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AN ANALYSIS ON THE DISTRIBUTED WELFARE ON SINGAPORE'S FISCAL POLICY

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1. Introduction

Taxes have long played a key role in the management of Singapore's economy as part of fiscal policy. Low taxes have been used to encourage growth and enterprise, attract investment as well as to promote a "savings ethic". Unsurprisingly, the CIA factbook ranks Singapore's inequality (via the Gini coefficient) number 27 in the world in 2008. In 2010, Singapore had a relatively high income Gini coefficient of 0.472 (SingStat: Key Household Income Trends 2010)

However, given that the Gini coefficient is calculated using data on income earned from wages, the Gini does not take into account the numerous redistributive policies put in place by the Singapore government over the years. However, not all redistributive policies favor income equality, the most hotly debated one being GST, Singapore's version of Value-Added Tax (VAT). In this paper, we contend that Singapore's fiscal policy largely favours the poor and the inequality situation in Singapore is less adverse than generally perceived. We do this by calculating the Gini coefficient for income earned from wages (defined below) and comparing it to the Gini for "adjusted income," generally defined as below:

$$Y = w(h - l)$$

$$\hat{Y} = w(h - l) - T + G$$

Y *Income earned from wages*

$\hat{Y}$ *Adjusted Income*

w *wage*

G *Government Benefits*

h *Total time per year*

l *Total time spent on leisure*

T *Taxes on Income*

The adjustments on income come in two forms: taxes (T) and government benefits (G). Due to limitations in data and requisite qualifications, we focus on the effects of a selected group of fiscal tools, namely income tax, workfare payouts, GST and motor tax (for taxes) and education subsidies (for government benefits), on ten different income groups. We find that the Gini coefficient is lowered by 19% after considering the five adjustments made in this paper. We then investigate which of the fiscal tools are progressive or regressive and also which has the greatest impact on redistribution in Singapore. Following this, we provide a

graphical analysis on the effects these fiscal policies have on hours worked (h-l) and the corresponding effects on income inequality, which the Gini cannot capture. We again find that the Gini is exaggerated when this is not taken into consideration. The paper concludes by discussing some policy implications of current fiscal measures for income redistribution, and suggests possible improvements to our measure of inequality in Singapore.

2. Methodology

2.1 Setup

Due to a lack of data availability, *annual household income from work* was used as the main measure (Census 2010 SR2, pp.11). This is convenient for analysis because firstly, the household unit is compatible with the culture and social system in Singapore. Secondly, most statistics available were grouped in that manner so little approximation was needed. Thirdly, income strictly from work would make it easier to account for taxes. Income groups considered ranged from $0 to $9,000 and up with $1,000 intervals throughout as per the data available.

2.2 Tools Employed

The main tool we employ to analyze income inequality is the Gini Coefficient. We calculate this by first collecting data on income and the five adjustments for each income group. Following which, we plot the corresponding Lorenz curves for each adjustment made to income. We then derive the function Y=L(X) and calculate the Gini coefficient with the following:

$$G = 1 - 2\int_0^1 L(X)\,dx$$

We also employ the income-leisure model. We estimate the budget lines of three representative individuals from three income groups: the bottom 10%, the median income

earner and the top 10%. The wage is approximated based on the assumption that each of these representative households work 40-hour weeks. This allows us to divide the income earned by wage by 40-hour weeks, producing their budget line. We then subject the budget line to the fiscal tools above to present the corresponding adjusted budget line. We assume that each representative individual has similarly even preferences between work and leisure.

2.3 Approximations

Several approximations were made to obtain data on taxes paid in each household income group. Some of these approximations are explained in the appendix.

2.4 Other Fiscal Policies

Additional Housing Grant (AHG) and Health Care Subsidies were initially considered but later removed. The assumptions and methods required to bring both items into our framework were too extensive and beyond our current means respectively.

2.5 Literature Review

Income Inequality and Taxes

It had been discussed by Ishita Dhamani, an NUS graduate in May 2008 that Singapore's tax structure was in fact worsening the income gap between the rich and the poor based on her findings. However, since then, the government has revised its taxation system, and we seek to explore if the widening income gap problem still exists.

Gini Coefficient and Lorenz Curve

While the Gini is a problematic summary statistic due to its relative nature (Debraj Ray, pp.188), it is nevertheless the international standard for measuring income inequality and hence finding a more precise reading of the Gini would be useful to understand inequality in Singapore. We understand that Department of Statistics has released different values of Gini

coefficient. We think this can be explained by the fact that our analysis is based on households whereas DOS' numbers are based on household members, which they do not release any other data on. Moreover, they do not provide any analysis on the redistributive effects of any of the fiscal tools. Our paper hopes to provide some form of a comparative study on the effects of the five selected fiscal tools on income inequality.

3. Analysis on Individual Fiscal Tools

3.1 Income Tax

The biggest source of government revenue and the most commonly used public finance tool to counteract income inequality is a progressive income tax regime. Singapore's tax system is likewise a progressive one where taxpayers pay incrementally higher rates for every additional band of income earned. We are using the 2012 tax rates for our analysis as seen below (IRAS: Income Tax).

Individual Income (SGD Per Annum)	Conditions		Tax Rate	Amount
0 – 20,000			0%	0
20,000 – 30,000	On the first On the next	20,000 10,000	0% 2%	0 200
30,000 – 40,000	On the first On the next	30,000 10,000	 4%	200 350
40,000 – 80,000	On the first On the next	40,000 40,000	 7%	550 2,800
80,000 – 120,000	On the first On the next	80,000 40,000	 12%	3,350 4,600
120,000 – 160,000	On the first On the next	120,000 40,000	 15%	7,950 6,000
160,000 – 200,000	On the first On the next	160,000 40,000	 17%	13,950 6,800
200,000 – 320,000	On the first On the next	200,000 120,000	 18%	20,750 21,600
320,000 and above	On the first Above	320,000 320,00	 20%	42,350

In order to visualize how progressive Singapore's income tax is, we plot the proportion of income tax payable against income earned from work as seen below:

