all have an influence on the economy's pricing dynamics (Mankiw, 2013). However, a more contemporary approach has arisen, with a greater acknowledgment of the demographic element and its possible effect on inflation.

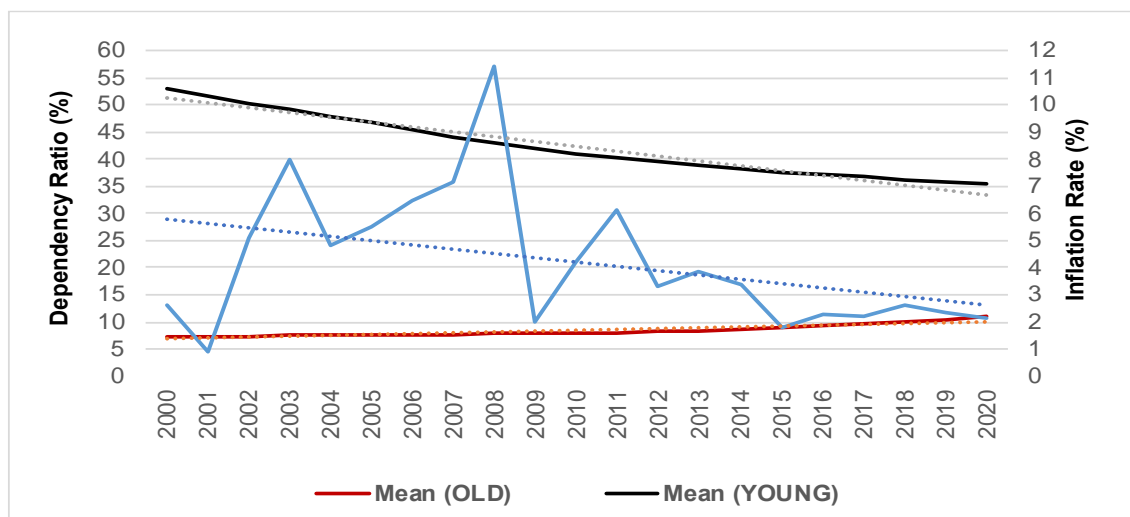
Within the framework of the demographic factor, demographic structure, often known as a population's demographic makeup, might be a significant predictor of an economy's trajectory (Yoon et al., 2014). In the recent year, various studies delved into the possibility of a connection running from demographic structure to inflation. This acknowledgment has been encouraged by unique correspondence observed between two significant economic events: the global financial crisis and the 1990s Japanese crisis. According to Juselius & Takáts (2018), both of the events drawing attention by the similarities found between the crises. Specifically, both crises happened during periods when the dependency ratio is in a minimum rate, followed by a period of low inflation as the proportion of older age groups in the population began to rise. Later on, the dependency ratio as one of a critical demographic indicator, has been receiving increasing attention due to its potential influence on the inflation dynamics.

ASEAN countries have emerged as a dynamic and diverse region characterized by rapid economic growth, demographic transitions, and evolving socio-economic structures. In the context of demographic

changes, Kajimura (2020) stated that this demographic transition happening in Southeast Asia is now considered as an urgent issue as the proportion of elderly is higher, which results from a decline in birth rates and higher life expectancy. In this era of ASEAN Economic Community (AEC), demographic and economics characteristics will be more closely related than before, as demography will be one of the factors that play a vital role in shaping the integration of economies and markets within the ASEAN region.

However, while the intricate relationship between issues demographic changes and macroeconomic dynamics has long intrigued economists, policymakers, and researchers alike, the empirical studies of direct link from demographics to inflation in the ASEAN context may not have received as much attention compared to other economic indicators such as economic growth or trade. Therefore, it is increasingly urgent to study between these variables, as this aging phenomenon to inflation is now a pressing issue, yet there remains a notable gap in the existing literature in terms of ASEAN context.

