WORKFORCE AGE STRUCTURE AND PRODUCTIVITY IN MALAYSIA

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OUTLINE PRESENTATION

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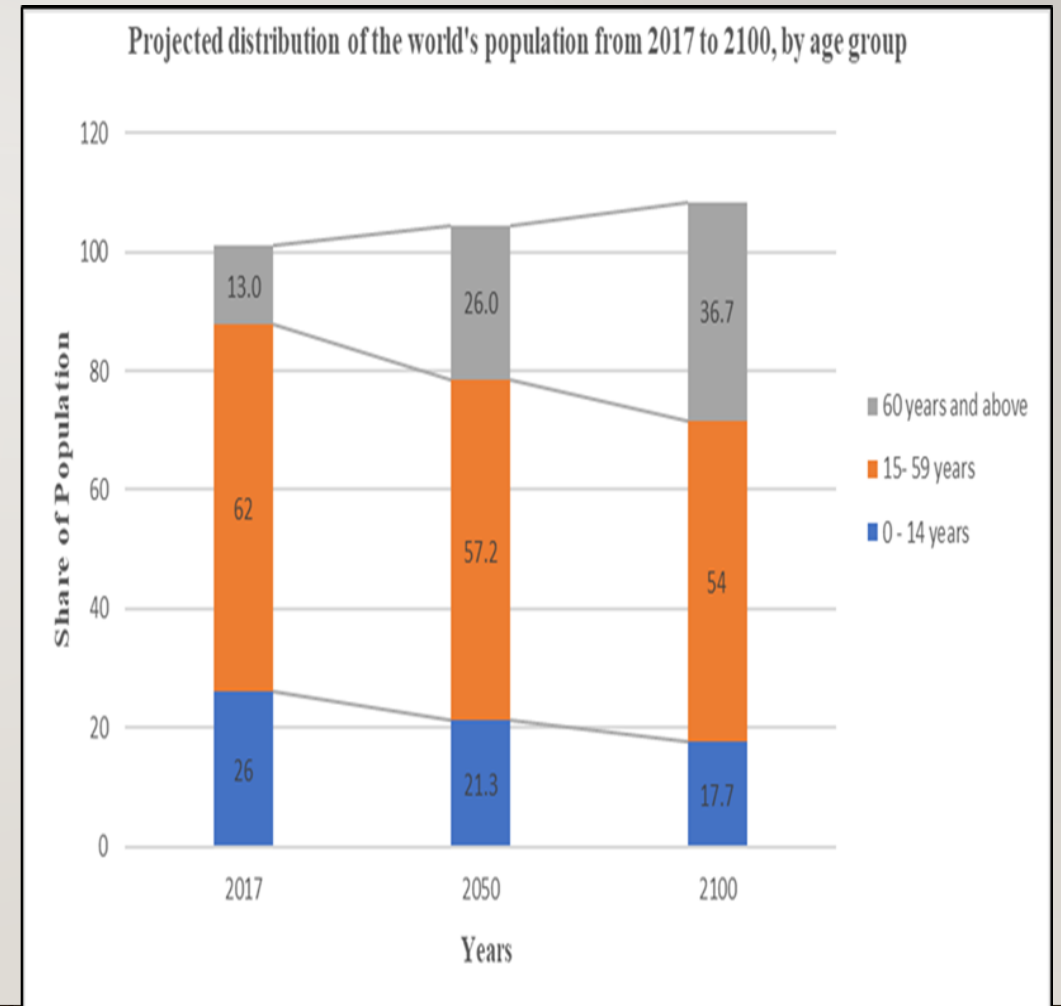04 RESEARCH METHODOLOGY

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INTRODUCTION

BACKGROUND OF THE STUDY

- The **world population is increasing.** The most significant **demographic trend** all over the world at the moment is the growth of **older population**.