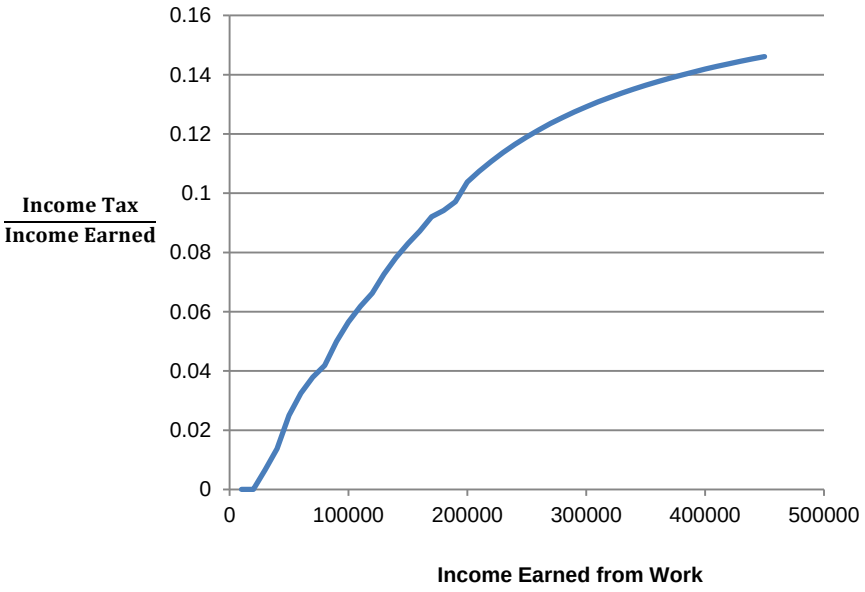

Figure 1: Income Tax / Income Earned from Work

We find that as income increases, the amount of tax a household has to pay as a proportion of income increases. This has the effect of reducing disposable income as income increases. Therefore, one can expect that after factoring in income tax, disposable income inequality will not be as high. We also note that while the tax payable as a proportion of income increases with income, it does so at a decreasing rate. This means that income equality is curbed as income increases, but at a smooth decreasing rate.

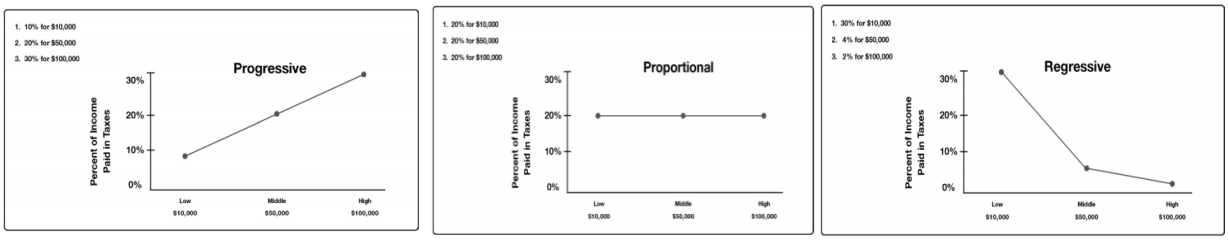

Figure 2: Progressive, Proportional and Regressive taxes

This is in contrast to a strictly progressive tax. In fact, the Singapore income tax regime tends towards a proportional tax as income increases. This suggests that the while income tax in Singapore is progressive at most income group levels, it becomes increasingly less

progressive as income increases. It is still nevertheless a progressive tax and the income tax is the second largest income redistributor in our paper with a Gini of 8.4% (see section 4).

3.2 Workfare Income Supplement Scheme (WIS)

Workfare is made up of three separate sub-schemes, namely the Workfare Income Supplement (WIS) scheme, the Workfare Training Support scheme and the Workfare Special Bonus scheme. For the purposes of this paper, we will be focusing on the WIS scheme.

The WIS scheme is similar to a negative income tax, offering a reward to individuals who remain active in the labour market, and work a minimum number of hours with a year. Payouts in cash and Central Provident Fund (CPF) handouts are given to these workers, to help provide them with more income and savings. This scheme is mainly targeted at encouraging older, low-wage Singapore Citizens who are at least 35 years or older, to continue contributing to the economy through their continued work. In part, these payments are also to aid Singaporeans who face competition from other low-wage foreign who are willing to accept lower salaries. With a qualifying average gross monthly income of $1,700 or less (inclusive of overtime pay and bonuses), the scheme also takes into account the value of each individual's home as a proxy measure of the economic status of each worker, restricting the annual value of their residential property to $13,000 or less. A summary of the benefits is shown in the table below:

Income Earned	Payouts	CPF
2400	103	257
4800	206	514
7200	266	664
9600	283	707
12000	300	750

14400	215	535
16800	129	321
19200	43	107

The WIS payouts are made based on a set of criteria, which include a worker's income earned and age group (CPF: Employee's WIS). For the purposes of this paper, we will focus our analysis on the youngest (35-44 years old) and oldest (above 60 years old) age groups.

We plot the proportion of WIS payouts as a proportion of income earned as seen below:

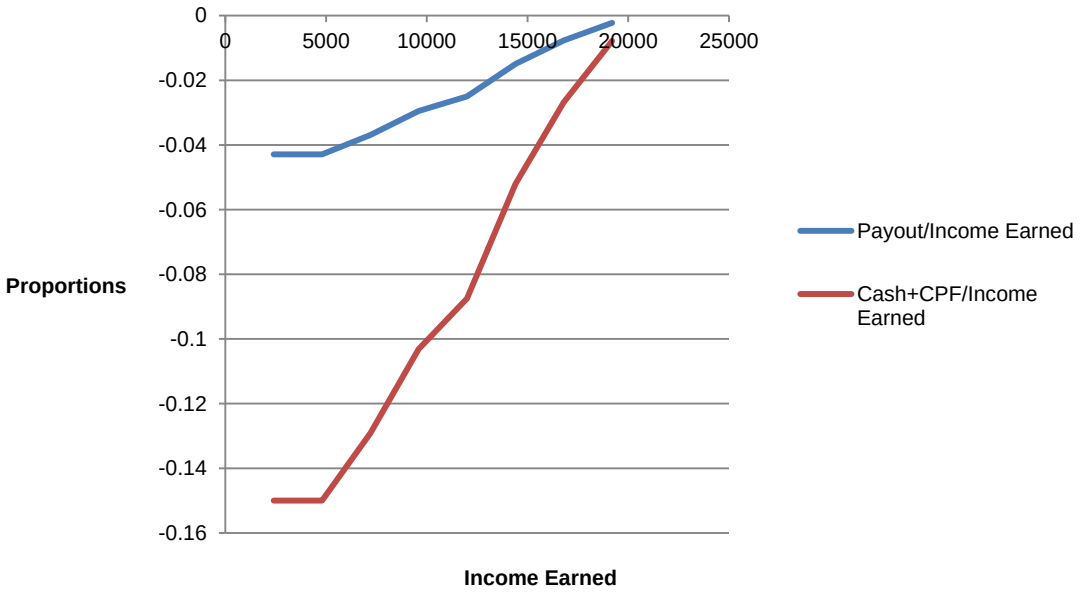

Figure 3: Proportions of Workfare (Negative Tax) of Income Earned (Age 35-44 years old)