The aging trend becomes evident as the ASEAN countries experienced a dependency ratio dynamic over the past two decades. As depicted in Graph 1, it could be seen that the old dependency ratio of ASEAN countries slightly increased from 2000 to 2020. On the opposite, the dependency ratio of young people significantly decreased over those periods. The dynamics of dependency ratio emerges a question whether it would be inflationary or deflationary. From the graph, it could be also seen that there is a similar trend between young dependency ratio and inflation rate. On the contrary, there is a different trend direction between inflation rate and old dependency ratio. Thus, it could be presumed, that old dependency ratio tends to be deflationary while the young one might be inflationary



**Figure 1.** Old and Young Dependency Ratio of ASEAN Countries over 2000-2020

Source: The World Development Indicator, 2023

The nexus between dependency ratio and inflation remains puzzling in terms of the theoretical basis and (or) empirical studies. In other words, there are at least two schools of thought related to dependency and inflation. First, the stagnation secular hypothesis proposed by Hansen (1939) which states that combination of aging and stagnating (i.e. negative population growth) may deter corporations from investing in a declining and less productive economy. Savings decline with age, and future social security may encourage younger generations to save more. As a result of surplus savings relative to investments, monetary policy is no longer practicable in driving economic growth, and inflation is lower than the targeted level. In detail, due to the structural excess saving resulting from inadequate investment and high saving rates, which keep the real interest rate at a low level that cannot be controlled by the monetary policy and leads to lower inflation rate, potentially falling below the target. Therefore, this hypothesis underpins the argument that old dependency is deflationary.

This hypothesis is also supported as there has been a rising interest in investigating the possibility of the opposite relationship between aging and inflation. Since Japan experienced an economic crisis in the early 1990s, there was an observation that when the dependency ratio (the proportion of dependents such as the young and

the elderly, to the working-age population) is lower, there is a tendency for inflation in the country to decrease. Moreover, Japan went through a unique situation as the proportion of its elderly population began to grow, signifying a rapidly aging population. The observation sparked an increasing interest in investigating the interconnection between demographic factors and inflation. Therefore, the old dependency-deflationary actually sourced from the studies in the Japanese context (Braun & Ikeda, 2022; Konishi & Ueda, 2013; Law, 2021; Nishimura, 2011; Shirakawa, 2012) who found the inverse relation between the age cohort of individuals aged 64 or above and inflation.

Surprisingly, the old dependency-deflation nexus also emerges in the context of other countries. For instance, (Gajewski, 2015; Yoon et al., 2014) found that old dependency ratio is deflationary in the context of OECD countries. Analyzing the relationship for 34 OECD countries, (Gajewski, 2015) discovered when the share of the population aged 80 and above increases by 1%, it is associated with 0.15% decrease in the average inflation rate. Bullard et al (2012) suggests that when older age cohorts have a significant influence on shaping government policies, especially those regarding the distribution of resources, it tends to result in an economy with lower levels of capital and lower inflation rates. Additionally, Andrews et al

(2016) also highlight that the deflationary effect is more pronounced as the age of the cohort increases. Therefore, those study findings support the stagnation secular hypothesis.

On the other hand, old dependency may be inflationary, as suggested by the Life Cycle Hypothesis. The life cycle hypothesis was introduced by Franco Modigliani, an Italian-American economist, and his student, Richard Brumberg, in a seminal paper published in 1954. According to Ando & Modigliani (1963), the life cycle hypothesis states that individuals adjust their consumption and saving patterns over their lifetime to maintain a consistent level of consumption. Individuals tend to save less and spend more during their younger and retirement years, while savings peak during their middle-aged years. As a result, when a significant portion of the individuals in the retirement phase increase, it can exert upward pressure on demand for goods and services as they spend their savings. This increased demand, without corresponding increase in supply, can push prices higher. Additionally, another channel of how the prices go up can be explained through the rising increase in healthcare and pension-related expenditures by the government associated with an aging population. It is clear that, according to this framework, aging process is seen as inflationary for the economy,

Idea of this hypothesis implies that individuals should smooth spending across life phases by retaining marginal utility constant. The model forecasts borrowing before entering the labor force, wealth building throughout working life, and retirement dissaving (Browning & Crossley, 2001). In addition, as the median age of a population increases, more households finance their consumption from accumulated savings and do not directly produce added value. Therefore, the discrepancy between aggregate demand and output in the economy rises and demand-driven inflationary pressure appears. Simultaneously, as the labor supply shrinks, wages are pushed up, which increases inflation through the cost channel (Broniatowska, 2019).

