Malaysia's Macro-Financial Strategy in Reducing Property Wealth Disparity and Increasing Property Ownership Affordability – Who Benefits More?

ABDUL HAMID MAR IMAN[a]* CHRISTOPHER GAN[b]

[a]Universiti Malaysia Kelantan
[b]Lincoln University, Canterbury, New Zealand

ABSTRACT

The relationship of a country's macro-financial strategy against property-based relative wealth (PBRW) disparity and property ownership affordability (POA) has not been analyzed before. These are perennial issues of any country since POA influences the level of PBRW disparity among the people. This paper addresses two issues. First, whether POA influences PBRW disparity or PBRW disparity influences POA or whether both have a bi-directional relationship. Second, whether the macro-financial strategy has any effect on PBRW disparity of the citizens. We used a sample of 36,349 individual market transactions of (mainly) residential and commercial properties over a 30-year period from 1982 to 2012. The study uses a vector autoregression to investigate the above issues. The result revealed that Malaysia's macro-financial strategy has had different effects on PBRW disparity and property ownership affordability of the Malaysian main ethnics group (Malays). It benefited the non-Malays more than the Malays.

Keywords: Wealth Disparity, Ownership Affordability, Cointegration, Granger Causality, Gini Coefficient, Vector Autoregression

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* Corresponding Author: E-mail: hamid.m@umk.edu.my
Any remaining errors or omissions rest solely with the author(s) of this paper.

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INTRODUCTION

Property-based relative wealth (PBRW) disparity is a new economic concept that has not been widely discussed or researched previously. There are only two studies that attempt to address this concept (Muhammad, 2011; Gan and Hamid, 2013). Further, measures of property ownership affordability (POA), such as housing affordability, have been well documented in the literature. However, no studies have examined the relationship of macro-financial strategy against POA and wealth disparity. In particular, no studies have examined whether or not macro-financial strategy of a country has influenced its citizens' PBRW disparity and POA. In addition, studies on the fundamental aspects related to property-based wealth accumulation have been very few (Sherraden, 2001; Kurz and Blossfeld 2004).

PBRW disparity and POA are a perennial issue of any country. It is argued that POA influences the level of PBRW disparity among the people of a country. Nonetheless, the level of PBRW disparity can also influence POA. Theoretically, PBRW disparity should be reduced by increasing POA. This is because financial hardship due to increasing housing costs leaves too little in the household budget for the families (Burke and Ralston 2003). POA is, thus, a peculiar problem especially for the low-income population because of difficulty to buy property. But it can also be a trap for the middle-income population because they can buy neither low-cost nor medium-cost properties (Mok and Lim, 2013). Gan and Hamid (2013) have disclosed that the average affordable property price over a 31-year period (1982-2012) for average Malaysians was about RM 114,256 for the Malays and RM 163,525 for the non-Malays. These figures were rather low.

Focusing on property to analyze POA and PBRW disparity is important for three main reasons. First, the property sector is a substantial driver of the Malaysian economy (MGCC, 2011). It is a major contributor to the nation's wealth (Acemoglu and Robinson, 2012, Knight Frank Research, 2012) and it has a close relationship with economic development (Hui, 2009). Second, property is a source of capital which, in turn, is a main source of wealth (Smith, 1904, Muellbaur, 2006). For example, real estate property can make up about 96% of wealth (Muhammed, 2011). Unlike income, which is a flow, property in terms of its physical entity and value is a stock. Thus, it could be a better measure of a person's economic prosperity because it is stable and it remains for a relatively longer period of time during a person's lifetime. In other words, it is a better wealth indicator as it represents an

accumulated stock rather than a passing flow of resources. Third, POA and PBRW disparity are a fundamental issue of the population of any country. Property has an important role in the creation and distribution of wealth (Appleyard and Rowlingson, 2010). Although property value is relatively stable, it can change according to changes in property prices. This phenomenon, in turn, affects POA and economic disparity. Such an analysis can partly evaluate the socioeconomic performance of the property market and to partly evaluate the effectiveness of government's macro-financial strategy to improve people's property-based economic standing.

Studies on economic disparity have conventionally focused on income (Ishak, 2000; Ragayah, 2008; Saari, 2010). There are no comprehensive systematic studies to calculate the level of economic disparity beyond income indicators or corporate share (Muhammed, 2011). Moreover, "income level or corporate ownership is not a true representation of one's economic well-being." (Muhammed, 2011, pp. 71-72).

Ishak (2000), Ragayah (2008), and Saari (2010) have concluded, among other things, that government's development policies towards liberalization, deregulation, privatization, export-oriented industrialization, restructuring of equity ownership, and assistance in property accumulation have increased income disparity. Besides, the Malaysian property sector is Chinese-dominated in terms of ownership and property value (Zurina *et al.*, 2009). Therefore, examining property-based relative wealth (PBRW) disparity is an important approach to analyzing ethnics' economic imbalance in Malaysia.

The normal strategy to improve POA is to increase personal income. However, much of it depends on individual efforts while the government may be able to directly or indirectly increase citizens' POA through its fiscal and monetary instruments, failing which may cause escalation in economic disparity.

This paper addresses two main issues. First, whether POA influences PBRW disparity or PBRW disparity influences POA or whether both have a bi-directional relationship. Second, whether the macro-financial strategy has any effect on PBRW disparity of the citizens. In most cases, property ownership is about affordability and different levels of people's affordability may have caused wealth disparity.

LITERATURE REVIEW

Disparity and Affordability

Adapting from Lorenz (1905) we define PBRW disparity as proportion of the total property value of a country that is concentrated among a given percentage of the population. It relates the cumulative proportion of property value to the cumulative proportion of individuals. The term *property-based relative wealth* is used to

explain 'part' of individual wealth that is reflected in the market value of property ownership, which is only a proportion of individual total wealth. The exchange price of a property on the date of transaction/valuation is a proxy of market value of a property. This value is relative to the total 'unknown' wealth of a person who may accumulate from cash (e.g. cash in hand, bank savings) and its equivalents (e.g. share, certificates) and non-liquid property (land and buildings). The value of property ownership is a source of wealth disparity in the way income is used for calculating income disparity.

