Bridging Household Income Gap: Malaysia

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Abstract - The purpose of this paper is to examine the long run and the short run relationship between household income gap, physical capital, human capital, and technological progress in Malaysia. Based on the Solow's growth model, this study applied the panel cointegration estimation of the full modified ordinary least square (FMOLS), as well as the Granger causality analysis. The result showed that there is a short run and long run relationship running from physical capital, human capital, technological progress towards the income gap of M40 and B40 groups of households. This study is unique because it addresses the income gap between a group of households of the bottom 40% and middle 40% across all states in Malaysia.

I. Introduction

The Department of Statistics Malaysia (DOS) in their recent publication of Household Income & Basic Amenities Survey Report 2019 (HIS & BA) 2019 reported that there were 7.3 million households in Malaysia. These households are categorised into three groups, namely, the bottom 40%, middle 40%, and top 20%. The B40, M40, and T20 groups consist of 2.89, 2.94, and 1.43 million households respectively in 2019. The vast majority of B40, M40, and T20 households reside in the urban area, 74%, 82%, and 88% respectively.

The household income gap between the M40 and B40 has been increasing since 2002 (HIS & BA, 2019). The Shared Prosperity Vision 2030 (SPV2030) has highlighted that the disparity between household income groups could cause inequitable growth. Furthermore, the income gap also has an impact on children's quality of life, the psychological state (low self-esteem and depression) among children will increase in a community (Ho, Li, & Chan, 2015). The influence of the income gap has immersed into households' decision and planning system as well. In other words, the household becomes pessimistic about the economic condition and unable to have a well-organized spending plan (Mahdzan, Zainudin, Sukor, Zainir, Wan, 2019). Besides narrowing the household income gap, equitable growth also emphasised on fair participation in the supply chain, reducing monopoly power, and improvement of anti-profiteering. According to SPV2030, sharing economic benefits will be inclusive if the livelihood of B40 households is improved with equitable income and wealth distribution.

Several researchers have addressed the issue of income disparity with respect to urbanisation (Ha, Le, & Trung-Kien, 2019; Ma, Wang, Chen, Zhang, 2018; Sulemana, Nketiah-Amponsah, Codjoe, & Andoh, 2019; Wang, Tan, Yang, Lin, & Zhang, 2019). Many researchers had also studied income disparity in a particular nation (Myers, 2017; Githuku, Omolo, & Mwabu, 2018; Rojas-Vallejos & Turnovsky, 2018) by examining income inequality of the Gini coefficient (Guo, 2017). There were no studies that analysed the Malaysian household income gap between household income groups. How do human capital, physical capital, and technological progress, attributed to narrowing the household income gap of the B40 and M40 households?

This study aims to determine how the household income gap could be bridged. First, to examine the short run causal relationship between household income gap of M40-B40, physical capital, human capital, and technological progress in Malaysia. Second, to examine the long run effect of physical capital, human capital, and technological progress on the household income gap of M40-B40 in Malaysia.