- There is an **upward trend** for population age group of **60 years and above.**

- **Declining trend** for age **group of 0-14 years** and **15 – 59 years.**

Projected distribution of the world's population from 2017 to 2100, by age group

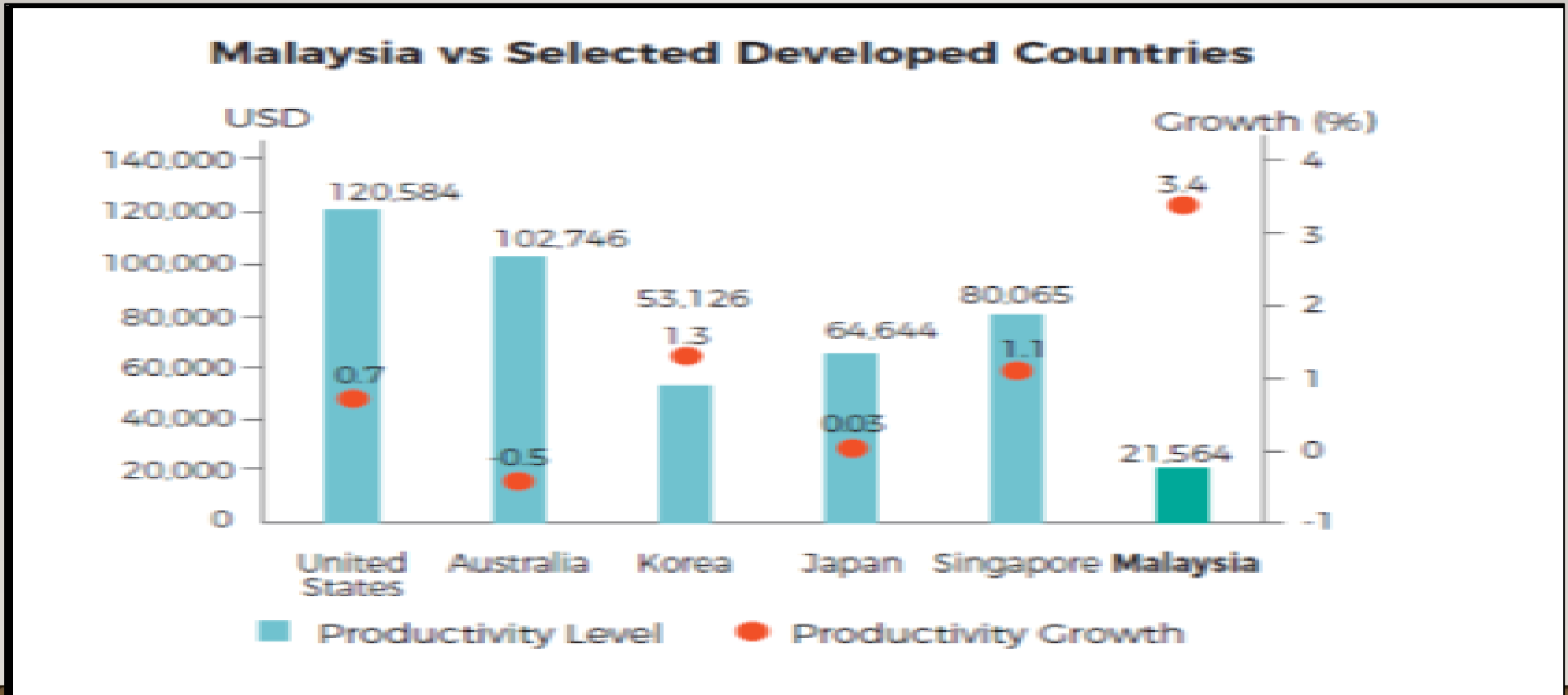|	60 years and above	15- 59 years	0 - 14 years
2017	13.0	62	26
2050	26.0	57.2	21.3
2100	36.7	54	17.7

Share of Population

Years

Source: The Statistical Portal

- The ageing population trend is affecting the percentage of workforce in Malaysia.