For a population with values y_i, (where i = 1 to n) that are indexed in a non-decreasing order (i.e. $y_i \leq y_i + 1$), the Gini coefficient can be estimated in the simplest way as follows:

$$G = \frac{1}{n}\left(n + 1 - 2\frac{\sum_{i=1}^{n}(n + 1 - i)y_i}{\sum_{i=1}^{n} y_i}\right) \tag{1}$$

where G is Gini coefficient; n is sample size; y_i is the income of $i^{th.}$ ranked person in the sample; and i is the rank-position $i^{th.}$ person in the sample.

In the U.S. and in other rich countries, rising wealth inequality has been associated with income (Lindert, 2000; Kennickell, 2009; and Atkinson *et al.*, 2011). However, Barczyk and Kredler (2012) point out that wealth inequality is also related to (increasing) asset prices and asset-price volatility.

The government's macro-policies on property ownership related to affordability have indirectly focused on improving macro-financial strategies, particularly on increasing gross national product (GNP), per capita income (CAI), foreign direct investment (FDI), gross national savings (GNS), loan to the building and construction (LoBC), development expenditure (DevE), and base lending rate (BLR).

In the residential sub-sector, affordability is the extent to which a given level of house price or rent does not impose an unreasonable burden on a household's income (adapted from Maclennan and Williams, 1990). Linneman and Megbolugbe (1992) and Bogdon and Can (1997) use percentage of income spent on housing in the U.S. to address affordability issue; CMHC (1991) addresses the amount paid for housing that is less than 30% of gross income where costs are based on norm rental income in Canada; HNZC (2004) discusses residual income that is sufficient to purchase other necessities after paying for housing costs in New Zealand; while broader measures of affordability some of which are used in Australia are discussed in Gabriel *et al.* (2005). All these definitions take into account the relationship between housing expenditure and household income (Whitehead, 1991).

Each of the above measures of affordability has its own merits and demerits. However, discussing them is not the focus of our paper. Instead, in this paper,

we use a simple concept of affordability index: $AFI_t = \dfrac{CAI_0}{CAI_t} \times \dfrac{MV_t}{MV_0} \times 100$

where CAI_0 = per capita income in base year; CAI_t = per capita income in year t; MV_0 = mean property value in base year; and MV_t = mean property value in year t.

Government Macro-Financial Strategy

The World Bank identifies as many as three hundreds and thirty-one macroeconomic factors that can be used to indicate economic development of a particular country (World Bank Organization, 2012). The *Economic Report* published by the Ministry of Finance Malaysia (MoFM) annually reviews Malaysia's economic development under six groups of development factors, namely sectoral performance; public sector financial performance; private sector performance; external trade, balance of payment, and foreign exchange; prices, employment, and wages; and social trends (see MoFM, 1994/1995). It is not easy to select the most appropriate factors without an extensive theoretical development together with an elaborate data mining process[1]. Nevertheless, from our preceding discussion, there are a number of macro-financial factors that can be tested for their significance in influencing property ownership affordability and PBRW disparity in Malaysia's property market. Discussion follows.

Per Capita Income (CAI)

Property which is an important means of wealth accumulation increases with increasing in personal income (Segal and Sullivan, 1998; Lea and Chiquier, 1999; Boehm and Schlottmann, 2004; Di and Liu, 2005). Similarly, affordability is assessed on the basis of income net of statutory expenses (The World Bank, 2012, pp. 14).

Per capita income can be considered as an indicator of economic development. World statistics show that the wealth of a nation is significantly correlated with its level of economic development. Based on this premise, wealth size and disparity can have a systematic long-term relationship with the level of per capita income. It is generally known that income of the non-Malays is much higher than that of the Malays (EPU, 2009). Thus, we can expect a similar trend of wealth size among both groups. The wealth size of the non-Malays (expressed as a long-term mean value (LTMV) property) is hypothesized to be larger than that of the Malays and, thus, so their affordability.

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[1] An in-depth analysis on these aspects was not undertaken in this study due to time and data limitation

Foreign Direct Investment (FDI)

International trade and foreign capital are the main factors contributing to Malaysian economic development since pre-independence (Aslam and Hassan, 2003). During the first phase of building Malaysia (prior to 1985), investment focused on agriculture and infrastructure while the second phase of building Malaysia (1985-2000), investment was focused on implementing heavy industry policy (Gan and Hamid, 2013), especially the car industry (Milne and Mauzy, 1999). In general, investment in infrastructure, housing, commercial, and industry help an economy to grow initially. This could be achieved through a combination of both domestic and foreign direct investment in real estate (FDIRE).

It was reported that with the increase in the number of high-net-worth individuals (HNWIs) in developing Asia, Asian private wealth is accumulated in residential and commercial properties (Holt, 2012). This wealth comes from individual and/or organization investing in residential and commercial properties. However, detailed statistics are not available to enable a comprehensive economic analysis. The best proxy for investment in these sub-sectors is FDI, comprising investments in various economic sub-sectors such as agriculture, fishery, and forestry; mining and quarrying; manufacturing; construction; trade/commerce; real estate; financial intermediation (including insurance); services; and unclassified sub-sectors (ASEAN Secretariat, 2011).

The external factor of the supply side of the property sector is assumed to be partly represented in a country's total inward investment. Thus, FDI partly reflects a country's attractiveness and openness to foreign investments as it propels ahead (see Groh and Wich, 2009; Hussin and Hussin and Muzafar, 2009). The investment will then be partly transformed into the construction and real estate sectors' outputs (e.g. property products and services) and outcomes (e.g. renting, tenancy, lease, sale and purchase, and ownership).

