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in Singapore**

by

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LIFETIME INCOME AND HOUSING AFFORDABILITY IN SINGAPORE

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ABSTRACT

The existing measures of housing affordability are essentially short-run indicators that compare current income with property prices. Taking into consideration that a housing purchase is a long-horizon decision and the property price reflects the discounted present value of future mortgage payments, we develop a housing affordability index as the ratio of lifetime income to housing price. Lifetime income is computed by obtaining the predicted income from a regression over the working life from age 20 to 64 for each birth cohort for which limited data were available. Lifetime income of Singapore households by three income quantiles (lower, median, and upper quartiles) shed new light on the increasing income inequality. The affordability index reveals informative trends and cycles in housing affordability both in the public and private sectors. We argue why residential property price escalations need to be avoided by showing that such price increases do not necessarily create a net wealth effect for the aggregate of households.

Keywords: lifetime income inequality; long-run housing affordability; wealth effect; price effect.

JEL Classification: R21, D31, D91.

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1. Introduction

After forty years of concerted efforts by the Government to house Singaporeans, Singapore now has proportionately the biggest public housing sector in the developed world. In 2006 the public sector accounted for 79% of the total housing stock and accommodated 81% of the total population (Yearbook of Statistics Singapore, 2008). Unlike Hong Kong, where there is also a large public housing sector but with a large proportion of public house renters, Singapore has achieved an impressive record of public home-ownership. Facilitated by various government policies such as the Approved Housing Scheme introduced in 1968, subsidized new public flats supplied by the Housing and Development Board (HDB) and subsidized housing loans,¹ public home ownership reached 79% of the total resident population of Singapore in 2007 (Yearbook of Statistics Singapore, 2008).

Singapore's private housing sector has also grown over the years. Although originally intended to serve mainly the high-income earners, growing incomes have opened up the private residential market to a large segment of the population. With aspirations to upgrade to private housing rising high and several episodes of house price escalations in the past, housing affordability has become a hot issue among the potential buyers. There are several factors in operation in this regard. First, some major policy changes have led to an increasing interaction between the public and private housing sectors. For example, the compulsory savings in the Central Provident Fund (CPF) that could only be withdrawn for the purchase of public housing have been allowed to be used for private housing purchases since 1981. Furthermore, the HDB resale market has been deregulated since 1989 to allow HDB-dwellers to purchase private property. The provision of subsidized funds and the removal of policy restrictions have bridged the public and private sectors and directly triggered the upgrading trend in the Singapore housing market. Upward housing mobility is well noted in the local literature (Lee and

¹ HDB mortgage rate is pegged at 0.1% above the Central Provident Fund interest rate, which is generally 2% below the mortgage rate of the commercial banks (Phang, 2001).

Ong, 2005, Yuen *et al.*, 2006).

Second, an intertwined housing price structure shapes the Singapore housing market now. There are three housing submarkets in Singapore: the new HDB flats market, the HDB resale flats market and the private property market. As the price of the latter two segments are market determined they tend to be affected by a similar set of macroeconomic conditions and price pressures spill over between the two markets. As for the new HDB flats, since 1990, the government has revised its objective from affordability to quality. Although the new flats are still sold at a subsidized price, the price is partially pegged to the resale market price (Ng and Chow, 2004). Third, the recent trend of Government policies has been to rely more on the private sector to meet housing needs. With a higher population target of 5.5 million to 6.5 million residents, the demand for housing will continue to increase.

In this context, a measure of housing affordability would be a useful indicator for policy makers. The literature shows that researchers have used different measures of housing affordability. Keare and Jimenez (1983) and Kamath (1988) evaluate the household's ability to finance mortgage payments. A measure of accessibility defined by the Australia National Housing Strategy (ANHS, 1991) assesses the household's ability to afford a down payment. Considering Singapore's upgrading phenomenon, Ong and Sing (1999) suggested a modified measure of affordability, which they termed as Threshold Upgradeability Index. This index considers the scenario that a household in the public housing sector is qualified for upgrading to private housing if the resale of the HDB flat generates enough cash for a down payment and the household's current income level is sufficient for mortgage payments (Lee and Ong, 2005, Yuen, *et al.*, 2006). Png (2007) takes the ratio of the 90th percentile of household income to private residential property price as a measure of affordability of private housing in Singapore. In essence, all these are measures of short-term housing affordability.

As pointed out by Quigley and Raphael (2004) housing affordability is not a

clearly-defined term; it is affected by a number of factors such as house price, household income both in the long run and short run, and financial market imperfections. Therefore, there are various ways of specifying housing affordability which may lead to different public policy approaches. Gans and King (2004) distinguished between long-term and short-term affordability. The key difference here is income. Households with long-term affordability problems are those who, in their lifetime, are unlikely to have sufficient income to pay for a house. Short-term affordability problem concerns households who may have lifetime incomes sufficient for a house purchase, but face short-term restrictions of financing it. They point out that these two measures lead to different policy approaches. Nevertheless, they concentrated on a short-term affordability measure. Quigley and Raphael (2004) expressed their concern over the limitations of short-term affordability measures. They argued that housing choice is one of the biggest expenditures for a household and is likely to be made based on a self-assessment of permanent income rather than current income. Households are unlikely to adjust housing consumption in response to short-run fluctuations of income. Quigley and Raphael, however, did not suggest a long-term affordability measure. In this paper, we try to bridge this gap by showing a methodology to compute a measure of long-term housing affordability that takes into account the lifetime income of households.

In Section 2, we present a regression methodology for predicting the age-income profile for different birth cohorts and then compute time series of aggregate lifetime income for Singapore for three income quantiles. In Section 3, we provide a brief demonstration of why property price should be assessed against lifetime income instead of current income and then present our housing affordability index as the ratio of lifetime income to residential property price, a measure which carries meaning both in its direction of movement and magnitude. We conclude in Section 5 with a discussion of policy implications.