We note that the initial cash payouts received by workers earning a monthly wage of $200, represents an increase in income by more than four percent, while adjusted income from CPF and cash payouts increases by a sizable fifteen percent. As the income of the worker increases, the payouts decrease or the negative tax paid increases proportionately, demonstrating the progressive nature of the WIS scheme. As expected, the Gini coefficient decreases with the addition of workfare, but only marginally, a mere 0.6% decrease in the Gini (see section 4).

3.3 Goods and Service Tax (GST)

Goods and services tax (GST) is a value-added tax imposed on the consumption of goods, except for the housing purchases and banking services, as well as exports of goods and services. Singapore's GST had been increasing all these years, from a mere 3% in 1994 to 7% today. It aims to spread the taxation burden more equally among the population.

An offset package comes with every increase in GST. It includes direct transfer benefits, CPF top-ups and rebates. Workface Income Supplement works as a complementary scheme which provides additional financial aid for the low-income workers. The tables below are examples of two financial aid schemes included in the package.

AV / AI	**Up to $7,000**	**$7,000 to $13,000**	**More than $13,000**
Up to $30,0000	$800	$600	$300
$30,001 - $100,000			
More than $100,000	$100		
NSFs/NSMen	$100		

Table 6: Structure of Growth Dividend

AV / AI	**Up to $7,000**	**More than $7,000**
Up to $30,0000	Aged 45-40: $300 Aged 50-50: $400 Aged 60-69: $500 Aged 70-79: $600 Aged 80 – Up: $700	Aged 45-40: $200 Aged 50-50: $300 Aged 60-69: $400 Aged 70-79: $500 Aged 80 – Up: $600
$30,001 - $100,000		

Table 7: Structure of Medisave Top-Up

In order to visualize whether GST is regressive or proportional, we plot the proportion of income tax payable against income earned from work as seen below:

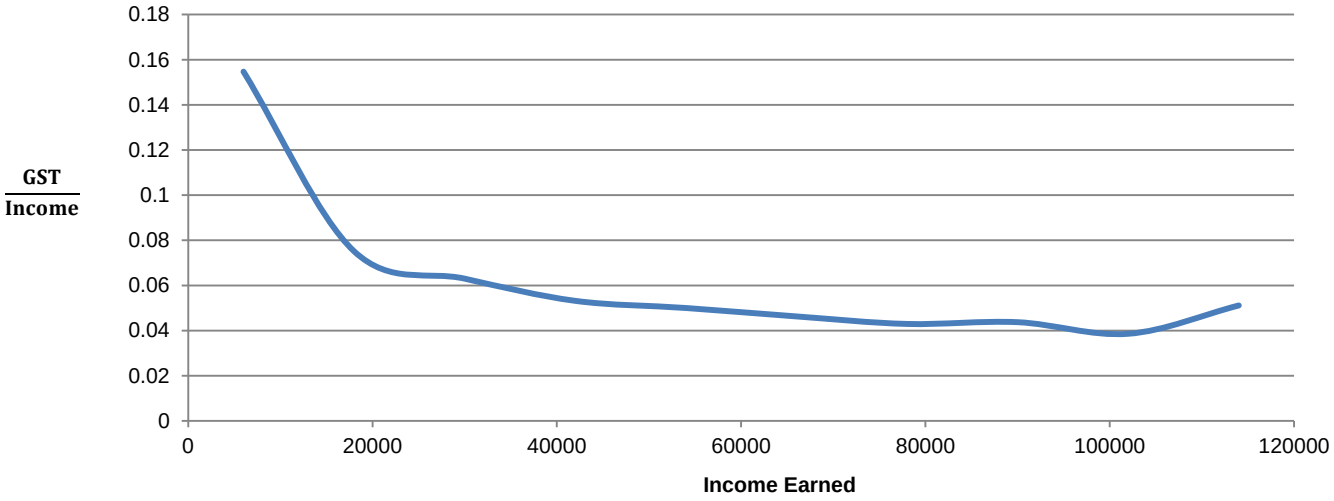

Figure 4 – GST Payable / Income

We note that for households with an annual income of less than $20,000, the graph is downward sloping and GST is clearly regressive where households with higher income pay less GST as a proportion of income. In general, it is assumed that each household purchases and consumes the same basket and amount of goods and services. It is also known that the marginal propensity to consume (MPC) of the lower income group is significantly higher than that of the higher income group, which means that they spend a higher proportion of their income for consumption in comparison to the richer ones. Thus, at first glance, GST seems like a form of regressive tax as the tax burden on the higher income group is less as compared to the poorer ones.

However, for income groups of above $20,000 per annum, it is observed that the graph becomes flatter, suggesting that GST become more proportional as income increases. This is due to the income elasticity of demand. Firstly, the demand for necessity will not change much with a rise in income, but for normal and luxury goods, people will tend to consume more with an increase in salary. Since these goods are priced higher than the necessities,

thus, with a per unit tax of 7%, the average GST payable as a proportion of income for the rich is much higher than it seems.

Hence, based on our findings, we can safely say that GST might be slightly regressive for the lower income groups, but it gets more proportional as income increases. If we factor in the offset packages offered to lower income groups in forms of rebates and transfers, which the poor would receive a substantial amount to offset the burden borne by GST, the lower income groups do not actually pay that much for GST. Our results show that GST is mildly regressive, increasing the Gini only by 8.4% (see section 4)

3.4 Taxes on Motor Vehicles

The main aims of motor vehicle taxes are to gain revenue and hence are not pegged directly to income. Nevertheless, there is a strong positive correlation between car usage and household income. On average, a $3,500 rise in income will prompt an approximate 10% increase in car ownership. (Census 2010 SR3, pp.125-128) The assumption made here is that daily car usage suggests ownership by the household.