The Percentage of Workforce By Aged Group

Young Aged (15-24) — Prime Aged (25-44) — Old Aged (45-64)
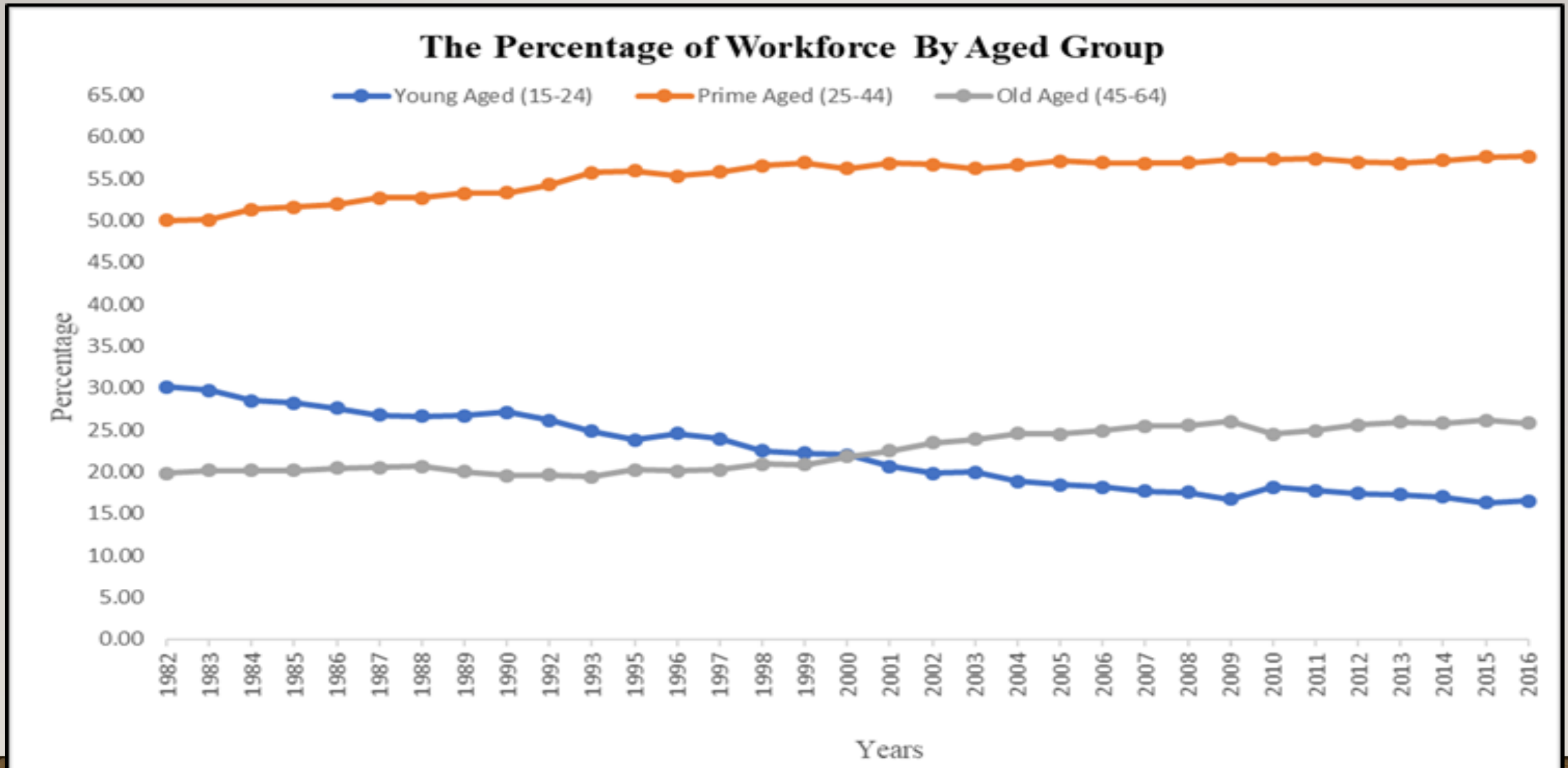
Source: DOSM (2016)

- Malaysia's **TFP growth** over the period 2006 – 2016, was only able to **sustain at 1%.** The **slow growth of TFP** can be further dampen with **the issues of ageing population.**

Malaysia vs Selected Developed Countries

USD | Growth (%)

Country	Productivity Level (USD)	Productivity Growth (%)
United States	120,584	0.7
Australia	102,746	-0.5
Korea	53,126	1.3
Japan	64,644	0.03
Singapore	80,065	1.1
Malaysia	21,564	3.4

■ Productivity Level   ● Productivity Growth

PROBLEM STATEMENTS

Problem Statements

Workforce age structure is changing as the proportion of older exceeds younger population.