2. Lifetime Income

Lifetime income is a well established concept in economics under the life-cycle and permanent income hypotheses of consumption (Modigliani and Brumberg 1954, Friedman 1957). Lifetime income or wealth is defined as the current income plus the discounted present value of expected future incomes, where income is broadly defined to include both labor and non-labor incomes. Since the future income stream is unobserved, many researchers have resorted to indirect methods for testing these hypotheses. Moffitt (1982, 1984) devised a method of constructing lifetime income based on observed household income by age. We adapt Moffitt's method to construct aggregate measures of lifetime income of Singapore households based on some limited data available.

At our request, the Department of Statistics, the Government of Singapore, provided us unpublished data on household income by age.² These data span over 13 years (1990, 1995, 1997-2007) and represent the income of resident households categorized by the age of the household head at five-year intervals from age 20 to 64 (9 age groups). We obtained the data for the three income quartiles: lower (25%), median (50%) and upper (75%). We simply refer to these as lower, median, and upper income quantiles.

Ideally we need a proper panel data set to estimate lifetime income. In such a data set, we will have the income record of each household tracked over the years. Unfortunately, such data are hardly available. The data we now have is regarded as a pseudo-panel in the literature, first extensively studied by Deaton (1985, 1997). In a

² The income data defined in the household expenditure survey refer to regular income from work or employment, as well as income received from rental, investment (eg. Interest and dividends) and other sources such as pensions, cash contributions received from relatives. Irregular or extra-ordinary receipts like proceeds from sale of properties, or one-off payments such as lump-sum CPF withdrawals, insurance claims and Economic Restructuring Shares from the government, as well as rebates and waivers on rent and utilities for HDB flats are not included.

pseudo-panel each cross-sectional survey may include a different set households randomly selected for the survey purpose. Therefore, it is not possible for us to track the same household over time. Nevertheless, it is possible for us to track the income profile of cohorts defined by the year of birth. The difficulty, however, is that the limited data we have do not provide a complete income profile from age 20 to 64 for every birth cohort. The problem is presented in Table 1. In the table birth cohorts are indicated by Cxx-xx. For example C66-70 refers to the sample group that was born in 1966-1970. As highlighted in the table, incomes for the cohort C66-70 are available only over the 20-39 age range. We need, therefore, a way to fill in the missing income points in order to get complete income streams for each cohort.

Table 1: Cohort plan from income data available

Age/Yr	1990	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
20-24	C66-70	C71-75	C71-75	C71-75	C71-75	C76-80	C76-80	C76-80	C76-80	C76-80	C81-85	C81-85	C81-85
25-29	C61-65	C66-70	C66-70	C66-70	C66-70	C71-75	C71-75	C71-75	C71-75	C71-75	C76-80	C76-80	C76-80
30-34	C56-60	C61-65	C61-65	C61-65	C61-65	C66-70	C66-70	C66-70	C66-70	C66-70	C71-75	C71-75	C71-75
35-39	C51-55	C56-60	C56-60	C56-60	C56-60	C61-65	C61-65	C61-65	C61-65	C61-65	C66-70	C66-70	C66-70
40-44	C46-50	C51-55	C51-55	C51-55	C51-55	C56-60	C56-60	C56-60	C56-60	C56-60	C61-65	C61-65	C61-65
45-49	C41-45	C46-50	C46-50	C46-50	C46-50	C51-55	C51-55	C51-55	C51-55	C51-55	C56-60	C56-60	C56-60
50-54	C36-40	C41-45	C41-45	C41-45	C41-45	C46-50	C46-50	C46-50	C46-50	C46-50	C51-55	C51-55	C51-55
55-59	C31-35	C36-40	C36-40	C36-40	C36-40	C41-45	C41-45	C41-45	C41-45	C41-45	C46-50	C46-50	C46-50
60-64	C26-30	C31-35	C31-35	C31-35	C31-35	C36-40	C36-40	C36-40	C36-40	C36-40	C41-45	C41-45	C41-45

There are many cohorts alive in one particular year. Therefore, the age-income profile in a given year will be a misrepresentation of the life-cycle income profile that we are interested in. As highlighted by Figure 1, the age-income profile for different cross-sections appear bi-modal, which stands counter to the hump-shaped age-income curve predicted by the life cycle model. Since various cohorts stay pooled in a given cross section, the life cycle component and the cohort effect remain mixed. Cohorts may differ from each other in many ways such as education, economic opportunities, fertility choice and productivity. Deaton (1997) regarded these differences as cohort effect which shifts the life cycle age-income profile upward if each successive

generation becomes better-off. If we plot the age-income profile by different cohorts, as in Figure 2, the hump shape emerges. Figure 2 also shows that the age-income profiles for different cohorts are roughly parallel to each other, especially for later cohorts. This allows us to assume fixed cohort effects in the regression model that follows.³

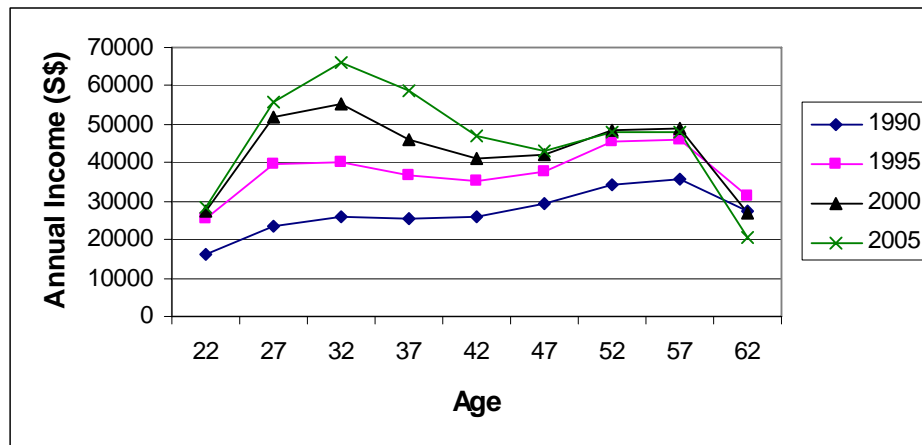


Figure 1: Age-income profile by cross-section (median quantile)