Several studies found evidence that it is in line with the life-cycle hypothesis. For example,

(Aksoy et al., 2016; de Albuquerque et al., 2020) found that a higher dependency ratio gives a pressure on inflation. De Albuquerque et al (2020) utilizing panel cointegration, focused on 24 countries in the OECD discovered that the age cohort of individuals aged 64 and older had a positive impact on inflation. They explained this positive impact by highlighting the increased propensity of this age categories to consume and engage in dissaving behavior, where individuals draw from their savings. Similarly, Aksoy et al (2016) also investigated OECD countries and reached a similar conclusion regarding the impact of aging populations on inflation. However, their study examined using the age category of 60 years and above. It indicates that while the specific age categories examined in the two studies differ slightly, both studies reached the same conclusion that individuals in or around the age of 60 tend to exhibit behaviors that lead to higher inflation.

On the contrary to most of the studies conducted in Japan, Isa (2021) found that a higher dependency ratio would lead to an increase in Japanese' inflation in the context of a regional (prefecture). Rather surprisingly, his findings demonstrated that a 1% increase in the old-age dependency ratio would lead to 0.14% rise in inflationary pressures. It indicates that study, contrary to common expectations, aging in Japan does not seem to cause deflation, as many might assume. This finding contradicts the prevailing idea that demographic shifts, specifically an aging population, are the central reasons behind Japan's low inflation.

In most recent, Juselius & Takáts (2018 and 2021) found that old dependency ratio is inflationary in the context of global setting. Several research attempted to investigate the relationship between dependence on the younger and inflation, in addition to the link between elderly dependency and inflation. For example, Juselius & Takáts (2018, 2021) discovered that youthful reliance is inflationary in addition to the fact that the older generation might contribute to inflation. Furthermore, increased inflation is connected with an increase in youth dependency in the majority of locations throughout the world.

Surprisingly, it appears to be deflationary in Sub-Saharan Africa. As a result, the link between inflation and young dependency is equivocal.

Since there are two points of views, the study results are still inconclusive. This empirical gap regarding the demographic (ages group) dependency and inflation nexus makes it relevant for studying the relationship in the context of ASEAN countries. Furthermore, studies related to it within the ASEAN countries setting are relatively rare, if any. Therefore, this study aims to shed light on the relationship between age-population ratio and inflation in the context of ASEAN countries by addressing a crucial question: does an aging population tend to lead to lower inflation, while a youthful population may exert upward pressure on prices?

Deriving from the preceding background and literature review, we hypothesize that the old dependency ratio has a positive and significant impact to inflation while, we assume that the young dependency ratio has a negative and significant impact to inflation in ASEAN countries.

In the quest to validate these hypotheses, this paper will review existing literature, analyse the empirical data, and employ an appropriate econometric model to provide a comprehensive understanding of the intricate relationship between ageing and inflation dynamics. This paper endeavors to probe into this critical correlation, aiming to contribute valuable insights within the ASEAN context. Understanding how demographic structure affects inflation is crucial for formulating effective economic policies and ensuring sustainable growth and stability in the face of these demographic transformations.

## RESEARCH METHODS

This study intends to ascertain whether the age dependency ratio matters for the inflation of ASEAN countries. Several studies have inspired us in examining that issue such as conducted by (Broniatowska, 2019; de Albuquerque et al., 2020; Goh et al., 2020; Ma & Tang, 2023). Our study spans the years 2000 to 2020 in eight ASEAN countries: Indonesia,

Malaysia, Thailand, Singapore, the Philippines, Vietnam, Brunei Darussalam, and Myanmar. Our empirical models are mostly motivated by the aforementioned studies. This study has three panel data models as a result of our modification.

$$INF_{it} = \beta_0 + \sum_{n=4} \beta_n Dem_{it} + \varepsilon \dots\dots\dots (1)$$

$$INF_{it} = \beta_0 + \sum_{n=4} \beta_n Dem_{it} + \sum_{n=2} \beta_n Mon_{it} + \varepsilon \dots\dots\dots (2)$$

$$INF_{it} = \beta_0 + \sum_{n=4} \beta_n Dem_{it} + \sum_{n=2} \beta_n Mon_{it} + \sum_{n=3} \beta_n Macro_{it} + \varepsilon \dots\dots\dots (3)$$