There are 3 types of taxes and fees: COE, annual road tax and fines. COE is calculated based data provided by LTA (Statistics In Brief, 2010). We expect medium income groups to own <1600cc cars while the richer income groups to own >1600cc cars. Car renewal data could only be obtained based on a national average which is marked at 5 years. Annual road tax calculation is based on engine capacity and age via LTA's online road tax calculator. The average age was used based on an annual tax figure. Fines are considered not to be discriminatory across income groups and a national average was taken based on the total composition fines earned in FY 09/10 (Annual Report 09/10, pp.93). Assuming that car size (engine capacities) increase with income, we estimate the following figures:

Income Group	$24,000-$59,999	$60,000-$95,999	$96,000-$108,000
COE/Year	$2,320	$2,482,40	$2,482.40
Annual Road Tax	$568	$1,214	$2,386
Annual Fines	$31.29	$31.29	$31.29
Annual Total	$2,191.29	$3,727.69	$4,899.69

Based on the expected number of cars owned by each household income group, we plot the proportion of income tax payable against income earned from work as seen below:

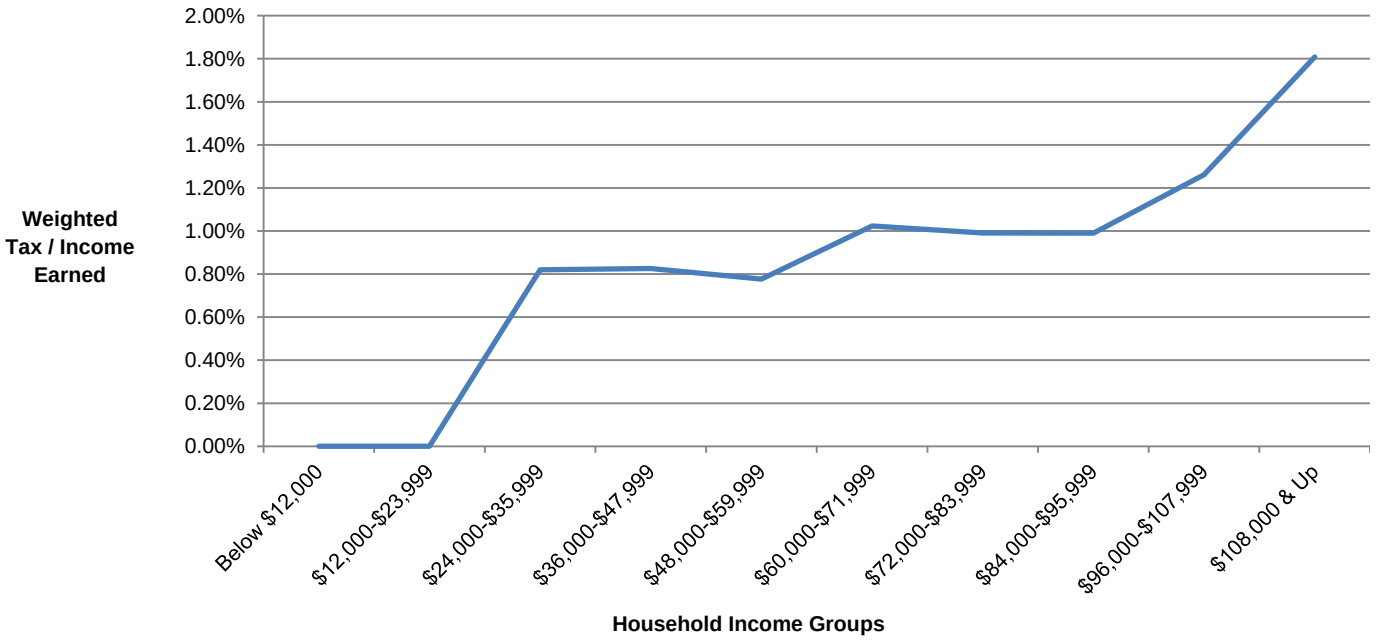

Figure 5: Tax Burden Per Income Group Weighed By Car Ownership Percentages

The plot provides us with a clearly upward sloping trend, indicating that the taxes are progressive in nature. However, we were not able to factor in Electronic Road Pricing and Parking Charges as the assumptions required to bring them into our overall analysis would not be realistic. However, considering that higher income earners are likely to work in areas that are affected by ERP and high parking charges, it can be assumed that the tax burden is even more progressive.

Our calculated effect on the Gini turns out to be relatively small, a mere 0.5% change in the Gini. This is likely to be due to the difficulty in estimating the expected number of cars per

household income group and the difficulty in attaining data on other kinds of motor taxes such as fuel tax.

3.5 Education Subsidies

Fiscal tools are not limited to taxes. We consider education subsidies in this section. According to the MOE's Budget, a total of $3,187,359,100 was spent on 532,225 Primary, Secondary and Junior College students which works out to a $5988 subsidy per student. This Assumes that an average family has one school going child. We plot the proportion of subsidy received (as a negative lump sum tax) against income below:

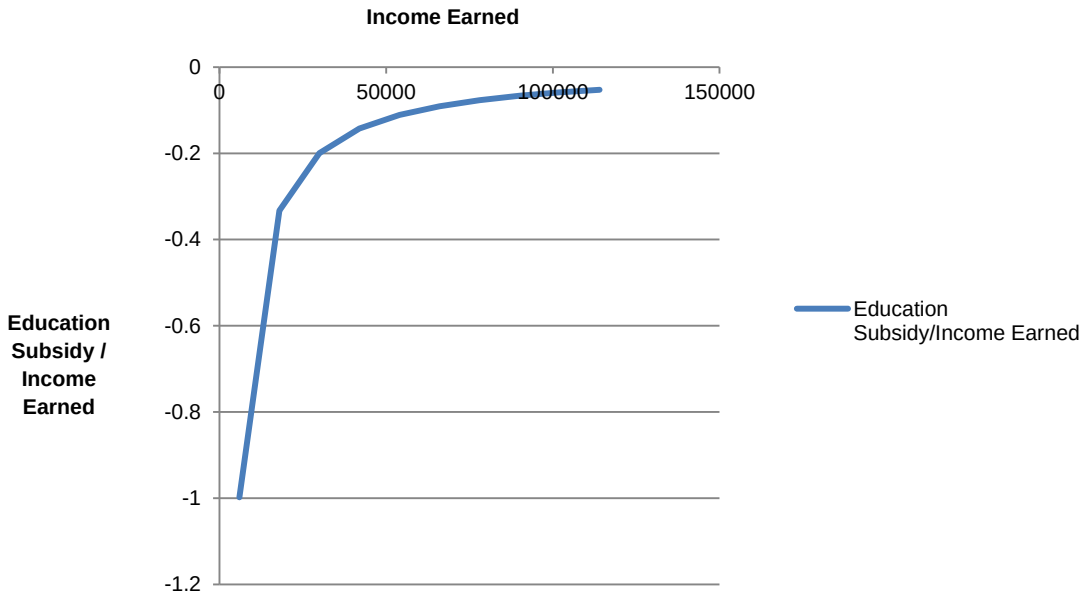

Figure 6: Tax Burden Per Income Group Weighed By Car Ownership Percentages

Much like the income tax, the graph depicts an positively sloped curve that increases at a decreasing rate, indicating that the education subsidy acts like a progressive tax, but becomes proportional as income increases. Our results show that the change in the Gini Coefficient at 6.8% is the largest out of our sample of fiscal tools. (see section 4)

4. Results and Discussion

4.1 Analysis on the Gini Coeffecient

A summary of the tax or benefits in each fiscal policy for each income group (in households) is shown below. The last column shows the “adjusted income” for each income group.

Household Income Bands	Median Income	Income Tax Payable	Workfare	GST	Motor Tax payable	Education Subsidy	Adjusted Income
0	**0**	0	0	0	0	0	**0**
Below $12,000	**6000**	0	-825	928.2	0	-5988	**11884.8**
$12,000-$23,999	**18000**	0	-300	1352	0	-5988	**22935.6**
$24,000-$35,999	**30000**	484.4512195	0	1890	245.85732	-5988	**33367.69146**
$36,000-$47,999	**42000**	1843.140244	0	2234	346.84616	-5988	**43564.45359**
$48,000-$59,999	**54000**	4086.952055	0	2701	419.29393	-5988	**52781.15402**
$60,000-$71,999	**66000**	6470.469799	0	3054	675.50922	-5988	**61787.78098**
$72,000-$83,999	**78000**	9001.282051	0	3350	772.49323	-5988	**70864.30472**
$84,000-$95,999	**90000**	12968.37782	0	3935	891.16882	-5988	**78193.05335**
$96,000-$107,999	**102000**	16790.63655	0	3935	1286.1323	-5988	**85975.83115**
$108,000 & Up	**114000**	20612.89528	0	5830	2061.5867	-5988	**91483.918**

When we plot the Adjusted Income together with the original Income Earned as seen below, we find that income groups below the 5^{th} decile (approximately)have an increase in their adjusted income and income groups above the 5^{th} decile a decrease. This suggests that the fiscal policies we analyzed turned out to be redistributive in favour of the poor.

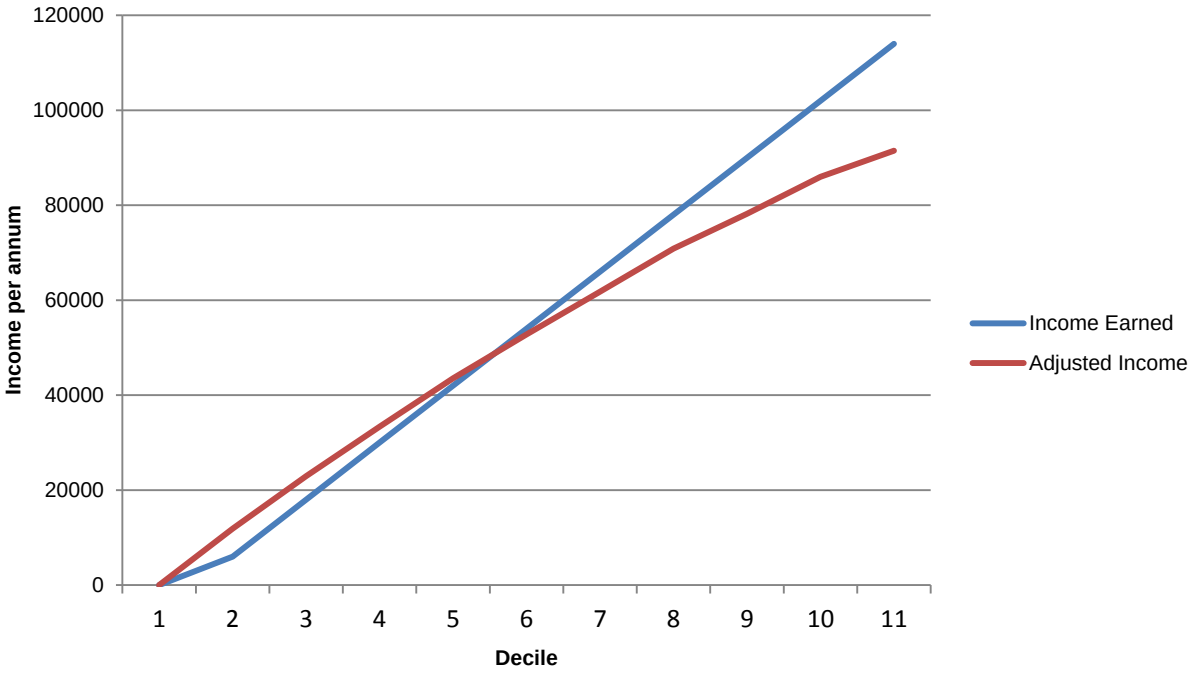

Figure 7: Singapore's Lorenz Curve: Income from Work and Disposable Income

When we plot the Lorenz curve for both income from work and adjusted income, we find that the Lorenz curve to be closer to the 45 degree line, implying that inequality is lower after considering the effects of the five fiscal tools analyzed in this paper. The corresponding Gini coefficient decreases from 0.37 to 0.30[1], a 19% decrease from the original coefficient. The Lorenz curve is shown below:

[1] The numbers differ from the Department of Statistics by quite a significant amount. We think this can be explained by the fact that our analysis is based on households whereas DOS' numbers are based on household members, which they do not release any other data on.