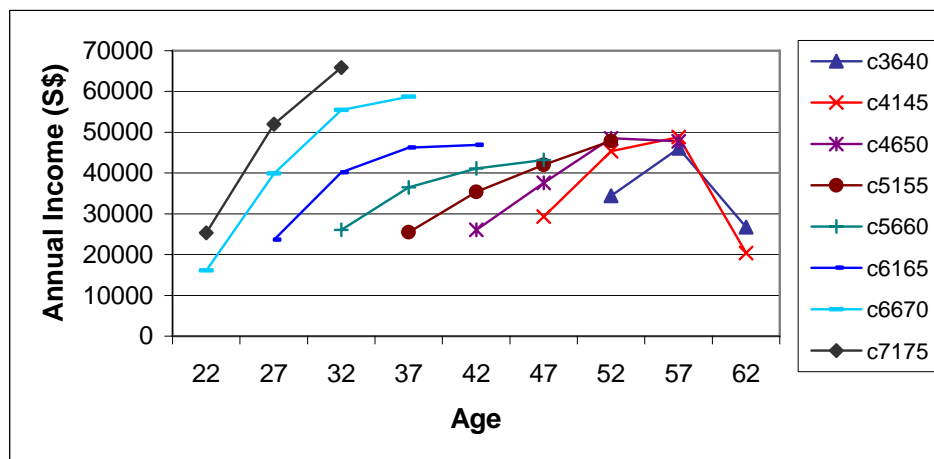


Figure 2: Age-income profile by cohorts (median quantile)

After arranging the available data in an unbalanced panel format we can use the

³ We provide plots for the median quantile only because the three income quantiles share similar shapes.

following regression of income on cohort dummies (*Cohort1*, *Cohort2* ...) and age polynomials to generate a complete income profile from age 20-64 for each cohort in our sample:

$$\log Y = \alpha_0 + \beta_1 \text{Cohort1} + \beta_2 \text{Cohort2} + \dots + \gamma_1 \text{Age} + \gamma_2 \text{Age}^2 + \varepsilon . \quad (1)$$

A word of caution is order here. The income data that we have by five-year age group do not allow us to account for the year effect in the regression. In other words, if we have income by each age from 20 to 64, instead of by age group, we will be able to decompose income into age, cohort and year effect as proposed by Deaton (1994). It is, nevertheless, possible that the cohort dummy coefficients of the regression may capture the year effect to some extent.

For the computation of our housing affordability index we need the lifetime income in nominal terms. However, our computations also shed light on lifetime income inequality which should be measured in real terms. We used the annual consumer price index over 1990-2007 to deflate the nominal income figures to obtain real income. In all, therefore, we ran six regressions to obtain our results, the three income quantiles each in both nominal and real terms. For illustrative purpose we report some results for the median income quantile. The estimated regression for the median nominal income based on 153 observations is given below:⁴

⁴ Note that in order to have more observations for age groups we interpolated 1991-1994 values assuming constant income growth rates. We did not do the same for 1996 because of the distorted growth rates resulting from the Asian Financial Crisis in 1997.

$$\begin{aligned} \log \hat{Y}_t = & 5.189 + 0.093(C31 - 35) + 0.024(C36 - 40) + 0.077(C41 - 45) + 0.148(C46 - 50) \\ & (16.3) \quad (0.9) \quad (0.2) \quad (0.7) \quad (1.3) \\ & + 0.169(C51 - 55) + 0.38(C56 - 60) + 0.74(C61 - 65) + 1.06(C66 - 70) \\ & (1.4) \quad (2.8) \quad (5.3) \quad (7.3) \\ & + 1.32(C71 - 75) + 1.39(C76 - 80) + 1.53(C81 - 85) + 0.203 \text{ Age} - 0.00193 \text{ Age}^2 \\ & (8.8) \quad (8.6) \quad (8.1) \quad (14.8) \quad (-12.7) \end{aligned}$$

(2)

$R^2=0.69$, $SE=0.19$, t-statistics in parentheses.

All the regressions fit the data well with reasonably large R^2 values.⁵ Figure 3 plots the age-income profile for the median income group after controlling for the cohort effects. Unlike Figure 1 which shows bi-modal income peaks at age groups 30-34 and 55-59, Figure 3 shows income peaks around age 50-55. The cohort effect shows that as the Singapore economy progressed each successive birth cohort enjoyed a higher income profile. Note that there are households in a given cohort that move across income quantiles. Our regression does not account for this movement. However, an analysis by income quantiles, as we do in this exercise, will address this issue.