Household Income

The mean household income of B40 and M40 are RM3,152 and 7,348 respectively in 2019. In the Eleventh Malaysia Plan 2016-2020 (11MP)[1], the government has given priority on increasing the mean income of B40 households to RM 5,270 in 2020 from RM 2,537 in 2014. Therefore, the shift of focus towards the bottom 40% of the household income is crucial because a sudden change in government policies or an increase in the cost of living will have a greater effect on the low-income group. According to Figure 1, income levels for B40 and M40 groups have improved from 1997 until 2019. However, the gap between the two-household has experienced an increasing trend. Thus, this gap has created an issue among Malaysian households for the past few years that has not been resolved.
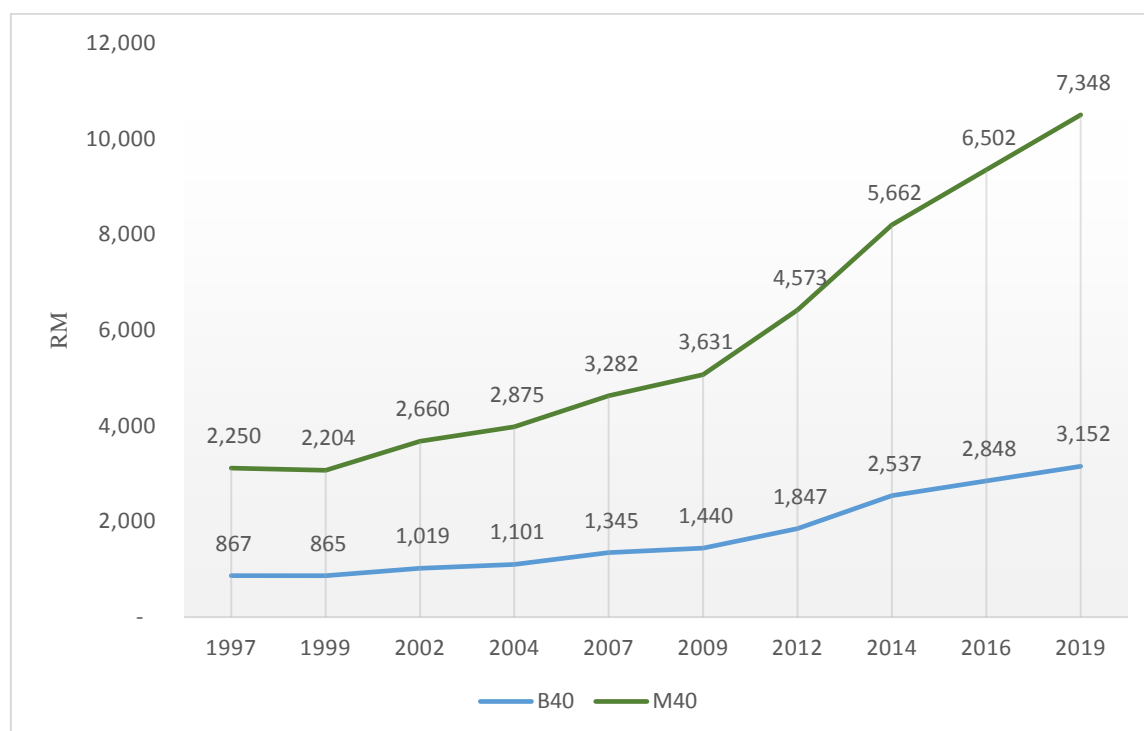

Figure 1: Monthly Mean Income of Household (RM), B40-M40
Source: Household Income Survey Report, Department of Statistics (DOS)

The disparity between household income has raised a concern of equality and review of the economic planning by the government. The gap has been prolonged for more than a decade and this has led to unintentional or unforeseen consequences that are deemed to be disastrous. This gap will need special attention by the government and a collaboration with the private sector for their contribution to tackle the issue, and if it is not contained as soon as possible, it will cause severe damage to the socioeconomic structure. Each household income

group has its own experience with financial situations that vary across the country. The income range indicator for a group of households that falls in the category of B40 is different in each state. Those household incomes that fall under RM5,110, RM3,710, RM,3,490, and RM6,960 are under the category of B40 in Melaka, Kedah, Sabah, and Selangor respectively. However, the household income that falls below RM4,850 is the overall view of B40 in Malaysia.

II. Literature Review

Many researchers have studied income disparity in a particular nation (Myers, 2017; Githuku, Omolo, & Mwabu, 2018; Rojas-Vallejos & Turnovsky, 2018). The disparity between household income was also studied by Guo (2017), by examining the income inequality through the Gini coefficient. However, it shows only in light of total household disparity without the segregation of household groups. The usage of Gini coefficient is the most widely known method to identify income inequality with the support of Kuznets curve theory. This is true for most of the past studies that conduct inequality from a macro scale point of view. The Department of Statistics (DOS) have included Gini coefficient as well to gauge income inequality between Malaysian households, income share by household group, and ethnic group in their publication (Household Income & Basic Amenities Survey Report 2019, DOS).

Therefore, the dimension of household income disparity between the group of households is necessary to conduct. Nor, Mayan, Binti, & Samat (2017) analyse specifically on the B40 groups in Penang, Malaysia on how to alleviate them into becoming a part of the M40 group of households. The result indicates there is a two-fold answer to overcome this problem, which is the internal and external factors of a household. Internal factors, education level, and skills must be pertinent to the current condition. External factors, human capital, and physical capital must be enhanced to assist the B40 groups. Nonetheless, human capital can be highlighted in terms of the quality of education that attracts the students to make a rational decision to pursue higher learning programmes (Harahap & Amanah, 2019). Additionally, human capital can also raise the income level through education and in return becoming more productive and improve the human development index at the same time (Jalil & Kamaruddin, 2018). Furthermore, Rani, Ghazali, Siwar, Isa, & Ismail (2019) also have extended their research on what contributes to the vulnerability of B40 groups in Kelantan, Malaysia. There are 3 factors attributed to vulnerability, social; economics; and environmental vulnerability. Additionally, being heavily dependent on one single source of income has caused B40 to become more vulnerable and susceptible to fall into poverty.