The internal supply sides of the residential, commercial, and industrial sub-sectors are measured by the total loan to the construction sector and the country's gross domestic product (GDP). Malaysia's continued surge in construction, by implementing crucial strategy for project financing and property loans from the banking sector, has witnessed the expansion of the property sector in the early 1990s. The confidence in the construction sector growth prospect has given rise to the increasing amount of loans to the sector.

Whether it is total GDP or per capita GDP, both variables measure a country's level of economic productivity and progress[2]. Both GDP measures have a close relationship with the levels of a country's economic activities and production of goods and services. Increasing per capita GDP indicates a progressing economy. A rise in per capita GDP implies an increase in productivity and, therefore, signals growth in the economy (Investopedia, Barro, 2003). Based on this premise, GDP can be considered as the most important proxy of economic development (Sen, 1983).

GDP, among other things, comprise the value of property-related final goods and services. This includes the construction, sales, and investment in residential, commercial, industrial, and agricultural properties. For example, the construction sector contributes some proportion to the GDP where the more active the construction sector the higher is the GDP.

GDP is theoretically related to FDI in that the latter is a source of production of good and services where FDI is expected to positively contribute to a country's GDP. In this context, FDI is considered as output while GDP value as outcome of economic progress. Thus, if both are to be considered as economic growth factors, FDI can be expressed as some ratio of GDP (Tian et al., 2008) or GDP can be expressed as some multiple of FDI.

Gross National Savings

Savings is a means of accumulating future wealth. Underlying it is consumers' anticipation of the needs to make some provisions to hedge against uncertain future obligations. The need to save to acquire property is one of these obligations.

Many households make a conscientious plan to save their incomes in order to purchase properties in the future. A great number of these households buy properties through loans extended by the financial institutions. Part of the loans comes from national household savings. Therefore, there is a relationship between the expectation to acquire properties and savings pattern over time. On the one hand, an increase in the national savings may partly be explained by savings which are made in anticipation of a higher real estate demand. On the other hand, financial institutions' capability to extend loans to the real estate sector can be correlated to the amount of deposits and savings available. In other words, the higher the amount of deposits and savings available, the higher the amount that can be disbursed to real estate loans.

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[2] Total GDP is the total added-value of final goods and services, produced domestically over a period of time. Per capita GDP indirectly measures the added-value of production of each individual person's final goods and services in an economy

Loan to Property Sector

Property ownership is contingent upon bank credit availability (Stern 2001; Karger 2004; Sykes 2005). Over the long run, a large proportion of people's property-based wealth exists in the form of bank loans. Unfortunately, details of individual loans for property ownership are not available in Malaysia. Instead, these loans are grouped together under "loans to the building and construction sector" (Thillainathan, 1997).

Loans to the building and construction sector (LoBC) can be considered as an economic development indicator variable (MFF) against PBRW. On the demand side, loan to the real estate sector and/or housing loan can be used as a proxy of economic growth. Specifically, loans to the building and construction sector have been committed by the Malaysian government to enhance the country's infrastructural development. According to the *Economic Report* (2012/2013) published by the Ministry of Finance, although the construction sector contributes only around three per cent to the national gross domestic product (GDP), it has strong forward and backward linkages with the rest of the economy.

This sector influences both the supply and demand for goods and services, thus, impacting the national economy. The construction sector also boosts the growth of the financial system and capital market by increasing the demand for project financing and property loans from the banking sector. For example, in 2012, loans worth RM32.2 billion were approved by the banking sector for construction activities, RM95.2 billion for the purchase of residential properties, and RM52.2 billion for non-residential properties. The construction sector also boosts the economy by creating jobs as well as increasing consumption. Overall, construction-push will lead to positive spill-over on the economy (Anon, 2012). One of the spill-overs can be in the form of indirect increase in people's relative wealth that is translated, among other things, into property ownership.
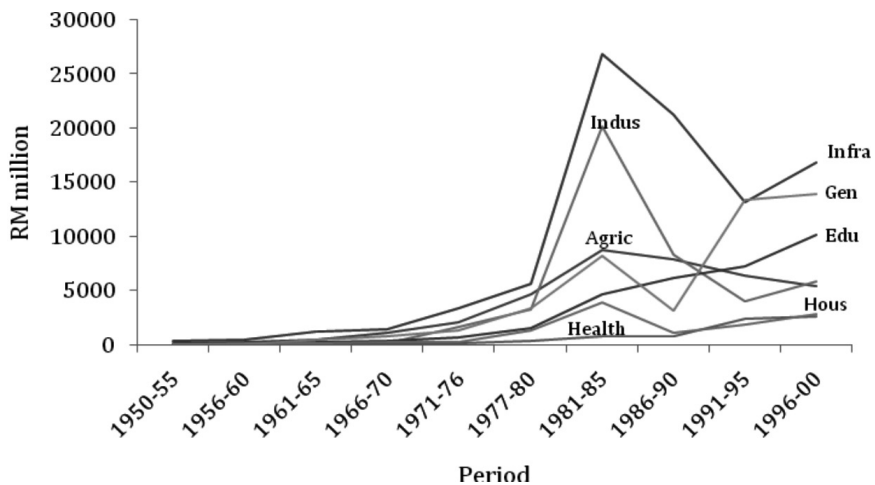
Development Expenditure (DevE)

The annual budget committed by the government to pursue various types of country's socio-economic activities/projects goes mainly to social services, economic services, security, and general administration (MoFM, 2012/2013). Out of RM30 billion of development expenditure in the Nineth Malaysia Plan (2006-2010) and Tenth Malaysia Plan (2011-2015), some proportion was allocated to reduce intra- and inter-ethnic income and wealth gaps (Chin, 2008). Other targets included poverty eradication, affordable housing, access to water and electricity and enhancement of healthcare, improvement of standard of living of marginalized

groups, strengthening human capital, public safety upgrading, improvement of environmental management and conservation, development of regional corridors, and acceleration of development in Sabah and Sarawak. Some specific aspects of the spending include food security program, building rural roads, providing low-cost housing while coping with the surge in the cost of building materials for approved infrastructure projects.