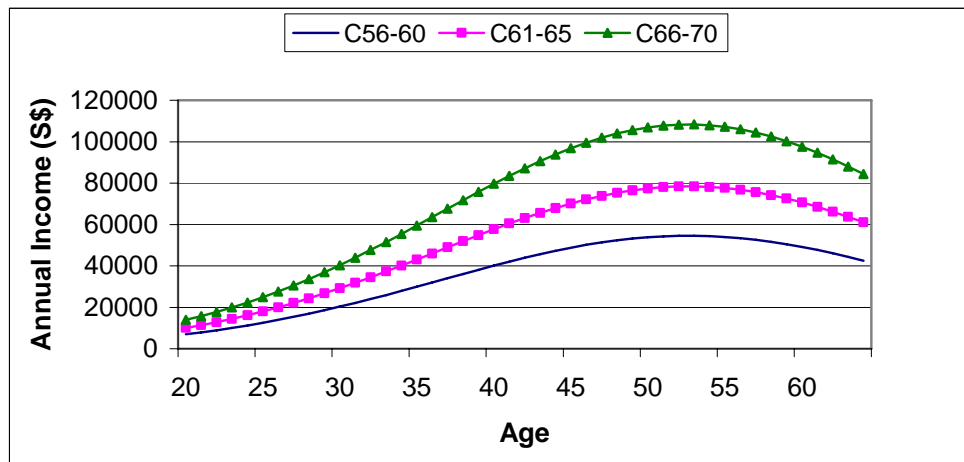


Figure 3: Life cycle income profiles for selected cohorts (median quantile)

After generating a complete income profile for each cohort from the regression method

⁵ Given the nature of the data and the type of regression a residual analysis for diagnostics will be of little help in this case.

we compute the lifetime income (wealth) as:

$$W = \sum_{A=20}^{64} \frac{\hat{Y}_A}{(1+d)^{A-20}} \quad (3)$$

where \hat{Y}_A is the estimated income at age A and d is the discount rate. We set the discount rate to 0.05 which has roughly been the average prime lending rate in Singapore over the observation period. As new cohorts are added on to the population we might be able to calibrate the cohort coefficients of our regressions and obtain the predicted income profile by quantiles. In that sense (3) retains the standard representation of lifetime income as the discounted present value of expected incomes. Note that because of the grouping of the income data to five year age intervals our lifetime income from (3) provides a time series at five year intervals. Since lifetime income moves smoothly over time we applied the spline interpolation method in the SAS software package to obtain a time series of lifetime income at the annual frequency.

Figure 4 presents real lifetime income of households at different quantiles by birth year of household heads. It is interesting to see that real lifetime incomes of cohorts born before the 1960s were stagnant for all the three quantiles. With the rapid growth of independent Singapore since the 1960s, lifetime incomes of the later cohorts also grew rapidly. Growth of lifetime income slowed down for cohorts born after 1975. These cohorts entered their working age after the mid 1990s when the Singapore economy entered a turbulent period starting with the Asian Financial Crisis in 1997. What is most striking to note is that the income inequality even when measured in terms of lifetime income (instead of the usual current income) has not only widened but the gradient of the income profiles of the upper and lower income groups have moved in the opposite directions for the cohorts born after 1975. Even for the median income category the lifetime income has not shown much growth after the Asian Financial Crisis.

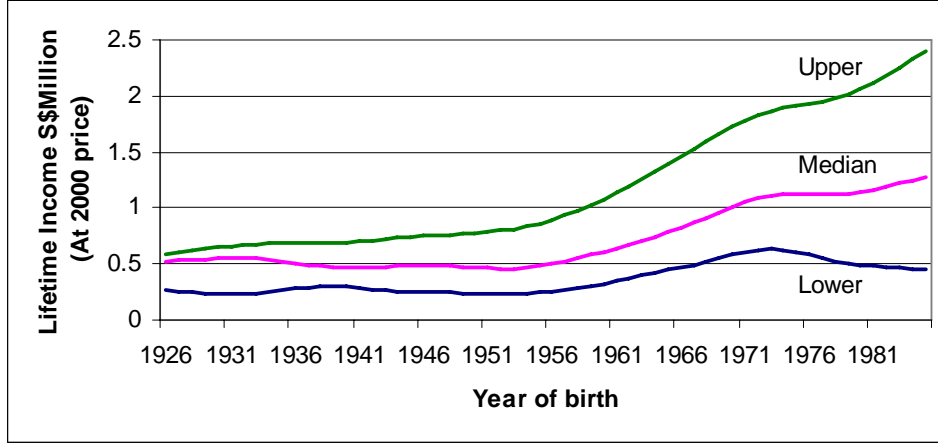


Figure 4: Real lifetime income by birth year of household head at different income quantiles

3. Housing Affordability Index (HAI)

Before presenting the affordability index it would be useful note that like lifetime income, house price can also be represented by a discounted present value. Typically a house purchase is financed by taking a mortgage which involves an interest cost. Even if one uses personal savings for buying a house or for a down payment, this still involves a cost in terms of forgone interest earnings. For simplicity, we can set the house price equal to a fixed rate N-year mortgage quantum L (loan), which requires an annual re-payment of R . If the mortgage rate is r and house price is P^h we have:

$$P^h = L = R \left(\frac{1}{1+r} + \frac{1}{(1+r)^2} + \dots + \frac{1}{(1+r)^N} \right) = R \left(\frac{1 - (1+r)^{-N}}{r} \right) \quad (4)$$

Since both the house price and lifetime income are represented by a discounted present value and they can be used in a meaningful way to construct an affordability index as opposed to an income-price ratio that uses current income. Our point of departure, therefore, is to stress the need for a long-run affordability index that takes into account the long-horizon nature of house purchase decisions. The housing affordability index to be constructed is, therefore, the ratio of lifetime (nominal) income for any chosen age group to the price of any selected property type.

More specifically we define HAI as

$$HAI_{t,age} = \frac{W_{t-age}}{P_t^h} \quad (5)$$

where W_{t-age} is the lifetime (nominal) income by year of birth that was constructed in Section 2 ($t-age$ is the year of birth), P_t^h is the average price of the chosen property type in year t . For example, $HAI_{1980,30}$ refers to the housing affordability index for the 30-year age group in 1980. It is calculated by dividing the lifetime (nominal) income of households with heads born in 1950 (W_{1950}) by the property price in 1980 (P_{1980}^h).