The original Solow's growth model has only used savings and population growth as the major influence on income per capita because it claims that every country differs in terms of savings and population (Solow, 1956). Indeed, savings does have an influence on economic performance because it ties with the relationship of investment very closely. Additionally, it has influence on capital formation as well through the initiatives of savings by the households (Mohamed Yousop, Wan Zakaria, Ahmad, Manan, & A'thif, 2020). Therefore, there are other literature has used the basis of this Solow's growth model to substantiate their results in pushing the economic condition and growth by incorporate extra element into the model, such as education attainment, education policies, capital stock, and labour stock (Myers, 2017; Arshed, Anwar, Hassan, & Bukhari, 2019). However, Mankiw, Romer, & Weil (1990) has made a breakthrough in the field of economic growth and augmented the Solow model by adding human capital and physical capital. MRW has made a point that both of these additional elements are related with saving rate and population growth. The version of augmented Solow model will be used in this present study in its attempt to address the problem of household income disparity.

Myers (2017) did incorporate Solow's growth model in the study of income inequality and finds that the result of reducing income inequality via Gini coefficient with the association of capital stock and labour is somehow mixed with the influence of economic growth. There are more determinants that affect income inequality and urge future researchers to add a more relevant independent variable that relates to income. Githuku, Omolo, & Mwabu (2018) examine income convergence in East African countries and conclude that physical capital and human capital have the potential to reduce income differences among African countries. Rojas-Vallejos & Turnovsky (2018) have used tariff reduction to determine income inequality and find that reduction in tariff will lead to increased inequality in the short run and long run period. The most affected income by this tariff policy is the lowest income quintile meanwhile the top income quintile gains more richness.

III. Methodology

In order to capture the effects of physical capital, human capital, and technological progress on the household income gap, an econometric model of the following form is estimated:

$$\text{(B40 and M40) } HIG_{it} = \beta_0 + \beta_1 PC_{it} + + \beta_2 HC_{it} + \beta_3 TECH_{it} + \varepsilon_{it} \qquad (1)$$

where HIG_{it} is the household income gap, PC_{it} is the physical capital, HC_{it} is the human capital, $TECH_{it}$ is the technological progress, meanwhile, ε and μ are the normally distributed error terms. The coefficient of β_1, β_2, β_3, α_1, α_2, and α_3 is the estimated value for HIG with respect to PC, HC, and TECH. The subscripts of *i* and *t* represent a cross-sectional of states (i = 1...16) and time period (1999-2019) respectively.

The difference in average household income between B40 and M40 is calculated to find the gap value of HIG. The independent variable of physical capital is proxy by gross fixed capital formation (GFCF) as a share of GDP and the data is obtained through DOS. The second independent variable, human capital is proxy by the number of students enrolment in a higher learning institution and the data is obtained through the Ministry of Higher Education (MoHE) website. The third independent variable, technological progress is proxy by the number of patents applied and it was obtained through the Intellectual Property Corporation of Malaysia (MyIPO).

Panel Unit Root
By employing the unit root test, test statistics may avoid any spurious estimates. Through the use of a panel unit root test, this allows the detection of the existence of stationarity level of the series.
The Im, Pesaran, and Shin (IPS) test is employed in this study. The test is an extension of the Levin, Lin, and Chu (2002) LLC test that allows for heterogeneity on the coefficient of the variables.

Panel Cointegration
The panel cointegration test was developed first by Pedroni (1999) to examine whether there is a long-term equilibrium relationship between the variables by estimating through the first and second equations in the model for each cross-sectional. This test is applied once the series has been identified to be stationary after the first difference. The two types of Pedroni panel cointegration tests are within-dimension and between-dimension. Upon taking the first difference of the stationary series from the test. From equation (1) and (2), the general estimated residual is as follows:

$$\varepsilon_{i,t} = HIG_{i,t} - \hat{\alpha}_0 - \hat{\alpha}_1 PC_{i,t} - \hat{\alpha}_2 HC_{i,t} - \hat{\alpha}_3 TECH_{i,t}$$
$$\Delta\hat{\varepsilon}_{it} = \hat{\rho}_i \hat{\varepsilon}_{it-1} \sum_{k=1}^{k_i} \quad \hat{\gamma}_{ik} \hat{\varepsilon}_{it-k} + \hat{v}_{it} \qquad (2)$$