However, we argue that such an emphasis and priority in the development expenditure has not been consistently in favour of the property sector. In the first-phase of the 'building Malaysia' era (up to mid-1980s), focus was given to correct rural-urban imbalances, in the second phase (1985-2000), emphasis was on industrial transformation, while currently priority is given to turn Malaysia into a developed nation. Along these milestones, property-related wealth creation was not neglected, but direct policies and instruments to increase property ownership among the Malays have not been visible or at least have not been effectively implemented.

Figure 1 shows that the government development expenditure for housing was among the smallest and was just above that for health by some percentage. Therefore, it should not be surprising if Malaysia's development expenditure did not benefit the PBRW of the Malays (and non-Malays as well) over the long term.

Source: Constructed from data in Malaysia Development Plans, various years.

Figure 1 Malaysia's development expenditure trends, 1950-2000
(Agric = agriculture; Edu = education; Gen = general; Health = health; Hous = housing; Idus = industry; Infra = infrastructure)

Base lending rate

Competitive low interest rates can spur demand for property (Lerman and Hendey, 2011) while high interest rates coupled with credit controls can reduce the supply of loans, making effective demand for homes decreases. With high prices, high interest rates, and greater difficulty in qualifying for loans, affordability is reduced too (OECD, 2011, chapter 4). Since interest used to fluctuate over time, it can be expected to influence PBRW in a certain way. In this study, we are curious to discover whether interest rate influences PBRW in a positive or negative way and to estimate the magnitude of its impact on PBRW.

Causality and Cointegration Theory

Granger Causality Test

The relationship between PBRW and government's micro-financial strategies (MFS) has never been previously researched. MFS are expected to be exogenous to, integrated with, and cause changes in PBRW. For convenience of discussion, we represent PBRW and MFS as Y and X variables, respectively, as follows:

$$\Delta Y_t = b_1 \Delta X_t + b_2 \mu_{t-1} + \varepsilon_t \tag{2}$$

where Δ denotes first difference, μ_{t-1} is the one period lagged value of the residuals from estimation of equilibrium error term, and ε_t is the error term with the usual properties.

For cointegrated series, the error correction term, μ_{t-1} which represents the speed of adjustment toward the long-run values, provides an added explanatory variable to explain changes in Y_t without μ_{t-1} cointegrated system being estimated in differences or being over-differenced. Equation (2) is a single equation of error correction model (ECM) which can be also used in the multivariate systems. For a bivariate system consisting of X-Y relationship:

$$\Delta Y_t = Y_y \mu_{t-1} + \sum_{j=1}^{n} \beta_1 \Delta X_{t-j} + \varepsilon_{1t} \tag{3a}$$

$$\Delta X_t = Y_x \mu_{t-1} + \sum_{i=1}^{n} \delta_i \Delta Y_{t-i} + \sum_{j=1}^{n} \phi_j \Delta X_{t-j} + \varepsilon_{2t} \tag{3b}$$

A time series Y_t Granger causes another time series X_t if the present value of X can be better predicted by using past values of Y, considering other relevant information (including the past values of X) used in either case. The standard Granger-causality test can be expressed in equation (3a) without μ_{t-1}. However, if the variables are cointegrated, μ_{t-1} is necessary. More specifically, X_t is said

to cause Y_t provided that β_1 in equation (3a) is non-zero. Similarly, Y_t causes X_t if some δ_i is not zero in equation (3b). If both of these events occur, a feedback effect is present.

In a Granger-causality situation, test for endogeneity and exogeneity of variables is a fundamental aspect of modeling. Expanding equations (4a -4e), we test the exogeneity of GM_{t-1}, GN_{t-1}, and DG_{t-1} in their respective relationships using the following sets of equation:

$$GM_t = f(GM_{t-1}, GM_{t-2}, AFIM_{t-1}, AFIM_{t-2}, GDP_{t-1}, FDI_{t-1},$$
$$GNS_{t-1}, LoBC_{t-1}, DevE_{t-1}, BLR_{t-1}) \qquad (4a)$$

$$AFIM_t = f(AFIM_{t-1}, AFIM_{t-2}, GM_{t-1}, GM_{t-2}, GDP_{t-1}, FDI_{t-1},$$
$$GNS_{t-1}, LoBC_{t-1}, DevE_{t-1}, BLR_{t-1}) \qquad (4b)$$

$$GN_t = f(GN_{t-1}, GN_{t-2}, AFIN_{t-1}, AFIN_{t-2}, GDP_{t-1}, FDI_{t-1},$$
$$GNS_{t-1}, LoBC_{t-1}, DevE_{t-1}, BLR_{t-1}) \qquad (4c)$$

$$AFIN_t = f(AFIN_{t-1}, AFIN_{t-2}, GN_{t-1}, GN_{t-2}, GDP_{t-1}, FDI_{t-1},$$
$$GNS_{t-1}, LoBC_{t-1}, DevE_{t-1}, BLR_{t-1}) \qquad (4d)$$

$$GD = f(GM_{t-1}, GM_{t-2}, GN_{t-1}, GN_{t-2}, AFIM_{t-1}, AFIM_{t-2}, AFIN,$$
$$GDP_{t-1}, FDI_{t-1}, GNS_{t-1}, LoBC_{t-1}, DevE_{t-1}, BLR_{t-1})$$
$$\text{and the derivatives} \qquad (4e)$$

where all variables are as defined earlier and t denotes time. The Granger causality hypothesis test is given as follows:

$$H_0: \text{all parameters} = 0 \quad \text{versus} \quad H_1: \text{Not } H_0$$

In each case, a *rejection* of the null implies that there is Granger causality. The causality test can be easily extended to a multivariate framework involving more than two variables. For example, there may be another variable, Z, which jointly cause X or Y. This study utilizes the classical procedure of Granger (1969, 1986) and Engle and Granger (1987) to test for causality.