In Malaysia, 24.7% of people aged 65 and above are still participating in the workforce (2010).

The concern is whether the ageing workforce is healthy as evidence from National Health and Morbidity Survey indicates that 17.5% Malaysian aged 18 and above have diabetes (2015).

There is a concern of unhealthy ageing workforce towards Malaysia's aim of becoming a high income nation and its effects to economic wellbeing as well as average living standards.

Population ageing is also one of the major headwinds of productivity growth. It is important to understand the impact of changing age structure to the productivity of the nation.

RESEARCH OBJECTIVES

Research Objectives

❑ To determine the degree of each working age groups and ageing workforce towards the productivity in Malaysia.

❑ To examine the short run and long run relationship between ageing workforce towards productivity.

❑ To check the causal relationship through Granger causality of ageing workforce and productivity.

RESEARCH METHODOLOGY

Theoretical Framework

The Cobb-Douglas production function:

$$Y_t = K_t^{\alpha}\ (A_t\ h_t)^{\ 1-\alpha}$$

Y_t is output, K_t is capital input per worker, h_t is human capital per worker, and A_t represent productivity. α is a parameter between zero and one it measures how fast diminishing returns to investment set in the economy.

By taking logs of both sides produce:

$$log(Y_t) = \frac{\alpha}{1-\alpha} log\left(\frac{K}{Y}\right)_t + log(A_t) + \log(h_t)$$

Theoretical Framework

➢ As for this study, it will only focus on the components of productivity into the effect of working aged population. This is because previous studies by Aiyar, Ebeke, & Shao (2016), Maestas & Powell (2015) and Feyrer (2007) have proven the overwhelming **importance of the productivity channel.**

➢ Productivity coefficients shows a magnitude higher than the other factor coefficients (capital per worker and human capital) towards demographic regressor.