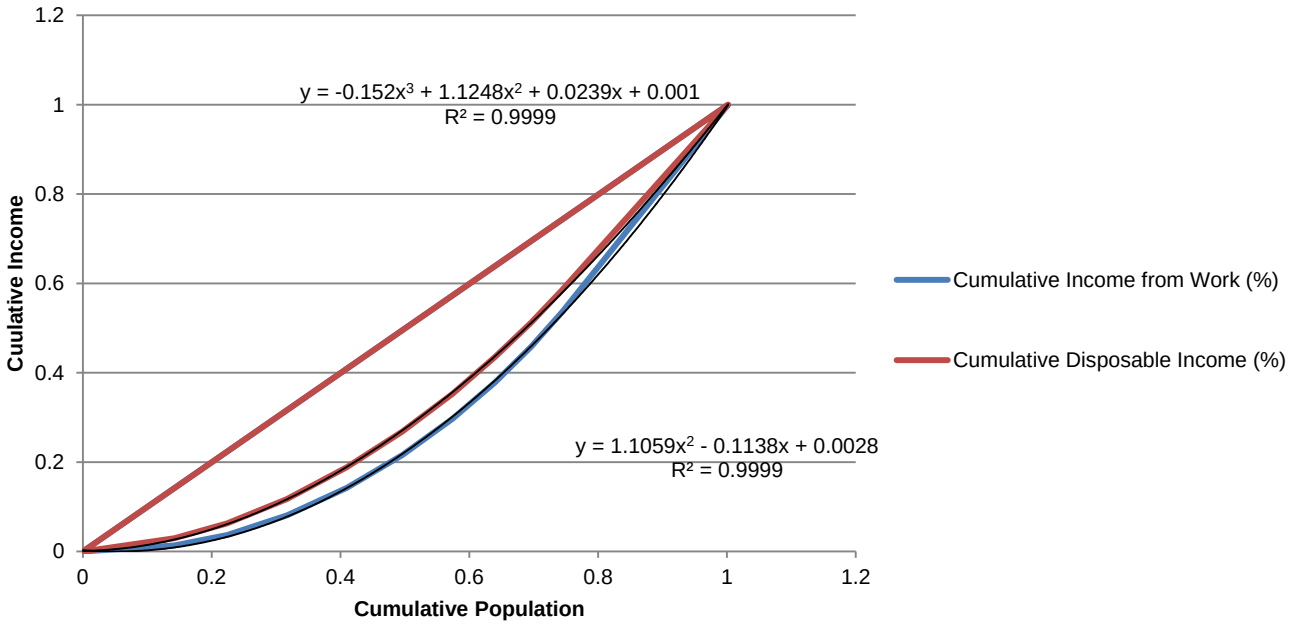

Figure 8: Singapore's Lorenz Curve: Income from Work and Disposable Income

We further sought to understand which of the five fiscal tools we analyzed had the greatest impact on income inequality in Singapore via the Gini coefficient. The result of each policy is shown below:

	Income from Work	Adjusted Income	After Income Tax	After Workfare	After GST	After Auto Tax	After Education
Gini Coefficient	0.370773	0.300233	0.339533	0.368433	0.373833	0.3687	0.302067
Difference in Gini		0.07054	0.03124	0.00234	-0.00306	0.002073	0.068706

We find that the out of the five fiscal tools, the largest redistributor of income is the education subsidy, followed by income tax, a distant second. If these tools are in any way representative of the fiscal tools employed in Singapore, than this would suggest that looking at tax policy alone would not be able to fully explain the income inequality situation in Singapore since subsidies, transfers and the generous provision of public goods contribute greatly to the redistributing income in Singapore. We also find that while GST is regressive, it is only mildly so, and hardly affects the overall income distribution.

4.2 Analysis with the Leisure- Income Model

While the Gini coefficient is somewhat able to measure the inequality in adjusted income, it is not able to account for the changes in hours worked due to the various fiscal tools. Recalling that income is a function of wage and leisure, we employ the income-leisure model to investigate this further.