Johansen Test for Cointegration

Relating PBRW to the macro-financial variables without correcting for stationarity may produce spurious regression results. The standard procedure to overcome such a problem is unit-root test in the data and, thus, the variables. Cointegration analysis is performed for this purpose. In this study, we adopt the Johansen approach to

cointegration analysis. The Johansen's methodology takes its starting point in the vector autoregression (VAR) of order p expressed as (Hjalmarsson and Österholm, 2007):

$$y_t = \mu + A_1 y_{t-1} + A_p y_{t-p} + \varepsilon_t \tag{5}$$

where y is an $n \times 1$ vector of variables that are integrated of order one – commonly denoted I(1) – and ε_t is an $n \times 1$ vector of innovations. The VAR can be re-written as

$$\Delta y_t = \mu + \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \tag{6}$$

where

$$\Pi = \sum_{i=1}^{p} A_i - 1 \quad \text{and} \quad \Gamma_i = -\sum_{j=i+1}^{p} A_j \tag{7}$$

If the coefficient matrix Π has reduced rank $r < n$, then there exists $n \times r$ matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta'y$ is stationary. Note that r is the number of cointegrating relationships, where the elements of α are known as the adjustment parameters in the vector error correction model and each column of β is a cointegrating vector. It can be shown that for a given r, the maximum likelihood estimator of β defines the combination of y that yields the r largest canonical correlations of Δy_t with y_{t-1} after correcting for lagged differences and deterministic variables when present.

Johansen proposes two different likelihood ratio tests of the significance of these canonical correlations and thereby the reduced rank of the Π matrix: the trace test and maximum eigenvalue test, shown in the following two equations, respectively.

$$J_{trace} = -T \ln \sum_{i=r+1}^{n} (1 - \lambda_i) \tag{8}$$

$$J_{max} = -T \ln (1 - \lambda_{r+1}) \tag{9}$$

where T is sample size and λ_i is the ith. largest canonical correlation. The trace test tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. The maximum eigenvalue test, on the other hand, tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of $1 + r$ cointegrating vectors.

We specify a parsimonious regression model relating property's LTMV-based Gini coefficient of the Malays and non-Malays (GM_t and GN_t), Malays' and inter-ethnic wealth disparity (DG_t) against the macro-financial variables, namely capita

income (CAI), gross domestic product (GDP), gross national savings (GNS), foreign direct investment (FDI), loan to the building and construction sector (LoBC), development expenditure (DevE), and base lending rate (BLR). By taking exogeneity and causality into account, the models are then specified as shown in equations (4a – 4e) (adapted from Jacobs et al., 1979; Maddala, 1992; Cheung, 1995; Tian et al., 2008).

Vector Autoregression

The aim of this study is to analyze PBRW dynamics and causality using the vector autoregression (VAR) (see Sims, 1980). However, one area of controversy about VAR is whether the variables included in a VAR model should be stationary. Some argue that if the time series is non-stationary, regressing one time series variable on another or more time variables can often give spurious results due to time-riding effects. One way to resolve the non-stationarity issue is by applying differencing on the variables under study. Sims (1980) recommends against differencing even if the variables have a unit root. The main argument against differencing is that it throws away information concerning the co-movement in the data which will, in general, lead to poor forecast. Therefore, a solution has to be found in order to analyze the differenced co-movement of the series so that neither spurious relationship nor loss of information in the series involved comes into effect.

The concept of cointegrated series has been suggested by Engle and Granger (1987) as a solution to this problem. In principle, if a set of variables X and Y are cointegrated, i.e. Xt, $Yt \sim CI$ (1), then there must exist an "error correction" which describes the short-run dynamics of Yt and Xt, in the general form.

Equations (2), (3a), and (3b) constitute a vector autoregression model (VAR) in first difference, which is a VAR type of ECM. In equations (3a) and (3b), if γ_x and γ_y equals zero, the model is a traditional VAR in first difference. If γ_y or γ_y differs from zero, ΔY_t or ΔX_t responds to the previous period's deviation from the long-run equilibrium. Hence, estimating Y_t as a traditional VAR in first difference, for example, is inappropriate if Y_t has an error correction representation. Therefore, if the variables are non-stationary and are cointegrated in the same order, the correct method is to estimate the error correction model, which is a VAR in first differences with the addition of a vector of cointegrating residuals. This VAR system does not lose long run information.

The general form of the ECM is expressed as follows:

$$\Delta y_t = \beta_0 + \beta_1 \Delta x_t + \gamma(x_{t-1} - y_{t-1}) + e_t \qquad (10)$$

where $\Delta y_t = y_t - y_{t-1}$ and $\Delta x_t = x_t - x_{t-1}$ are dependent and independent variables, respectively. Where a multivariate relationship is involved, as in our case, the term $(x_{t-1} - y_{t-1})$ can be substituted by $(\hat{y}_{t-1} - y_{t-1})$

The modified ECM is now expressed as follows:

$$\Delta y_t = \beta_0 + \beta_1 \Delta x_t + \gamma(\hat{y}_{t-1} - y_{t-1}) + e_t \qquad (11)$$

METHODOLOGY

Data and Analysis Procedure

We used a sample of 36,349 individual market transactions of mainly residential and commercial properties from the state of Johor and Selangor, Malaysia from 1982 to 2012. The data were obtained from the Department of Property Valuation and Services (JPPH) and National Property Information Centre (NAPIC). We then identify Malay, non-Malay, and company ownerships. This last category was excluded from the sample because of unrecognizable or unclassifiable ethnic identity of the owner(s). The data sets were sorted and grouped into annual series consisting, among other things, the name of transferor (seller/vendor); name of transferee (buyer/purchaser); and transfer price (RM/unit). From these data, we create ethnicity (based on transferee's name) and property mean price variables.