Schematic Diagram
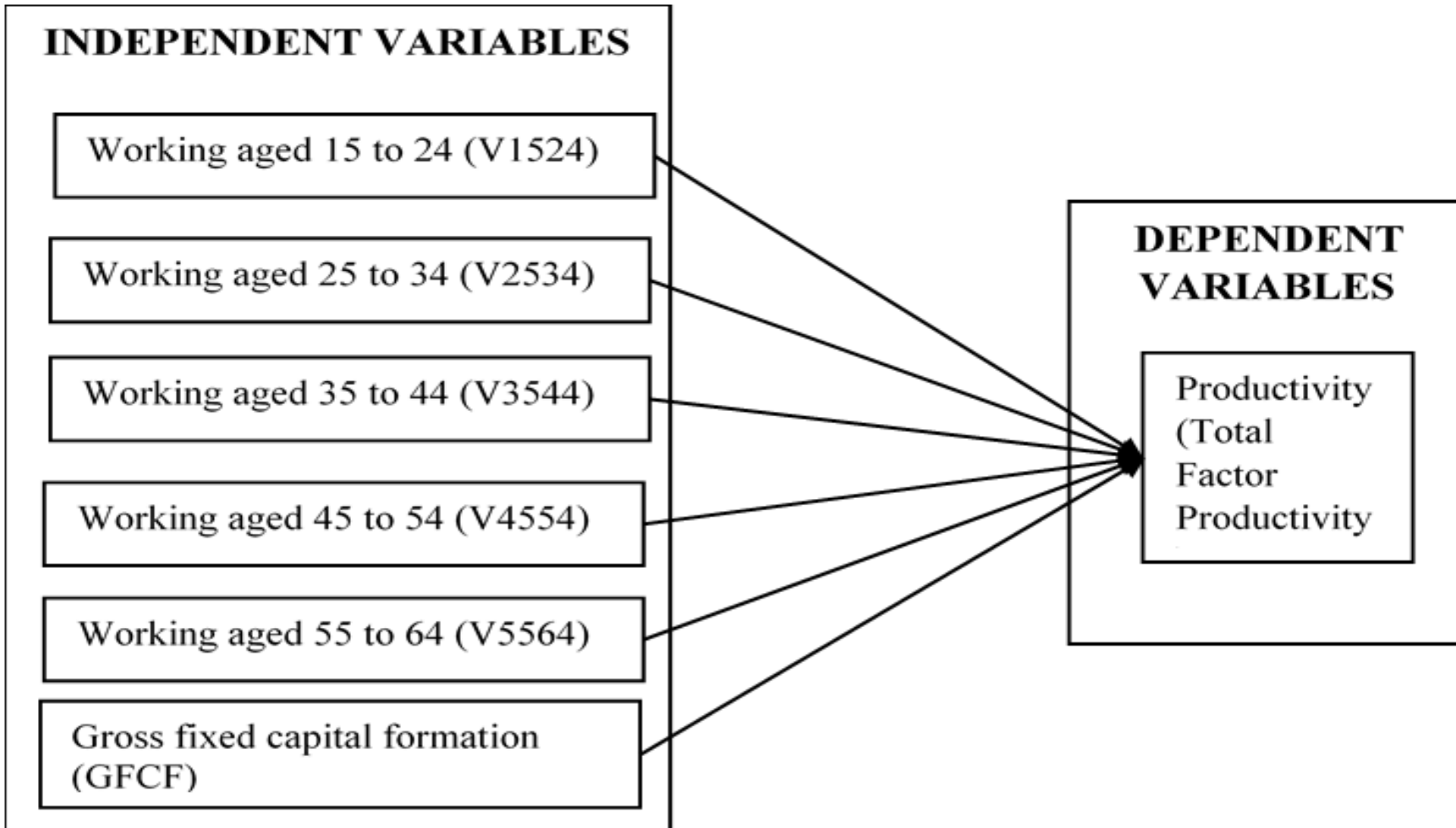
Model Specification

In terms of multiple linear regression model:

$$\ln TFP_t = \beta_0 + \beta_1 LnV1524_t + \beta_2 LnV2534_t + \beta_3 LnV3544_t - \beta_4 LnV4554_t - \beta_5 Ln5564_t + \beta_6 LnGFCF_t + \varepsilon_t$$

- All variables are measured in real term of natural logarithm.

- β_0 is constant, β is the slope coefficient and ε_t is the error term.

- t is referring as time from 1982 until 2014.

- The sign of coefficients for $\boldsymbol{\beta_1, \beta_2\ \beta_3}$ **and** $\boldsymbol{\beta_6}$ **is expected to be positive** while $\boldsymbol{\beta_4}$ **and** $\boldsymbol{\beta_5}$ **is expected to be negative** because it is assumed that an increase in the old aged working population will have a negative impact to TFP.

Data Description

Variables	Indicator Name	Unit	Source of Data
Dependent variables			
Productivity: Total Factor Productivity (TFP)	CTFP	Index at constant (2011=1) in Ringgit Malaysia	Penn World Table 9.0
Independent variables			
Total Employment (aged group)			
Aged 15 to 24	V1524		Department of Statistics Malaysia (DOSM)
Aged 24 to 34	V2534		
Aged 35 to 44	V3544	Thousand	
Aged 45 to 54	V4554		
Aged 55 to 64	V5564		
Domestic Investment	Gross Fixed Capital Formation (GFCF)	Ratio GFCF to GDP	Department of Statistics Malaysia (DOSM)