The first model only accounts the influence of demographic related variables on the inflation rate. Dem is a vector of demographic characteristics related to age-dependency ratio namely old dependency ratio (OLD), young dependency ratio (YOUNG) and another population characteristic i.e., labor force participation (LFP) which reflects the labor market condition. In the second model, monetary factors are added as an explanatory in explaining the inflation which is reflected by a vector of two monetary variables (Mon) involving money supply growth rate (MS) and real interest rate (RIR). Then, in the last model (3), the inflation rate is thus explained not just by demographic and monetary factors, but also by macroeconomic conditions (Macro). This vector included fiscal condition (fiscal balance/FB), foreign sector (current account deficit/CA), and GDP growth (GDPG).

The use of factors other than demographic attributes are conceptually relevant. Inflation, for example, is a monetary phenomenon that may be linked to monetary variables such as money supply. Furthermore, inflation could be related to the real sector, such as greater GDP growth, which may result in higher inflation (demand pull inflation). Furthermore, by including such variables, it would be a robustness procedure to determine whether the influence of demographic characteristics changes when other variables are included. In more detail, the description of variables involved in this study is described as follow:

**Table 1.** Description of Variables

Variables	Description	Reference	Data Source
Inflation (INF)	The annual percentage change in the consumer price index	(Broniatowska, 2019; de Albuquerque et al., 2020; Goh et al., 2020; Ma & Tang, 2023)	World Economic Outlook (IMF)
Old Dependency Ratio (OLD)	Ratio of older dependency, population aged 65 and more/population aged 15–64	(Broniatowska, 2019; Ma & Tang, 2023)	World Development Indicator (The World Bank)
Young Dependency Ratio (YOUNG)	Ratio of older dependency, population aged 014/population aged 15–64	(Broniatowska, 2019; Ma & Tang, 2023)	World Development Indicator (The World Bank)
Labor Force Participation Rate (LFP)	Ratio of labor force as a percentage of the working-age population aged 15-64	(Barros, 2022)	World Development Indicator (The World Bank)
Real GDP (GDPD)	Growth of Real Gross Domestic Product (GDP) at Constant 2015 US\$	(Aksoy et al., 2016; de Albuquerque et al., 2020)	World Development Indicator (The World Bank)
Current Account Balance (CA)	Net exports of goods and services plus net factor income, as % of GDP	(Alawin & Oqaily, 2017; Bazzaoui & Nagayasu, 2019)	World Economic Outlook (IMF)
Real Interest Rate (RIR)	Lending interest rate adjusted for inflation	(Ma & Tang, 2023)	World Development Indicator (The World Bank)
Broad Money Growth (MS)	Growth of sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities such as certificates of deposit and commercial paper.	(de Albuquerque et al., 2020; Ma & Tang, 2023)	World Development Indicator (The World Bank)
Fiscal Balance (FB)	The difference between revenue and expenditure of central government, as % of GDP	(Bazzaoui & Nagayasu, 2019)	World Economic Outlook (IMF)

Source: Data Processed, 2023

The models 1-3 would be estimated first by employing the panel data modelling i.e. estimating models with random and fixed effect model as well as performing the model selection criteria (the Hausman Test). After conducting those stages, the results would be evaluated first to see whether there are classical assumption problems in the panel model namely heteroscedasticity, cross-sectional correlation and serial correlation. To check the panel homoscedasticity, if the random effect model suggested, Wald test could be carried out as suggested by (Baltagi et al., 2009). Meanwhile, whereas the fixed effect model is preferred, the Wald test might be conducted (Baum, 2001). To

ascertain that cross-sectional units are independent, this study employs the Pesaran CD test to get absolute correlation of residuals and its probability value (De Hoyos & Sarafidis, 2006). Lastly, to detect the serial correlation in the panel data model, the Wooldridge test would be employed (Drukker, 2003).