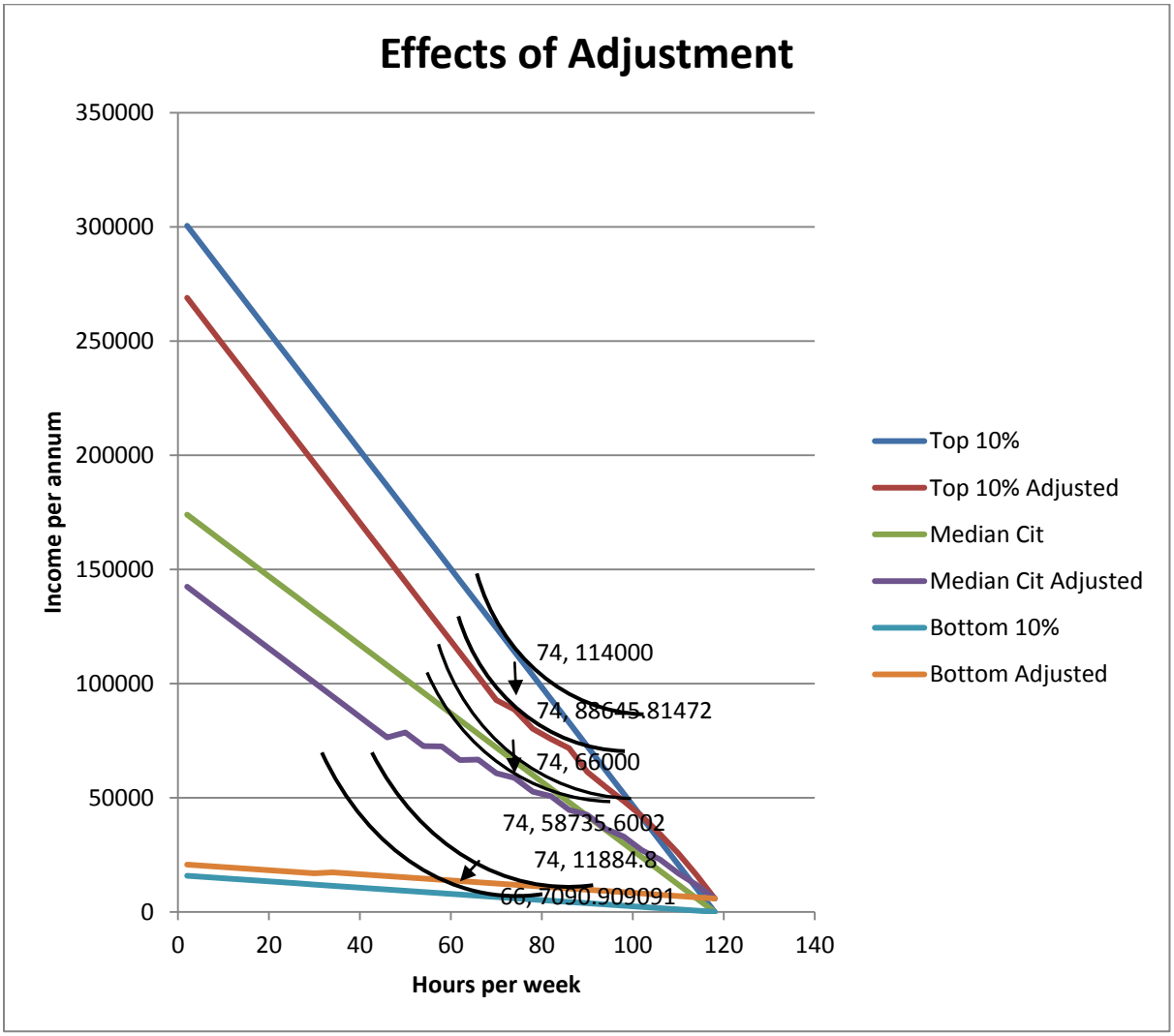

Figure 9: Income-Leisure Model: Effects of Adjustment

While both the representative for the top 10% and median earner experiences drops in income, they consume the same amount of leisure as before the adjustments. However, for the representative for the bottom 10%, he/she chooses to work 8 hours more per week, effectively compensating for the loss of income from the adjustments. This is in part due to

the many kinks in the budget lines of the representative for the top 10% and median earner. However, this is also part explained by the utility curves drawn – for similarly shaped preferences, the lower one's wage, the flatter the budget line. Since individuals will optimize utility at the point of tangency, the optimization point will occur at the flatter parts of their utility curves. The flatter the utility curve, the stronger the preference for income and the stronger the income effect. The Gini coefficient cannot account for how lower income groups have a greater tendency to work more in order to compensate for the loss of income and is therefore exaggerated.

4.3 Analysis on WIS and Age

Economic theory and trends suggest that there is a trade-off between income inequality and growth, of which the latter is a key economic objective of Singapore. WIS particularly was designed in place of the typical welfare systems used in the west which typically creates disincentives to work, a situation Singapore attempts to avoid with WIS. This explains the distinct WIS schemes by age. We plot the adjusted incomes after WIS for two age groups, 35-44 years old and above 60:

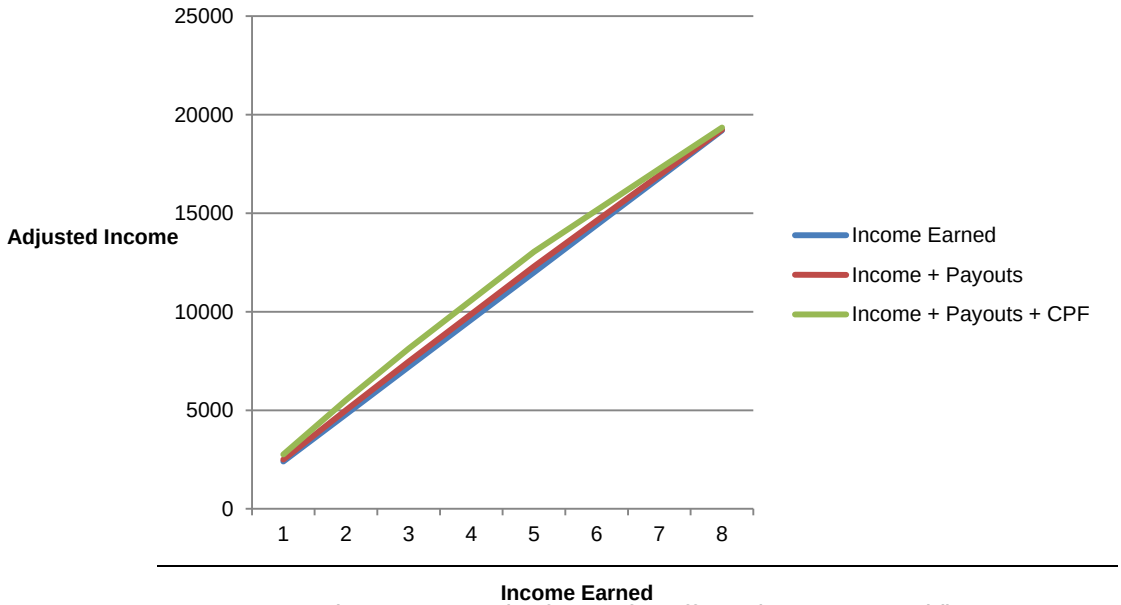

Figure 10: Graph of Transfer Effects (35-44 years old)