RESULTS

Descriptive Statistics

	LCTFP	LV1524	LV2534	LV3544	LV4554	LV5564	LGFCF
Mean	-0.045915	7.535352	7.883093	7.591664	7.179675	6.291478	3.367348
Median	-0.043410	7.530641	7.904409	7.675732	7.162320	6.237348	3.261908
Maximum	0.044813	7.765824	8.452228	8.081444	7.808770	7.014455	3.895488
Minimum	-0.148868	7.366888	7.358194	6.963852	6.557204	5.815026	3.094696
Std. Dev.	0.047071	0.111247	0.305355	0.351762	0.400961	0.345111	0.263536
Skewness	-0.222480	0.234485	0.073636	-0.390684	0.035327	0.525886	0.732817
Kurtosis	2.383307	2.497774	2.136545	1.774181	1.573197	2.249249	2.210831
Jarque-Bera	0.795162	0.649226	1.054961	2.905605	2.806045	2.296047	3.809952
Probability	0.671944	0.722807	0.590090	0.233914	0.245853	0.317263	0.148826
Sum	-1.515199	248.6666	260.1421	250.5249	236.9293	207.6188	111.1225
Sum Sq. Dev.	0.070902	0.396032	2.983728	3.959575	5.144631	3.811244	2.222435
Observations	33	33	33	33	33	33	33

➢ max and min values do not show any huge divergent and disparity

➢ Kurtosis result shows normal distribution, (distribution with a flat peak and thinner tails)

➢ Jarque Bera estimation value shows that all variables accept the null hypothesis of normal distribution

Unit Root Test – ADF & PP

Order of Integration Variables	ADF – 1st Difference			PP- 1st Difference		
	None	**Intercept**	**Trend & Intercept**	**None**	**Intercept**	**Trend & Intercept**
LCTFP	-5.37135 (0.0000)***	-5.29157 (0.0001)***	-5.26602 (0.0009)***	-5.37209 (0.0000)***	-5.28756 (0.0001)***	-5.26087 (0.0009)***
LV1524	-5.669222 (0.0000)***	-5.99849 (0.0000)***	-5.95555 (0.0002)***	-5.66799 (0.0000)***	-6.00204 (0.0000)***	-5.95906 (0.0002)***
LV2534	-0.76120 (0.3778)	-5.020446 (0.0003)***	-5.01136 (0.0017)***	-2.42764 (0.0169)**	-5.01829 (0.0003)***	-5.00319 (0.0017)***
LV3544	-0.52113 (0.4821)	-1.33520 (0.5994)	-5.22067 (0.0010)***	-1.51923 (0.1187)	-4.67688 (0.0007)***	-5.27059 (0.0009)***
LV4554	-1.031639 (0.2653)	-4.86072 (0.0005)***	-4.79021 (0.0029)***	-1.80531 (0.0680)*	-4.85848 (0.0005)***	-4.78760 (0.0030)***
LV5564	-2.70920 (0.0084)***	-4.57138 (0.0010)***	-5.88957 (0.0002)***	-2.620571 (0.0105)**	-4.57138 (0.0010)***	-8.07767 (0.0000)***
LGFCF	-3.60148 (0.0008)***	-3.56131 (0.0127)**	-3.50912 (0.0559)*	-5.37209 (0.0000)***	-5.28756 (0.0001)***	-5.26087 (0.0009)***

➢ Stationary test was conducted at level & first differences using ADF test and PP test

➢ All variables are found to be stationary with integrated at I(1) and statistically significant at 1% level of significance.

Ordinary Least Square Method (OLS)

Variables	Coefficient	Standard error	т-statistic
Constant	0.789339	0.548056	1.440252
LV1524	-0.437799	0.143360	-3.053847***
LV2534	0.376315	0.204518	1.840008*
LV3544	-0.778334	0.172314	-4.516948***
LV4554	0.942914	0.199055	4.736939***
LV5564	-0.353378	0.156025	-2.264875**
LGFCF	0.255246	0.035456	7.199001***
R-square	0.812933		
Adjusted R-square	0.769763		
Durbin Watson	1.373062		
F-Statistics	18.83124 (0.000000)***		

➢ All variables are statistically significant.

➢ TFP has a positive relationship with LV2534, LV4555 and LGFCF.

➢ TFP has a negative relationship with LV1524, LV3544 and LV5564.