Although the ordinary least square with robust standard error approach could be used to deal with those problems, the generalized least square (GLS) model has a more efficient parameter (Bai et al., 2021; C. B. Hansen, 2007). Therefore, the GLS model might be appropriate. Notwithstanding, could be used if the variance matrix of disturbance is known. Therefore,

following (Bai et al., 2021), we could employ feasible GLS (FGLS) estimation by assuming that the variance matrix of disturbance is unknown. They suggested that the proposed FGLS estimator is more efficient than the ordinary least squares (OLS) estimator in the presence of heteroskedasticity, serial and cross-sectional correlations by consistently predicting the large error covariance matrix. Furthermore, (Woolridge, 2010) also argued that the variance matrix of disturbance is most often unidentified and therefore, employing FGLS would be more appropriate.

## RESULTS AND DISCUSSION

Table 2 reveals the descriptive statistics of all variables used. We look first at the main variables of interest namely inflation and old-young dependency. The average inflation rate across all countries and study periods is around 4%, which is generally regarded as a moderate inflation rate. However, its standard deviation is currently at 6% and it indicates that the inflation rates among the observed countries and time periods are fairly diverse. Aside from that, the minimum and maximum value could also show it. The old dependency ratio has a mean value of approximately 9% but has a low standard

deviation. This indicates that the observed data for that variable are often either close to the mean or have little data variability. The mean value of the young dependency is about 38,5% with high dispersion compared to the old one. It indicates that the young dependency ratio tends to vary over the countries. In addition, the higher mean value of young dependency relative to the old one also might also indicate that the proportion of non-productive youth is a way higher than the old one. The other variables which relatively have a high dispersion are money supply and current account balance.

Table 3 shows the Pearson correlation coefficients of all variables. Focus on the correlation between variables of interest, there is a negative correlation between inflation and old dependency ratio, although it is very weak. Meanwhile, the young dependency has a positive correlation with inflation. It indicates that the old dependency might be deflationary while the young one might be inflationary. Among all variables, real interest rate has the highest correlation coefficient, -0.65. It is relevant since the interest rate is the one of main tools to maintain inflation rate. Other variables which have a relatively moderate correlation with inflation rate are GDP growth and current account balance.

**Table 2.** Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
INF	168	0.0404	0.0611	-0.1979	0.4747
OLD	168	0.0890	0.0275	0.0448	0.1976
YOUNG	168	0.3853	0.1140	0.1589	0.6439
LFP	168	0.7077	0.0573	0.5691	0.8187
RIR	168	0.0489	0.0515	-0.2901	0.3825
MS	168	0.1252	0.1047	-0.1193	0.4911
GDPG	168	0.0493	0.0369	-0.0952	0.1452
CA	168	0.0724	0.1132	-0.0865	0.4509
FB	168	-0.0068	0.0594	-0.2168	0.3614

Source: Data Processed, 2023

**Table 3.** Person Correlation Matrix

Variables	INF	OLD	YOUNG	LFP	RIR	MS	GDPG	CA	FB
INF	1.00	-	-	-	-	-	-	-	-
OLD	-0.08	1.00	-	-	-	-	-	-	-
YOUNG	0.19	-0.63	1.00	-	-	-	-	-	-
LFP	0.06	0.56	-0.60	1.00	-	-	-	-	-
RIR	-0.65	-0.07	0.11	-0.07	1.00	-	-	-	-
MS	0.21	-0.05	0.26	0.21	0.30	1.00	-	-	-
GDPG	0.38	-0.09	0.20	0.13	0.02	0.45	1.00	-	-
CA	-0.30	-0.28	-0.25	-0.06	-0.10	-0.35	-0.34	1.00	-
FB	-0.10	-0.12	-0.18	0.08	-0.10	-0.15	-0.10	0.61	1.00

Source: Data Processed, 2023

Table 4 reports the results of the Hausman and the Classical Assumption test namely the Pesaran CD test for cross-sectional dependence identification, the Wooldridge test for serial correlation and the Wald test for identifying the heteroscedasticity problem of the models. The result of the Hausman test reveals that H0 is strongly rejected for all of the models since the chi-square value is significant at all traditional benchmarks of probability values (1%, 5% and 10%). Therefore, the fixed effect model is more appropriate for all models. Before continuing to inference the results of panel data modelling, we first evaluate whether the classical assumptions are violated.