Property transaction records were used to calculate relative property-based wealth and property-based Gini coefficients of both ethnic groups using equation (1). We computed property long-term mean-value-based Gini coefficients (MV-based Gini coefficients) of the Malay and non-Malays to derive PBRW disparity of both groups. PBRW disparity and property ownership affordability index of the Malays (AFIM) and non-Malays (AFIN) were then included in equations (4a – 4e). Data on population (including race or ethnic proportions) were obtained from Department of Statistics Malaysia (for various years). Data for macro-financial factors, namely GDP, CAI, FDI, GNS, LoBC, DeVE, and BLR were obtained from various published sources such as Bank Negara Reports, Malaysia Economic Reports, Malaysia population statistics, Five-Year Malaysia Plans, World Economic Forum, UNCTAD publications, IMF Working Papers, and Malaysian Industrial Development Authority statistics.

RESULTS AND DISCUSSION

The results for unit root test against the endogenous and exogenous variables indicate that all variables were I(1) in levels but I(0) in difference, indicating the presence of unit root (Table 1). Therefore it is appropriate to use differencing of the variables for the model estimation.

Table 1 The ADF τ-Values for Unit Root Test[ξ] against the variables

	Intercept included			Intercept and trend included		
	Level	**Differenced**		**Level**	**Differenced**	
		First	**Second**		**First**	**Second**
Endogenous:						
lgGM	−3.693	−10.342	−5.426	−3.693**	−10.151	−4.612
lgGN	−2.244*	−7.225	−10.634	−2.673*	−1.163*	−3.722**
lgAFIM	−2.289*	−6.899	−3.312**	−1.779*	−3.981**	−3.268*
lgAFIN	−3.811	−2.198*	−7.085	−3.498*	−4.028**	−7.291
lgGD	−2.747*	−6.393	−5.524	−2.700*	−3.563*	−4.295**
Exogenous:						
lgGDP	0.192*	−4.817	−6.828	−2.188*	−4.792	−6.683
lgFDI	−2.052*	−7.531	−5.003	−2.977*	−7.406	−4.896
lgGNS	−1.365*	−5.508	−9.926	−0.301*	−3.114*	−4.375
lgLoBC	−1.326*	−2.715*	−4.767	−1.747*	−3.453*	−4.683
lgDevE	−0.587*	−5.678	−9.105	−2.536*	−5.570	−8.927
lgBLR	−1.872*	−5.467	−5.060	−3.847**	−5.432	−4.893

[ξ]Test – H0: Series has a unit root. H0 is not rejected at **1% level and *5% level.

Critical t-values:	1% level	−3.670	Critical t-values:	1% level	−4.309824
	5% level	−2.964		5% level	−−3.574244

Table 2 Cointegration Tests for lgGM lgGN lgGD lgAFIM lgAFIN
Based on Linear Deterministic Trend First-Difference (n = 31)

Panel A: Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	**Eigenvalue**	**Trace**	**0.05**	**Prob.****
No. of CE(s)		**Statistic**	**Critical value**	
None *	0.697932	71.17570	69.81889	0.0388
At most 1	0.402340	36.45967	47.85613	0.3735
At most 2	0.340802	21.53240	29.79707	0.3253
At most 3	0.168070	9.447215	15.49471	0.3256
At most 4 *	0.132170	4.111028	3.841466	0.0426

Panel B: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized	**Eigenvalue**	**Max-Eigen**	**0.05**	**Prob.****
No. of CE(s)		**Statistic**	**Critical value**	
None *	0.697932	34.71602	33.87687	0.0396
At most 1	0.402340	14.92727	27.58434	0.7540
At most 2	0.340802	12.08519	21.13162	0.5393
At most 3	0.168070	5.336187	14.26460	0.6989
At most 4 *	0.132170	4.111028	3.841466	0.0426

Panel C: Existence of selected pairwise cointegration of endogenous variables			
		Trace Statistics	**Max. Eigen-Value**
lgGM versus	lgAFIM	No	No
lgGN versus	lgAFIN	No	No
lgGD versus	lgAFIM	Yes	Yes
	lgAFIN	No	No

Trace test and Max-eigenvalue test both indicate 1 cointegrating equation at the 0.05 level.
* denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) p-values.

Both Trace test (Panel A) and maximum Eigen statistic (Panel B) test in Table 2 suggest that the four endogenous series were not consistently cointegrated. Selected pairwise cointegration tests shown in Panel C further support this. Therefore, we suggest vector autoregression for analyzing the data. Furthermore, it was hypothesized that the endogenous dependent variable is a function of the lagged values of all other endogenous variables defined in the model (see equations 4a – 4e).

The t-values for the lagged values of endogenous variables in Table 3 suggest that neither GM nor AFIM had Granger-caused each other, thus, giving no evidence of bi-directional relationship. Further, none of the macro-financial factors has any

impact on intra-Malay property ownership affordability. Foreign direct investment (FDI) and development expenditure (DEVE) were significant relative to PBRW disparity among the Malays (GM), with DEVE having a larger coefficient of elasticity and negatively related to GM compared to FDI. The results indicate that for a 1% increase in FDI and DEVE, intra-Malay PBRW disparity dropped by 0.75% and increased by 0.23%, respectively.