The advantage of using the income-price ratio as an affordability index is that not only the direction but the magnitude of the index is also meaningful. Under this measure, an increase in HAI means that the affordability is improving and a decrease means an erosion of affordability. An index value of unity means that the household's lifetime income is just enough to pay for the property. In other words, those who buy such properties lock their entire lifetime income in the property. Any value below unity suggests that households are in perpetual debt if they commit to such higher priced properties, as their lifetime income is not sufficient for such a purchase.

Presently, we do not have detailed data series on prices of different types of properties in Singapore. What we have are two price indices, one is the private property price index released by the Urban Redevelopment Authority since 1975 and the other is the HDB re-sale price index released by the Housing and Development Board since 1990. Using some starting average price levels we can use the rate of change of these indices to construct average price series for the private and public housing sectors. For the private sector we used an average price of S\$1,308,000 in 1997 as estimated by Phang (1997) and for the HDB re-sales we used an average price of S\$276,210 in 2007Q4 by taking the weighted average of prices for 3-room (\$197,000; 31%), 4-room (\$273,000;

38%), 5-room (\$340,000; 23%), and executive (\$415,000; 8%) flats.

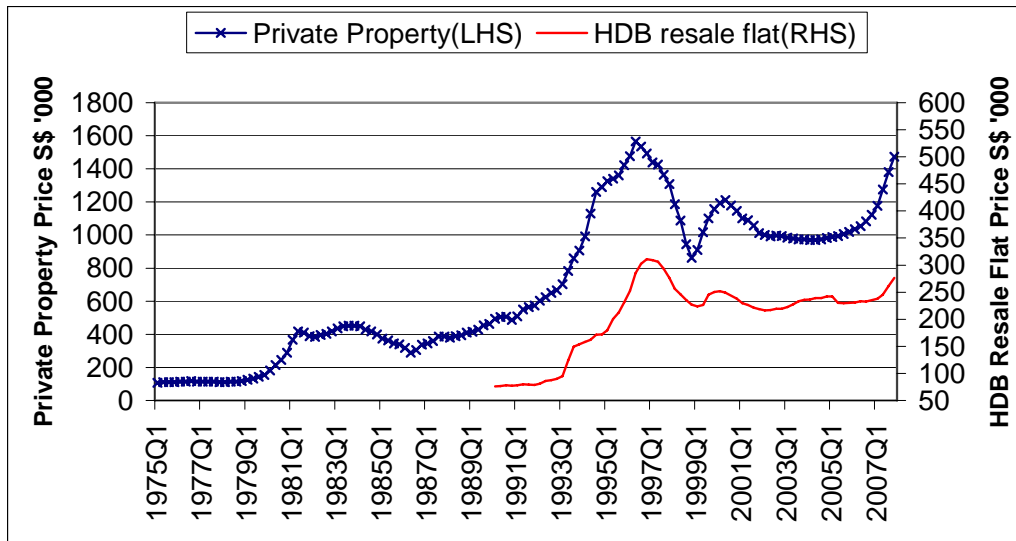


Figure 5. Average price of private housing and HDB resale flats (quarterly)

Figure 5 shows the average price levels for both the private and public residential properties. Both price series follow similar trends and turning points with a sustained large price gap of similar magnitude over the years. Since 1980, the trend growth of private residential property prices was about 14% with prices increasing, on a year-on-year basis, by 102% in 1981Q1, 47% in 1994Q3, and 31% in 2007Q4. The price of HDB resale flats has followed similar cycles.

Table 2 presents the HAI (ignore HAI-adjusted for the moment) by income quantiles for private and public residential properties computed for the 30-year old age group. This is roughly the age at which people might consider buying residential properties. Figure 6 highlights the cyclical movements of the HAI for private properties for the three income quantiles. Since lifetime income moves smoothly, cycles in HAI are primarily determined by the gyrations of property prices. The largest drop in HAI across income groups occurred in the early 1980s and housing affordability has never recovered to the pre-1980 levels since then. Since 1980, the index has fluctuated around constant levels of 0.6 for the lower quantile, 1.2 for the median quantile, and

2.1 for the upper quantile. The price bubble in the mid 1990s resulted in another substantial erosion of affordability of private property across income groups. At the peak of the price bubble in 1996, the HAI for the median quantile was 0.6 and that for the upper quantile was 1.1. Such a sharp drop in affordability of private housing even for the upper income group is a serious concern.

Table 2 indicates that private properties are clearly a far-fetched goal for the lower income group; the index has remained well below unity for them. The interesting case to consider is the median income group. In 1975, lifetime income of middle-income households with heads aged 30 was nearly 4 times the amount they would have paid for an average-priced private property. By mid 1980s, their lifetime income was only sufficient to purchase one private property. The trend continued and during the 1994-1996 property price escalation HAI fell below unity suggesting that median income households would be in debt if they purchased an average-priced private property during this period. Price escalation since late 2007 has brought down affordability again.