The result of the Pesaran CD test for the model 2-3 strongly rejects H0 since the CD statistic is insignificant at all of the traditional critical level. It means that there is no cross sectional dependence on those two models but it does in model 1 since the probability value of CD stat is significant. Furthermore, the results of the Wooldridge test show that all of the models suffer from the serial correlation. It Could be seen from the F-statistic of models which strongly reject the H0. In addition, all of the models have also experienced the heteroscedasticity problem which. Since the assumption of no serial correlation and homoscedasticity of all models are violated, and the OLS estimators are inefficient. Consequently, the FGLS procedure should be conducted.

**Table 4.** The Result of The Hausman and Classical Assumption Tests

Hausman Test	Null Hypothesis	Chi-Square	Probability	Conclusion
Model 1	Random Effect	1.78	0.6189	Random Effect
Model 2	Random Effect	128.12	0.0000	Fixed Effect
Model 3	Random Effect	122.96	0.0000	Fixed Effect
Pesaran CD Test	Null Hypothesis	CD Stat	Probability	Conclusion
Model 1	Cross Sectional Dependence	5.975	0.0000	Cross sectional dependence
Model 2	Cross Sectional Dependence	-0.779	1.5638	No Cross-sectional Dependence
Model 3	Cross Sectional Dependence	0.774	0.4388	No Cross-sectional Dependence
Wooldridge Test	Null Hypothesis	F-Stat	Probability	Conclusion
Model 1	No first-order autocorrelation	40.705	0.0004	Serial Correlation
Model 2	No first-order autocorrelation	30.329	0.0009	Serial Correlation
Model 3	No first-order autocorrelation	31.416	0.0000	Serial Correlation

Wald Test	Null Hypothesis	Chi-Square	Probability	Conclusion
Model 1	Panel Homoscedastic	183.000	0.0000	Heteroscedastic
Model 2	Panel Homoscedastic	113.000	0.0000	Heteroscedastic
Model 3	Panel Homoscedastic	187.000	0.0000	Heteroscedastic

Source: Data Processed, 2023

Table 5 shows the FGLS estimated results for models 1, 2, and 3. Those estimation results are robust where the panel is homoscedastic and there is no cross-sectional dependence and serial correlation (Beck & Katz, 1995). In this section, we present a comprehensive study of our research divided into the following three analyses. First, from Table 6, we can infer that in general, it could be seen that the old dependency ratio has a negative coefficient. Meanwhile, the positive coefficient is revealed by the youthful dependence. before considering the significance of the coefficients, since the sign of the coefficients do not alter after incorporating control variables, it could be inferred that elderly dependence tends to be deflationary while the young one tends to be inflationary.

Second, by considering the significance of the coefficients, from the result of the model 3, the elderly dependence has a negative and significant impact on inflation. From that result, we can infer increasing old dependency ratio by 1% would lead inflation to decrease by 0,4%. Meanwhile, as reported by the results of model 1 and 2, the youthful dependence gives a positive and significant influence on inflation. It gives a magnitude about 0,11% – 0,19% or an increase of young dependence by 1% would result in rising inflation by about 0,11% - 0,19%. From those two results, we might conclude that the old dependency ratio successfully explains the price dynamic after being controlled by monetary and macro variables. Interestingly, however, young dependency fails to significantly influence the inflation rate where macro variables involved.

**Table 5.** The Result of FGLS Estimation

VARIABLES	(1) INF	(2) INF	(3) INF
OLD	-0.0140 (0.221)	-0.0300 (0.139)	-0.447*** (0.150)
YOUNG	0.191*** (0.0547)	0.118*** (0.0387)	0.00518 (0.0385)
LFP	0.298*** (0.103)	0.0724 (0.0733)	0.0316 (0.0651)
RIR		-0.929*** (0.0584)	-0.909*** (0.0516)
MS		0.217*** (0.0335)	0.142*** (0.0316)
GDPG			0.263*** (0.0810)
FB			0.0356 (0.0539)
CA			-0.168*** (0.0360)
Constant	-0.243*** (0.0825)	-0.0352 (0.0591)	0.0822 (0.0554)
Wald-Chi2	16.19	296.33	339.73
Log Likelihood	239.52	317.19	439.25
AIC	-471.03	-622.37	-661.45
BIC	-458.53	-603.62	633.33
Observations	168	168	168
Number of COUNTRY	8	8	8