Cointegration Test & ECM

Variable	ADF -Level			PP – Level		
	None	Intercept	Trend and Intercept	None	Intercept	Trend and Intercept
Residual (UHAT)	-4.339499 (0.0001)***	-4.276362 (0.0020)***	-4.221574 (0.0113)**	-4.265204 (0.0001)***	-4.194637 (0.0025)***	-4.133242 (0.0139)**

Variables	Coefficient	Standard Error	τ-statistics
C	0.001459	0.011891	0.122706
D(LV1524)	-0.283549	0.187009	-1.516233
D(LV2534)	0.187708	0.302773	0.619962
D(LV3544)	-0.624006	0.252406	-2.472234**
D(LV4554)	0.896949	0.260983	3.436806***
D(LV5564)	-0.381636	0.139103	-2.743553**
D(LGFCF)	0.294625	0.048744	6.044321***
μ_{t-1}	-0.828095	0.246327	-3.361769***
R-squared: 0.638540			
Durbin-Watson: 1.570969			

➢ There is a long-term relationship between the variables and cointegration between variables.

➢ The error correction term is significant, there is existence of short run relationship between variables.

➢ The ECT does not suffer from a spurious regression.

Granger Causality Test

- There is **no causality relationship** between various working age group with TFP.

- **Bidirectional** causality between **GFCF** and employed person age group 45 – 54 **(LV4554). Unidirectional** causality between the employed person age group 45 -54 **(LV4554)** and age group 25 – 34 **(LV2534).**

Diagnostic Test

Test Normality of Error Term: Jarque Berra Test
- Do not reject null hypothesis
- Error term is normally distributed

Test on Variance of Error Term (Heteroscedasticity): White Test
- Fail to reject the null hypothesis of error term is homoscedastic at 10% level of significance.
- The means error term has constant variance.

Test on Function Form: Ramsey Regression Specification Error Test
- Fail to reject the null hypothesis
- This model indicates that there is no misspecification of function form. The data does fit multiple linear regressions.

SUMMARY FINDINGS

Summary Findings

Objective 1

➢ We find a mixed result of relationship between different age group towards productivity. Employed age groups (LV4455 & LV2534) have a positive relationship with productivity, LV4454 a biggest contribution. A negative relationship with productivity for employed person age group 55-64. However, age group LV1524 and LV3544 that shows a negative relationship with productivity does not correspondent with previous findings that indicate a younger aged employed cohort should give a positive relationship.

Objective 2

➢ There is a long-term relationship between the variables and cointegration between variables. The **coefficient of error term is 0.8281** suggesting that TFP adjusts to employed person age group of 15-24, 25-34, 35-44, 45-54, 54-64 and gross fixed capital formation with **a lag of 82.81% of discrepancy between long-term and short-term TFP is corrected within a year**.

Objective 3

➢ No causal relationship between various working aged group with TFP.

Limitation of study

Data

I

- Availability of employment data by age for a longer period.

Previous Studies

II

- Lack of previous quantitative research study in Malaysia for this topic.
- Studies on ageing in Malaysia focus on qualitative research

Significant

❑ New knowledge to face the challenges of macroeconomic impact of ageing in Malaysia

❑ For the Government in policy development and implementation in facing ageing population

RECOMMENDATIONS

Recommendation

➢ Government to design policies that cater to the different aged cohort of workforce:

Old Age Group LV5564   **Negative relationship with productivity**

- improve the employability and offers effective lifelong learning programs;
- offer flexi working hours;
- introduce a new technology that boosts productivity among older workers;
- scrap any laws that discriminate age.

Age Group LV1524

- widen the skill based of this aged group;
- Government could provide incentives to encourage employ younger workforce;
- increase the awareness of vocational educational and technical (VET) programmes.

Recommendation

Age Group LV3544   **Negative relationship with productivity**

- a more flexibility in the working hours;
- Government should continue to promote Flexi Working Arrangement (FWA) among employer in Malaysia and it should be offer to all employees and not just parent and carers.

Age Group LV4554 & LV2534   **Positive relationship with productivity**

- providing initiatives or reward systems;
- recognising and appreciate the efforts the employee has contribute;
- to create an avenues and opportunities for employees to advance in their positions;