Table 2: Housing Affordability Index for 30-year old by income quantile

Year	Private Property						HDB Resale Flats		
	HAI			HAI-adjusted			HAI		
	Lower	Median	Upper	Lower	Median	Upper	Lower	Median	Upper
1975	2.0	3.8	6.0	-	-	-	-	-	-
1976	1.9	3.6	5.8	-	-	-	-	-	-
1977	2.0	3.8	6.1	-	-	-	-	-	-
1978	2.0	3.8	6.1	-	-	-	-	-	-
1979	1.6	3.1	5.2	-	-	-	-	-	-
1980	1.0	1.9	3.2	-	-	-	-	-	-
1981	0.6	1.1	1.9	-	-	-	-	-	-
1982	0.6	1.1	1.9	-	-	-	-	-	-
1983	0.5	1.0	1.8	-	-	-	-	-	-
1984	0.6	1.1	2.0	-	-	-	-	-	-
1985	0.7	1.3	2.4	-	-	-	-	-	-
1986	0.8	1.5	2.9	-	-	-	-	-	-
1987	0.7	1.4	2.6	-	-	-	-	-	-
1988	0.7	1.4	2.6	-	-	-	-	-	-
1989	0.7	1.3	2.4	-	-	-	-	-	-
1990	0.7	1.3	2.3	0.8	1.5	2.8	4.2	7.6	14.0
1991	0.7	1.2	2.2	0.8	1.4	2.6	4.5	8.0	14.6
1992	0.7	1.2	2.1	0.8	1.4	2.5	4.5	7.9	14.3
1993	0.5	1.0	1.7	0.7	1.2	2.1	3.2	5.6	10.0
1994	0.4	0.7	1.3	0.5	0.8	1.5	2.7	4.7	8.4
1995	0.4	0.7	1.2	0.4	0.8	1.4	2.3	4.1	7.2
1996	0.4	0.6	1.1	0.4	0.8	1.4	1.7	3.1	5.5
1997	0.4	0.7	1.3	0.5	0.9	1.6	1.8	3.2	5.6
1998	0.6	1.1	1.8	0.8	1.4	2.4	2.4	4.2	7.3
1999	0.6	1.1	1.9	0.8	1.4	2.5	2.6	4.6	7.8
2000	0.6	1.0	1.7	0.8	1.3	2.2	2.7	4.7	7.9
2001	0.7	1.2	2.0	0.9	1.6	2.6	3.1	5.4	9.1
2002	0.8	1.4	2.3	1.0	1.8	2.9	3.3	5.8	9.7
2003	0.8	1.4	2.4	1.1	1.9	3.1	3.2	5.7	9.5
2004	0.8	1.5	2.4	1.1	2.0	3.3	3.1	5.6	9.3
2005	0.8	1.4	2.4	1.0	1.9	3.2	3.1	5.8	9.8
2006	0.7	1.4	2.3	0.9	1.8	3.0	3.0	5.9	9.9
2007	0.5	1.1	1.9	0.7	1.4	2.4	2.6	5.4	9.3
Ave 80-07	0.6	1.2	2.1	0.8	1.4	2.4	3.0	5.4	9.4

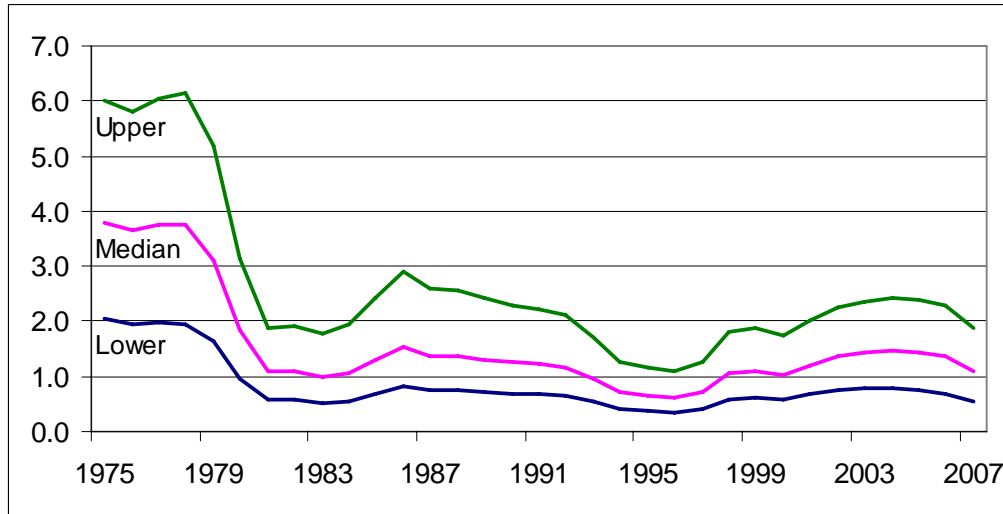


Figure 6: HAI of private property for 30 year-old group at different quantiles

The same computations in Table 2 for average-priced HDB resale flats show a much better affordability picture. Although the price bubble in the mid 1990s led to an erosion of the affordability of HDB resale flats, even for the low income group the HAI remains about three for averagely priced flats; in other words, their lifetime income is about three times the average price of a resale HDB unit. Disaggregated price data by the HDB flat type are needed for a more informative analysis of affordability of public housing.

Adjusted HAI for upgraders

As mentioned earlier, one important phenomenon of the Singapore property market is the upgrading from HDB flats to private properties. Our income data do not include capital gains from property sales (see footnote 2) and we do not have access to such data. However, we can make an adjustment to our HAI for private properties to account for the HDB-upgrader effect. Since most of the upgraders from public to private housing in Singapore rely entirely or largely on cash proceeds from the sale of HDB flats for down payment of the private property purchase, we adjust our HAI for private properties as follows:

$$HAI_{t,age} - adjusted = \frac{W_{(t-age)}}{P_t^{pri} (1 - \frac{P_t^{HDB}}{P_t^{pri}})} \quad (6)$$

where the relative price P_t^{HDB} / P_t^{pri} (HDB resale price to private property price ratio) captures the effect of the differential growth rate of the two price series. The adjustment indicates that keeping lifetime income and private property price the same, an increase in resale price of HDB flats provides a bigger amount of cash for down payment, leaving a smaller mortgage burden for the household to finance the private property. It should be noted, however, that there might be an over-adjustment here. In Singapore, when a household sells its owner-occupied HDB flat in the resale market, it has to settle the outstanding loan of the flat if any, return the CPF housing withdrawals with interest and settle relevant payments⁶ before completion of the resale transaction. Therefore, a household may not be able to make use of all the cash proceeds from the transaction for down payment of the private property. Moreover, a household is likely settle the minimum down payment using a portion of the cash proceeds and keeps the rest for other investment purposes. As we have no way to factor in all these possibilities, our adjustment is only suggestive.