Source: Data Processed, 2023

Third, before conducting an in-depth analysis, it's necessary to select the most appropriate model from the three models in the estimation. To determine the best model, we use three thresholds, namely the Wald Chi-Square, Log Likelihood and AIC-BIC statistics. A higher Wald Chi-Square value indicates better predictive power for a set of variables. While the Log Likelihood which is a measure how well the model explains the observed data. A higher log-likelihood suggests that the estimated parameters of the FGLS model are more likely to have generated the observed data. Therefore, the higher value of both two statistics indicates the best model in our study. In addition, as generally known, the AIC (Akaike Information Criterion) and BIC (Bayesian Information Criterion) are the statistical properties which can be used to choose the most appropriate model among competing models. The principle of using those statistics is "lower is better". After comparing using three criteria, we decide that Model 3 is the best one among the three models. As a result, we rely on model 3 in conducting the more comprehensive economic analysis.

From the result of model 3, we argue that the involved variables that have a significant influence on inflation are old dependency ratio, real interest rate, money supply growth and current account balance. The negative and significant effect of old dependency ratio on inflation rate indicates that elderly dependence is deflationary. This finding is aligned with the stagnation secular hypothesis proposed by Hansen (1939), which suggests that a rising dependence of elderly tends to make investment less appealing, while savings typically decrease with age. As highlighted by Bullard et al. (2012), older cohorts tend to seek a high rate of return from their savings, which implies their reliance on accumulated savings from earlier years to cover their later-life consumption needs. This pattern can, in turn, encourage younger generations to save more for their future economic security, as they anticipate a decline in savings as they age.

This high saving rate and low investment situation leads to a low real neutral interest rate,

making it difficult for monetary policy to stimulate further investment and resulting in low inflation levels (Liu & Westelius, 2016). Economically speaking, the rise of elderly and declining the young population could lead to economic slowdown since it may deter corporations from investing and could discourage households from spending in a declining and less productive economy.

Furthermore, according to Liu & Westelius (2016), the combined impacts of a slowdown in population growth and an acceleration in the aging process began to impose deflationary pressure on the economy throughout the 2000s. According to their research, the drop in the overall population will overcome the deflationary impact generated by an older population in the future, becoming the primary demographic factor driving deflation. Moreover, this finding is also in line with the studies conducted by Gajewski, (2015); Yoon et al., (2014), who found that old dependency ratio is deflationary in the context of multi-country setting.

Additionally, Han (2019) suggests that the link between aging population and inflation can be explained through risk-taking channels. He emphasized that elderly often exhibit conservative spending and business habits. This conservative spending behavior can lead to reduced consumption, which, in turn, may impact consumer demand. It also may lower investments as elderly have a higher proportion of their assets in more conservative and less speculative investments (risk-averse) aims to ensure the availability of funds for living expenses and healthcare due to increasing mortality risks (Braun & Ikeda, 2022). This channel therefore discourages both consumption and investment, reducing aggregate demand and consequently, exerting downward pressure on the price level.

Our finding as well as the argument from previous studies also confirm the Graph 1 reveals that inflation declines along with inclining of elderly dependence and declining of youthful dependence. Therefore, we strongly argue that old-dependency is deflationary for eight observed

ASEAN countries during the observation periods.

Move to analyze the impact of explanatory variables on inflation. Firstly, we discuss the impact of monetary factors. The real interest rate has a significant impact in reducing inflation. A rising of the real interest rate by 1% would cause inflation to decline by 0,9%. It reflects that the interest rate is a powerful in combating inflation. The impact of interest rate is fairly prominent since increasing of the interest rate would absorb excess money supply in the economy and it is relevant with the theoretical basis of traditional monetary policy. In addition, our finding is also supported by the study conducted by Ma & Tang, (2023).