where $\hat{\gamma}_{ik}$ and k_i are permitted to differ across all units. The null hypothesis, H_0 of no cointegration and the alternative hypothesis, H_1 of cointegration are both being tested for $\rho_i = 1$ and $\rho_i < 0$ respectively. There is a total of seven tests that are performed, which is the combination of within-dimension and between-dimension of panel cointegration. The between-group estimator is preferable than the within-group estimator and it is said that the between-group estimator has more superiority than the within-group estimator according to Pedroni (2001).

Panel Causality
The cointegrating relationship indicates the existence of a causal relationship among the variables, at least in one direction. The panel of the vector error correction model (VECM) will be estimated through the regression of the augmented vector autoregressive (VAR) model along with ECT. Thus, once the cointegration relationship has been determined, the cointegrating parameters are estimated by fully modified ordinary least squares (FMOLS), a non-parametric method to further estimate the long run effect of the independent variables on the household income gap. The FMOLS analyses are efficient techniques to correct for endogeneity and serial correlation in cointegrating regression (Thornton & Tommaso, 2019; Bispham. 2010).

The lag residual from FMOLS will be obtained and included in the first difference of the main equations of the model to express the long run association between the explanatory variables and the household income gap. The general panel VECM is specified as follows:

$$\Delta HIG_{it} = \hat{c}_i + \sum_{\rho=1}^{k} \quad \hat{c}_{2ip} \Delta PC_{it-\rho} + \sum_{\rho=1}^{k} \quad \hat{c}_{3ip} \Delta HC_{it-\rho} + \sum_{\rho=1}^{k} \quad \hat{c}_{4ip} \Delta TECH_{it-\rho} + \hat{u}_t \hat{g}_{it-1} + \hat{s}_{it} \qquad (3)$$

where Δ denotes the first difference of the variable, c_i are the parameters to be estimated; k the lag length; and g_{it-1} the lags of the residual from the group-mean panels FMOLS of Equations (3). By means of inflicting $\hat{c}_{2ip}$, $\hat{c}_{3ip}$, $\hat{c}_{4ip}$ to 0, thus Granger causality will be implemented for the short run test through the result of Walt test of $\chi 2$. The causal relationship between dependent variables and explanatory variables will be investigated and as well as indicate the short run panel causality coefficient of this relationship. This technique is as significant as the VAR

method due to its nature in giving a valuable insight regarding the inclination of the course of causality direction between the elements inside the model that points out to the short run association. The long run causality is checked by the statistical significance of the t-test on the parameter $_{ŝit}$ of the error correction term (ECT).

IV. Findings

Table 1 shows the IPS test results for all series used in this study. All series were stationary after the first difference at 5 percent level of significance.

Table 1: IPS Unit Root

	Levels		**First Difference**	
	Intercept	**Trend & Intercept**	**Intercept**	**Trend & Intercept**
HIG_{BM}	4.5868(1)	0.5943(1)	-9.79805(1)***	-3.04889(0)***
PC	3.4608(1)	0.0754(0)	-2.4332(1)***	0.2796(0)
HC	0.4244(1)	0.3812(1)	-5.4042(1)***	-3.3308(0)***
TECH	0.4197(1)	0.3645(1)	-3.4708(1)***	-2.0735(0)**

Notes: The automatic lag length selection () is based on the Schwarz information criterion. Asterisks ***, **, * denote significant at 1%, 5%, and 10% levels respectively.

The panel Pedroni cointegration test is utilised to identify the long-term equilibrium relationship between the variables by estimating Equation (1) in the model for each cross-sectional. The panel cointegration tests included two types, within-dimension and between-dimension, which consists of Panel-v, Panel-rho, Panel-ADF, Panel-PP, and Group-rho, Group-PP, Group-ADF statistics respectively.

The result of the cointegration test shows that the majority of the test statistics (4 out of 7), which is the Panel PP, Panel ADF, Group PP, and Group ADF is significant at 1 percent level (Table 2). In other words, the null hypothesis of no cointegration is being rejected at the 1 percent level of significance. Therefore, conclude that there is a cointegration relationship running between the series, a long run relationship between household income gap, physical capital, human capital, and technological progress.