Table 3 VAR Estimates of the Intra-Ethnic Models (lags 1 & 2, n = 31)

	lgGM	**lgAFIM**		**lgGN**	**lgAFIN**
$lgGM_{t-1}$	-0.279859	0.115123	$lgGN_{t-1}$	0.156510	-0.177441
	(-1.44112)	(0.74996)		(0.60865)	(-0.99274)
$lgGM_{t-2}$	0.188237	-0.025959	$lgGN_{t-2}$	-0.100558	0.157479
	(1.10796)	(-0.19329)		(-0.59092)	(1.33135)
$lgAFIM_{t-1}$	-0.109623	-0.126553	$lgAFIN_{t-1}$	-0.251502	0.459557
	(-0.44894)	(-0.65565)		(-0.73425)	**(1.93018)**
$lgAFIM_{t-2}$	-0.316739	0.261819	$lgAFIN_{t-2}$	0.113663	0.116806
	(-1.24251)	(1.29931)		(0.48037)	(0.71020)
C	1.885471	1.296134	C	-0.286612	-0.211693
	(1.84136)	(1.60134)		(-0.24939)	(-0.26500)
lgGDP	-0.031236	-0.317362	lgGDP	1.283752	0.126009
	(-0.08375)	(-1.07649)		**(2.49739)**	(0.35266)
lgFDI	0.229359	0.039499	lgFDI	0.454532	0.225793
	(2.60475)	(0.56748)		**(3.65758)**	**(2.61393)**
lgGNS	-0.215047	-0.247424	lgGNS	-1.922570	-1.020428
	(-0.45013)	(-0.65517)		**(-3.24275)**	**(-2.47610)**
lgLOBC	0.421827	0.374697	lgLOBC	0.240073	0.647141
	(1.16533)	(1.30952)		(0.64018)	(2.48261)
lgDEVE	-0.749197	0.025583	lgDEVE	-0.088960	0.011990
	(-2.05705)	(0.08886)		(-0.28490)	(0.05524)
lgBLR	-0.424540	-0.311533	lgBLR	-1.050159	-0.919608
	(-0.78354)	(-0.72739)		**(-1.91936)**	**(-2.41801)**
R-squared	0.688584	0.337560	R-squared	0.826553	0.775096
Adj. R-squared	0.515576	-0.030462	Adj. R-squared	0.730194	0.650149
Sum sq. resids	0.243204	0.151964	Sum sq. resids	0.277534	0.134093
S.E. equation	0.116238	0.091883	S.E. equation	0.124171	0.086311
F-statistic	3.980057	0.917228	F-statistic	8.577838	6.203407
Log likelihood	28.17747	34.99621	Log likelihood	26.26285	36.81025

Table 3 (*Cont'd*)

Akaike AIC	-1.184653	-1.654911	Akaike AIC	-1.052610	-1.780018
Schwarz SC	-0.666023	-1.136282	Schwarz SC	-0.533981	-1.261388
Mean dependent	-0.415907	1.992306	Mean dependent	-0.549910	1.924097
S.D. dependent	0.167008	0.090514	S.D. dependent	0.239054	0.145924

Note: Figures in bold indicate t-values which were significant at least at 10% level.

Table 4 VAR Estimates of the Inter-Ethnic Models (lags 1 & 2, n = 31)

	lgGD	lgGM	lgGN	lgAFIM	lgAFIN
lgGD$_{t-1}$	0.258068	0.101151	0.241537	0.036684	0.062202
	(0.75205)	(0.81355)	**(2.28530)**	(0.62892)	(0.65630)
lgGD$_{t-2}$	-0.447661	-0.177159	-0.162878	-0.128686	-0.110810
	(-1.17039)	(-1.27834)	(-1.38258)	**(-1.97934)**	(-1.04893)
lgGM$_{t-1}$	-0.135955	-0.047740	0.003516	0.371354	0.214737
	(-0.14714)	(-0.14260)	(0.01236)	**(2.36442)**	(0.84144)
lgGM$_{t-2}$	1.056398	0.188504	0.348721	-0.053195	-0.041754
	(1.56572)	(0.77109)	(1.67806)	(-0.46383)	(-0.22406)
lgGN$_{t-1}$	2.164795	-0.111264	0.099013	-0.343651	-0.249756
	(2.04676)	(-0.29034)	(0.30394)	**(-1.91150)**	(-0.85497)
lgGN$_{t-2}$	-0.224049	0.113086	-0.123047	0.116459	0.359649
	(-0.26463)	(0.36864)	(-0.47185)	(0.80923)	(1.53799)
lgAFIM$_{t-1}$	-1.228572	-0.386763	-0.690721	-0.917410	-0.059541
	(-0.82149)	(-0.71375)	(-1.49951)	**(-3.60888)**	(-0.14415)
lgAFIM$_{t-2}$	-0.243412	-0.644879	-0.230535	-0.556595	0.047684
	(-0.17711)	(-1.29504)	(-0.54461)	**(-2.38259)**	(0.12562)
lgAFIN$_{t-1}$	-1.642567	-0.008104	0.318116	0.686379	0.471552
	(-1.36609)	(-0.01860)	(0.85899)	(3.35836)	(1.41994)
lgAFIN$_{t-2}$	0.445683	0.137819	0.152245	0.342733	0.045564
	(0.39281)	(0.33525)	(0.43566)	**(1.77714)**	(0.14540)
C	4.219901	2.506023	2.650410	2.781186	-0.281503
	(0.81612)	(1.33763)	(1.66421)	**(3.16435)**	(-0.19711)
lgGDP	-0.403474	-0.175421	1.061689	-0.184727	0.015504
	(-0.25000)	(-0.29999)	(2.13582)	(-0.67338)	(0.03478)
lgFDI	-0.630115	0.171724	0.245393	-0.001669	0.173375
	(-1.34462)	(1.01137)	(1.70015)	(-0.02095)	(1.33952)