Table 2 also presents the results for HAI-adjusted of private property for the 30-year old group for different income quantiles. To highlight the difference, Figure 7 plots the HAI and HAI-adjusted for the median income group. Apart from the level shift which shows the wealth effect that upgraders could enjoy, the two curves share similar turning points resulting from the co-movement of property prices of the private and public sectors. It is worth noting that even the HAI-adjusted fell below unity in the mid 1990s for the middle income earners. This implies that rapid escalation of both private and public property prices do not necessarily make middle-income upgraders better off.

⁶ Relevant payments include upgrading cost, applicable for the HDB flats that are affected by HDB's Main or Lift Upgrading Program and upgrading levy, applicable for the flats in an upgrade precinct.

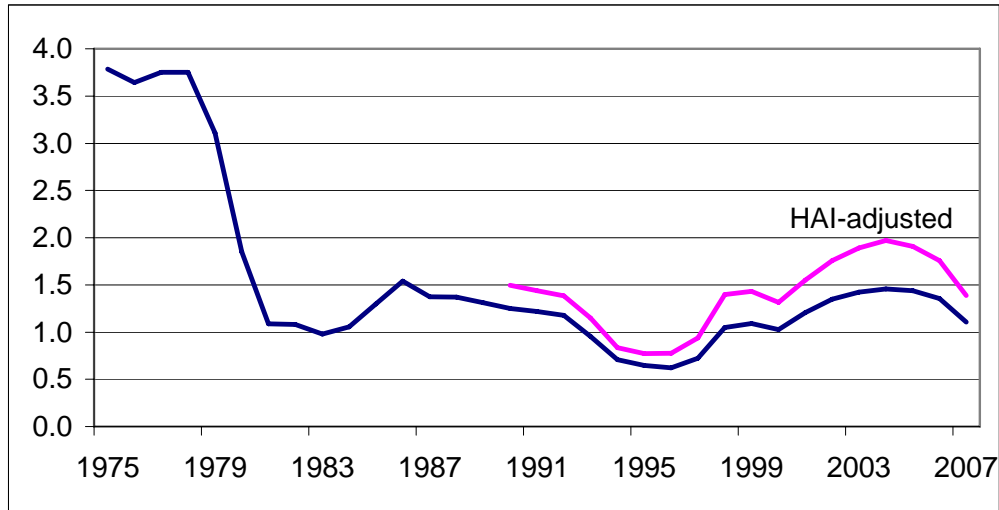


Figure 7: HAI and HAI-adjusted for 30 year-old group (median quantile)

5. Discussion

The affordability measure presented in this exercise based on the ratio of lifetime income to housing price takes into consideration the long-horizon nature of house-purchasing decisions. This long-run measure combined with a short-run measure of housing accessibility (ability to pay for initial expenses) should provide policy makers with more complete information for monitoring the housing market. Computing lifetime income also shed light on lifetime income inequality, which is more informative than the income inequality measures that use current income in a given cross section made up of different cohorts.

Our estimates of lifetime income in Singapore by three income quantiles show that even the lifetime income inequality has been increasing rapidly especially after the Asian financial crisis. In fact, despite the substantial growth of the economy, the lower income quantile has seen a drop in their real lifetime income. In the increasingly globalized world, Singapore's experience is likely to be shared by other developed economies as well. As for housing affordability, our index shows that past episodes of house price escalations have led to a substantial erosion of housing affordability, especially in the private segment of the market.

A natural question to ask then would be, with a more than 90% home ownership (both public and private), why should there be any concern about property price escalations if higher prices mean higher wealth for Singaporeans? Although there is no question that a higher price means a higher value of the housing stock, how this translates into a “wealth effect” is what matters for the aggregate economy. Abeysinghe and Choy (2007) have examined in detail the wealth effect of property prices on consumption in Singapore and found that the wealth effect is very much absent. In the absence of cheaper suburbs which offer quality living, the only way for Singapore residents to unlock property values is, apart from emigrating, to downgrade to smaller units. This does not seem to be happening on a large scale and explains why the “housing wealth effect” on consumption is insignificantly small. Perhaps this explains the rush for “en bloc” sales in Singapore that enable the owners to unlock the property wealth and buy another unit of similar or better quality and even retain some capital gains.⁷

What is disturbing to note is that higher property prices, instead of creating a wealth effect, exert a negative and significant “price effect”⁸ on consumption expenditures leading to a fall in the average propensity to consume. As for the negative “price effect” Abeysinghe and Choy (2007, p. 23) explained: “As house prices go up, the increase in the value of housing assets is accompanied a by a concurrent rise in the financial liabilities of households, in the form of higher down payments for the purchase of residential properties and burgeoning housing loans. Due to the limited avenues for liquidating property assets, households have to build up sufficient financial assets to smooth the profiles of their lifetime consumption of non-housing goods and

⁷ In an en bloc (collective) sale of private property units, the owners usually get a much better price than what they could expect by selling a unit on their own. Developers expect to make huge profits by re-developing the land into to a more intensive residential property complex with more units, usually of smaller size. Apartment blocs that are demolished after an en block sale are not necessarily the old ones.

⁸ Phang (2004) called this a negative wealth effect and Ludwig and Slok (2002) called it a substitution effect. Since wealth effect and substitution effect are not defined to be negative we call it a “price effect”.

services.” This creates the negative “price effect” which they measured using housing loans.