Table 2: Panel Cointegration

Models	Panel v	Panel ρ	Panel PP	Panel ADF	Group ρ	Group PP	Group ADF
HIG_{BM}	-0.7121	2.5865	-4.0684***	-2.4654***	3.9969	-8.4685***	-4.2568***

Notes: The asterisks ***, **, * denotes rejection of the null hypothesis at 1%, 5%, and 10% levels respectively. The automatic lag length selection is based on Schwarz

The FMOLS method is used in this study to estimate the long-term effect of the coefficient and sign of the variables together. Equation (3) will produce the FMOLS residual to identify the short run, long run, and causality direction between the variables. The result shows that there is a bidirectional relationship running between household income gap and human capital at 1 percent and 5 percent significance level (Table 3). The long run relationship between household income gap, human capital, and technological progress is significant at 1 percent level.

Table 3: Panel VECM

Dependent Variable	ΔHIG_{BM}	ΔPC	ΔHC	$\Delta TECH$	ECT
FMOLS					
ΔHIG_{BM}	-	3.3728*	3.9564**	11.1057***	0.3681***

ΔPC	1.102654	-	1.0998	14.0952***	0.0658
ΔHC	4.4369**	3.9230**	-	8.8932***	0.4503***
ΔTECH	0.845338	3.4815*	10.8796***	-	0.8287***

Notes: The asterisks ***, **, * denotes rejection of the null hypothesis at 1%, 5%, and 10% levels respectively. The automatic lag length selection is based on the Schwarz information criterion.

V. Discussion

There was a cointegrating relationship present between the variables in the long run. There was a long run causal effect running from physical capital, human capital, and technological progress to HIG_{BM}. Human capital had a negative relationship with the household income gap of HIG_{BM}. Thus, more investment in human capital will reduce the income gap between M40 and B40 households. Human capital has become an essential development in order to reduce the disparity of income groups.

There is also evidence of short run effects of human capital on the household income gap. A bidirectional relationship exists between the two elements. Thus, human capital indeed promotes reduction in income disparity across 13 states and 3 federal territories in Malaysia. More attention, initiatives, guidelines, and strategies are required than ever before to alleviate the standard of education in the higher learning institution. A new agenda towards focusing on higher education institutions that leads to a new opportunity for students to be able to achieve higher certificates and qualifications to enter the workforce must be adequate to fulfil the socioeconomic gap.

A higher level of education will ensure a more decent job selection that leads to a higher paying job. Albeit, the mean monthly wages for those who have a bachelor's degree is RM5,903, which is much higher than the national figure (KRI Report, 2020). In the labour force dimension, there is a total of 15.6 million persons employed and only 29.4 percent of employed persons with tertiary education in 2019. Meanwhile, there is only 14.7 percent of the labour force that specifically possess a bachelor's degree in 2017 (KRI Report, 2018).

Therefore, a policy recommendation of creating an awareness program that caters to the needs of youth to pursue higher education must be established. Not just to pursue a Diploma certificate, rather, it entails pushing forward until reaching the goal of a bachelor's degree or master's degree if necessary. Initiate a program for final year students in secondary school and final year semester students in universities to participate in a higher learning education journey to reap the benefits in the future. An adjustment and review on the Malaysia Education Blueprint (Higher Education) 2015-2025 must be revised because it is a critical subject to tackle for the purpose of addressing the social issue among Malaysians.

VI. Conclusion

This study investigated the short run, long run, and causality relationship between the group of households income of M40-B40, physical capital, human capital, and technological progress by employing an augmented Solow's Growth model. The empirical results indicate that there is a short run and long run relationship running from physical capital, human capital, and technological progress towards the household income gap. Nonetheless, the Granger causality test shows that there is a bidirectional relationship between human capital and household income gap. However, human capital is the only variable that has a negative relationship with household income gap. Hence, an investment in human capital has the tendency to decrease the disparity between household income groups.

This finding has a crucial role in producing a policy recommendation on human capital development. Additional initiatives and student aspiration pillars on Malaysia Education Blueprint (MEB) can therefore have the potential to eliminate socio economic imbalance issues among the people. Insert a 'Meneraju Hadapan' initiative to create an awareness programme and be motivated to pursue higher education for final year post-secondary and tertiary (STPM, matriculation, foundation, diploma) students. The strategy is to equip students mentally, physically, and emotionally for future academic challenges.

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