Table 4 (*Cont'd*)

lgGNS	1.219885	0.001314	-1.056912	-0.101258	-0.904113
	(0.59264)	(0.00176)	(-1.66709)	(-0.28941)	(-1.59031)
lgLOBC	-0.312367	0.103168	-0.351334	-0.550325	0.521742
	(-0.20856)	(0.19011)	(-0.76162)	**(-2.16170)**	(1.26127)
lgDEVE	0.728420	-0.430920	-0.138625	0.641736	0.239560
	(0.46093)	(-0.75258)	(-0.28480)	**(2.38901)**	(0.54885)
lgBLR	0.687737	0.064784	-0.997542	0.290875	-0.869648
	(0.28657)	(0.07450)	(-1.34956)	(0.71306)	(-1.31203)
R-squared	0.698224	0.758964	0.914990	0.819404	0.816543
Adj. R-squared	0.295857	0.437584	0.801642	0.578609	0.571933
Sum sq. resids	1.433880	0.188240	0.136026	0.041429	0.109382
S.E. equation	0.345673	0.125246	0.106468	0.058757	0.095473
F-statistic	1.735291	2.361574	8.072454	3.402915	3.338149
Log likelihood	2.451006	31.89213	36.60275	53.84139	39.76381
Akaike AIC	1.003379	-1.027044	-1.351914	-2.540785	-1.569918
Schwarz SC	1.804897	-0.225526	-0.550395	-1.739267	-0.768400
Mean dependent	-0.552098	-0.415907	-0.549910	1.992306	1.924097
S.D. dependent	0.411941	0.167008	0.239054	0.090514	0.145924

There was no evidence of whether intra-non-Malay PBRW disparity (GN) or intra-non-Malay property ownership affordability (AFIN) had Granger-caused each other. This is confirmed by the result in Table 2 (Panel C). GNS, GDP, BLR, and FDI significantly influenced intra-non-Malay PBRW disparity with intra-non-Malay PBRW disparity highly elastic compared to the first two factors. The results indicate that a 1% increase in GNS and BLR reduced intra-non-Malay PBRW disparity by 1.92% and 1.05%, respectively. By contrast, a 1% increase in GDP and FDI increased intra-non-Malay PBRW disparity by 1.28% and 0.45%, respectively.

In terms of the magnitude of effect, AFIN was significantly responsive to GNS, BLR, LOBC, and FDI in a descending order. AFIN was negatively affected by GNS and BLR where a 1% increase in these factors caused intra-non-Malay property ownership affordability to decrease by 1.02% and 0.92%, respectively – a unitary elasticity situation. Conversely, a 1% increase in FDI and GDP caused intra-non-Malay property ownership affordability to have increased by 0.23% and 0.13%, respectively.

Table 4 shows the vector autoregression estimates of five log-form endogenous variables, namely GD, GM, GN, AFIM, and AFIN. The inter-ethnic models show some evidence of Granger-causality, namely a two-way causality between GD

and GN, and a unilateral causality of GD, GM, GN, and AFIN against AFIM. In the first case, there was no precedence between GD and GN. In the second case, GM and AFIN preceded AFIM in the same direction while GD and GN preceded AFIM in the opposite direction.

Table 4 also shows that except for AFIM, none of the macro-financial factors has any significant effect on the endogenous variables. Development expenditure influences AFIM positively where a 1% increase in DEVE give rise to a 0.62% increase in AFIM. However, for every 1% increase in LoBC, AFIM drops by 0.55%.

The 'beneficial' effects of Malaysia's macro-financial strategy favour the non-Malays in reducing property wealth disparity and increasing affordability compared to the Malays (Table 5).

Table 5 Intra-ethnic and inter-ethnic qualitative effects of Malaysia's macro-financial strategy on property-related wealth disparity and ownership affordability

	Intra-Ethnic				Inter-Ethnic			
	Favourable to		Unfavourable to		Favourable to		Unfavourable to	
	Malays	Non-Malays	Malays	Non-Malays	Malays	Non-Malays	Malays	Non-Malays
Reducing disparity	DEVE	GNS	FDI	GDP	DEVE	–	LoBC	GDP
	–	BLR	–	FDI	–	–	–	FDI
Increasing affordability	–	FDI	–	–	–	–	–	–
	–	BLR	–	–	–	–	–	–

CONCLUSIONS AND IMPLICATIONS

This study did not discover the evidence of intra-ethnic bi-directionality of relationship between property-based relative wealth disparity and property ownership affordability, based on the results of GM versus AFIM and GN versus AFIN. However, there is a unilateral directionality of inter-ethnic PGRW disparity, intra-Malay PGRW disparity, intra-non-Malay PGRW disparity, and property ownership affordability of the non-Malays against property ownership affordability of the Malays.

The study shows that Malaysia's macro-financial strategy has different effects on PBRW disparity and property ownership affordability of the main Malaysian ethnic groups. The effects of Malaysia's macro-financial strategy favour the non-Malays more than the Malays. Without discounting the possibility of data and/or estimation problems, the results have specifically pointed to FDI, GNS, and BLR as favourable macro-financial factors to the non-Malays while DEVE was favourable

to the Malays. BLR strategy, in particular, may need to be further analyzed with respect to its wealth effect on the Malays. Our study has indicated that BLR did not influence PBRW disparity as well as property ownership affordability of the Malays; this effect was more prominence on the non-Malays. This result was quite illusionary. Perhaps, BLR did influence some sections of the Malay population marginally, but not on a national scale.

The government should continue to increase development spending since it is the only factor that can help reduce property-based wealth disparity among the Malays. Nevertheless, the strategy to increase Malays' share of the 'national pie' from FDI and GNS should be further contemplated although the outcome of this study was not in in favour of the Malays. The reason is, if they have been beneficial to the non-Malays, they should yield a similar effect to the Malays. As far as increasing the Malays' share of FDI is concerned, their active participation in property development, construction, and investment is one way of increasing their wealth size and wealth creation. As for GNS, increasing households' rate of savings (together with innovative incentives) should be the government's priority to enhance Malays' property-purchasing capacity.

Further study should address the role of loan to the building and construction sector (LoBC) since the result of this study could have pointed to the problem of 'loan mismatch', apart from the problems indentified above. This can occur when the loan disbursed by the government is not appropriately channeled to property purchase and investment portfolio. Another possible reason is that greater size of loans poured into the real estate sector compared to the market value of properties has caused negative equity among the Malays. This needs a further research in future.

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