An important issue then is the bequest motive, that is, when property prices go up parents can leave a higher-valued asset to their children. Even from this angle, the economy wide net wealth effect is likely to be small for a couple of reasons. First, by the time the inheritance occurs, children would have bought their own properties; consequently, they have to sell their own or the inherited property to capitalize its value. Selling the properties may increase financial wealth of households, depending on the outstanding mortgage. The buyers who are buying at high prices, on the other hand, are subject to the negative “price effect” mentioned above. Abeysinghe and Choy (2007) find that the negative “price effect” on consumption outweighs the “financial wealth effect”. The net effect of bequest in this context, therefore, depends on the relative magnitudes of the financial wealth and housing loans created. It is likely to be either zero or negative for the aggregate of households or the macroeconomy.

Second, a more complicated situation arises with the 99-year lease system in Singapore; all HDB housing and a sizable proportion of private housing are subject to a 99 year lease. Since there is still more than half life left even for the oldest 99-year lease-hold properties, the fixed lease period may appear to be unimportant at this stage. However, our regression estimates for HDB 4-room flats transacted between May and July 2008 show that a 10-year age gap between two flats lead to about 12% price difference with the older one selling cheaper.⁹ If the 99-year lease effect also comes into play, the prices may drop substantially, perhaps to the discounted present value of the remaining stream of rental incomes, and such properties may not generate much bequest value to children. It is also worth noting that, with the life expectancy more than 70 years even for who were born in the 1970s, the remaining lease of a 99-year lease-hold property may not be long enough to generate a high bequest value. Thus,

⁹ The regression was based on 2578 observation with $\log(\text{Price})$ as the dependent variable and age, area of the flat, date of transaction, and 25 dummies plus a constant term for 26 districts.

government policies on the lease-hold properties (both public and private) will have a strong bearing on the bequest value of such properties.

If in aggregate the “price effect” of high property prices outweighs the wealth effect it is important for property prices to move up with the growth of lifetime income such that the affordability does not get unduly eroded. The average growth rate of lifetime income for cohorts born after 1960 for the median quantile has been about 4-5% which has also been the average growth rate of per capita disposable income since 1975. We have seen in Figure 5 how property prices have moved over this period. Although price escalations are a good stimulus to property developers, they run the risk of property price collapses by the time properties come on the market. Therefore, a more predictable trend of property prices is good for both the buyers and developers. Although it is difficult to avoid property price cycles, policies could be devised to reduce the amplitude of these cycles.

Reference

Abeyasinghe and Choy (2007) *The Singapore Economy: An Econometric Perspective*, Routledge

AHNS (Australia National Housing Strategy) (1991) “The Affordability of Australian Housing”, Issues Paper No. 2

Deaton, Angus (1985) “Panel Data from Time Series of Cross-sections”, *Journal of Econometrics*, Vol 30, pp. 109-126

Deaton (1994) “Saving, Growth, and Aging in Taiwan”, in David A. Wise, ed. *Studies in the Economics of Aging*, Chicago University Press for the National Bureau of Economic Research

Deaton, Angus (1997) *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*, Baltimore and London: John Hopkins University Press

Friedman (1957) *A Theory of the Consumption Function*, Princeton University Press

- Gans and King (2004) "The Housing Lifeline: A Housing Affordability Policy", *Agenda*, Vol 11(2), pp. 143-155
- Kamath (1988) "The Measurement of Housing Affordability", *Real Estate Issues*, Fall/Winter, pp. 26-33
- Keare and Jimenez (1983) *Progressive Development and Affordability in the Design of Urban Shelter Projects*, World Bank
- Lee and Ong (2005) "Upward Mobility, House Price Volatility, and Housing Equity", *Journal of Housing Economics*, Vol 14 pp. 127-146
- Modigliani and Brumberg (1954) "Utility Analysis and the Consumption Function: An Interpretation of Cross-sectional Data" in Kurihara *Post-Keynesian Economics*, Rutgers University Press
- Moffitt, R. (1982) "Postwar Fertility Cycles and the Easterlin Hypothesis: A Life-cycle Approach", *Research in Population Economics*, Vol 4, pp. 237-252
- Moffitt, R. (1984) Trends in Social Security Wealth by Cohort" in Marilyn Moon Ed., *Economic Transfers in the United States*, The University of Chicago Press
- Ng and Chow (2004) "Availability of Bank Credit and the Residential Property Price Level: Evidence from Singapore", www.asres.org/2004Conference/papers/5_Ng_Chow.pdf ASRES Conference 2004
- Ong,S.E. and Sing,T.F. (1999) "The Threshold Upgradability Index" *The Real Estate Times*, Vol 2(1) pp. 14-20
- Phang, S. Y. (2001) "Housing Policy, Wealth Formulation and the Singapore Economy", *Housing Studies*, Vol 16, pp. 443-459
- Phang, S. Y. and Wong, W.K. (1997) "Government Policies and Private Housing Prices in Singapore", *Urban studies*, Vol 34, pp. 1819-1829
- Png, I. (2007) "Private real estate remains affordable", Newspaper article, The Straits Times, March 6.
- Quigley J.M. and Raphael, S. (2004), "Is Housing Unaffordable? Why isn't it More Affordable", *Journal of Economic Perspectives*, Vol 18(1), pp. 191-214
- Yuen, B., Kwee, L., and Tu, Y, (2006) "Housing Affordability in Singapore: Can We Move from Public to Private Housing?", *Urban Policy and Research*, Vol 24(2) pp. 253-270

Yearbook of Statistics, Singapore, 2007

Housing and Development Board, Singapore www.hdb.gov.sg