Our estimation also showed that the growth in money supply has a positive and significant impact on inflation, and this result is supported by the study of Law, (2021). From the model 3, it could be inferred that an increase of money supply growth by 1% would cause inflation to increase the inflation rate by about 0,15%. That finding is economically relevant since according to classical view, the percentage change of price (inflation) reflects the percentage change of money supply. As proposed by the quantity theory of money, money supply is the most significant factor in driving inflation (Friedman, 1989). Despites its evolution and contribution from multiple economists, the core idea of the theory indicates the positive impact of money supply on the overall price level, that remains to be a fundamental and consistent aspect to the theory. Hence, when the money supply expands, it typically results in a direct increase in prices, signaling inflation in the economy, *ceteris paribus*.

Then we analyze the impact of macro variables on inflation. From the coefficient of GDP growth, we could infer that a rise of growth by 1% would lead on increasing inflation by 0,19%. Our finding is also in line with the finding of Law (2021), and it is also relevant since the increase of GDP reflects the higher aggregate demand and it would cause the price to increase (Keynes, 1936). This finding is further supported by Bhattacharya (2013), who found that positive

shocks in real GDP growth create inflationary pressures. Moreover, Tolasa et al. (2022) argue that the positive relationship between these variables can be explained by household's propensity to save and changes in total investments, which may also influence the aggregate demand. This finding of economic growth impact on inflation further justifies that inflation for eight observed ASEAN countries is not solely a product of monetary factors.

Furthermore, the external factor which is the current account balance gives a negative and significant impact on inflation. Specifically, a higher share of exports, a lower share of imports and net factor income relative to GDP could lead inflation to decrease. The current account often regarded as the total financial flows in and out of a country (Prasad et al., 2006), such situation essentially represents a financial inflow resulting from foreign activities, where more funds in the form of foreign currency flow into the country due to increased demand for the local currency (Zhu et al., 2022). Economically, a greater inflow of foreign currency would create domestic currency to appreciate. As proposed by the exchange rate pass-through concept, an appreciation of the exchange rate tends to have a negative impact on import prices (Feinberg, 1989). Therefore, a decrease in the current account balance, which can signal an inflow of foreign currency and domestic currency's appreciation, can result in lower prices of imported goods. This, in turn, can directly affect domestic price levels and may contribute to higher inflation in the economy (Alawin & Oqaily, 2017).

## CONCLUSION

Inflation has traditionally been studied in the framework of monetary and macroeconomics. Meanwhile, recent studies incorporate the other attributes such as demographic structure particularly age dependency in explaining the inflation dynamic. There are two points of views associated with the nexus between age dependency and inflation. First, the life-cycle hypothesis which argues that age dependency, especially the old one, is

inflationary. The second view is the stagnation secular hypothesis which states that old dependency is deflationary. In the ASEAN Context, the data show that the young dependency has significantly declined over the past two decades and it has a similar trend with the inflation rate. Meanwhile, the old dependency has a positive trend although it increases slightly over time. Therefore, it could be presumed that the elderly dependence is deflationary while the young one is inflationary.

To empirically explain that phenomenon, we collected the data from eight ASEAN countries in the time span of 2000-2020. We developed three models to explain the inflation rate which is associated with age dependency. In the first model, we only involved the demographic related variables including age dependency in explaining inflation. Then, the monetary related variables were added as regressors in the second model. Lastly, the several macroeconomic indicators were also considered as control variables in the third model. The panel data procedure conducted and classical assumption test was also performed. As a result, we found that the assumption of no-serial correlation and homoscedasticity are violated. To deal with that, we employed a feasible generalized least square model (FGLS).

Based on the selection process, the third model was chosen. The result reveals that the old dependency ratio gives a negative and significant impact on the inflation rate. Therefore, it could be concluded that aging is deflationary and it supports the stagnation secular hypothesis. Furthermore, several traditional variables that successfully explain the change of consumer price index are interest rate, money supply growth rate and GDP growth.

All in all, by considering the impact of aging on inflation as well as the trend of the data which show that the elderly dependence increases overtime, the monetary authorities in ASEAN might consider the dynamic of age dependence in maintaining inflation.

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