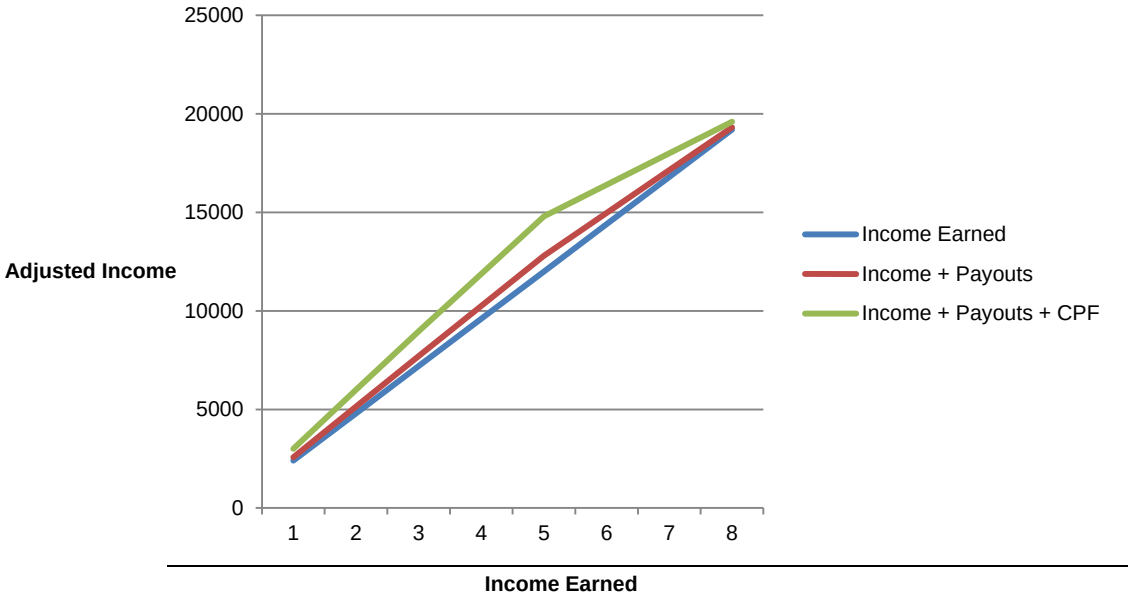

Figure 11: Graph of Transfer Effects (Above 60 years old)

In Figure 11, we note that for workers aged 60 and above, the effect of transfers on workers' wages is slightly more pronounced, with the greatest deviation corresponding to a monthly income of $1000, resulting in an observable kink in Figure 11.

As was observed in Figure 3, Figure 12 also reflects a decrease in the amount of transfers beyond the $1000/month income level, only more significant in this case.

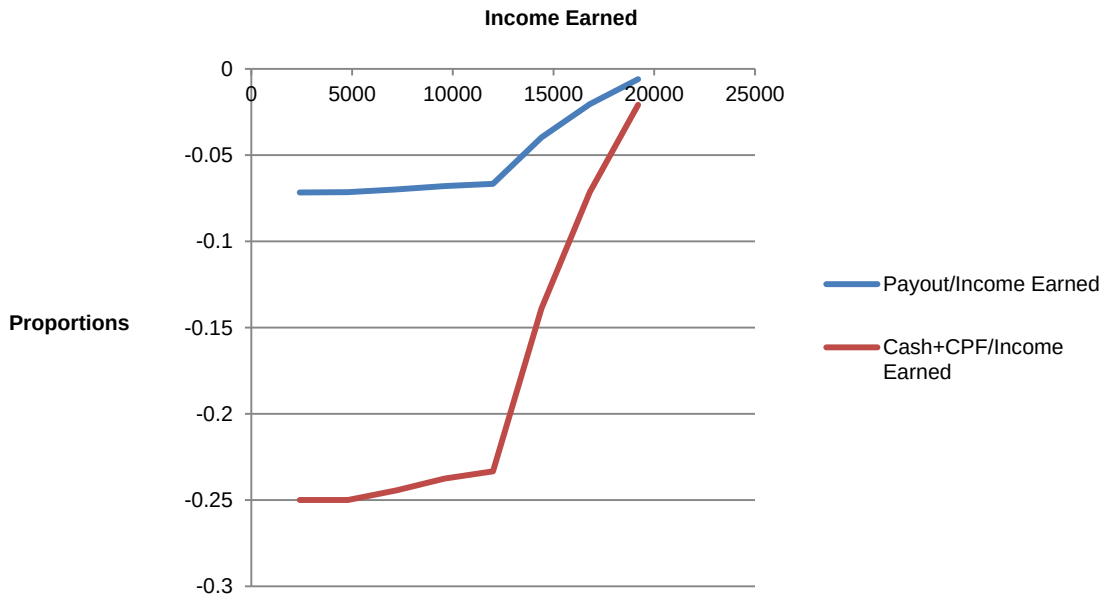

Figure 12: Proportions of Workfare (Negative Tax) of Income Earned (Above 60 years old)

This suggests that younger people will be less disincentivized to work. This is because while their total adjusted income (earned income + payouts + CPF) increases roughly by the same amount as those above 60, unlike their older counterparts, they are not able to withdraw their CPF, so their disposable income increases by substantially less. Since workers are likely to respond to their disposable income, they are not disincentivized to work as had they been full disposed to their adjusted income. The government may also be trying to enforce a higher savings rate for low-wage workers, perhaps due to the need to hedge against any emergencies that may arise.

5. Conclusion

We find that Singapore's fiscal policies do not worsen income inequality, but instead, they help to reduce the gap between the two extremes of the income spectrum. Based on our findings, we find that the Gini coefficient for Singapore is exaggerated. This is firstly because the Gini Coefficient does not factor the effects of the taxes and government benefits this paper considered. Our analysis shows that it ought to be lower than stated. Different taxes and subsidies have different effects of varying extent on income, but as a whole, it is a progressive fiscal structure. Singapore's redistribution of income owes primarily to a systemic manner of transfer payments - primarily taxing the rich and redistributing it in terms of public goods such as education to all.

Secondly, using the leisure-income model, we were able to suggest that the Gini coefficient is overestimated because it does not take into account how people's work behavior will respond to taxes and subsidies. Our analysis suggests that lower income groups will work more to compensate for a loss in income and therefore close the income gap further as a response to these policies. Moreover, we find that while these fiscal policies generally redistribute income towards the lower income groups, the WIS scheme particularly keeps the disincentive for working-age people to working at a minimum.

Since the addition of two more income tax bands did a better job in redistributing income among the lower and higher income groups, we would suggest that the government can gradually introduce more bands in four year intervals. In addition, we think that a tiered GST system would generate more social equality among the residents in Singapore. Tier one GST can remain at 7%, which applies to all basic necessities such as food and toiletries. The second tier can be fixed at 8%, which will be charged if one purchases normal and luxurious goods such as digital gadgets and spa services. All these will help create a more even income distribution among the population, which would lower the Gini coefficient even further while keeping incentives to work in a fine balance.

However, we suggest that further research be done to extend the analysis of our projects to include the range of other taxes and government benefits not considered in this paper, including CPF, property taxes and an estimation of the government subsidy given to public housing in Singapore.

6. References

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7. Appendix: Approximation of Data

Income Taxes: Data available was based on individuals. Approximations were made to weight it based on the number of working persons in each household income band.

WIS Scheme: The effects of the WIS scheme assume one working individual per household, and that the individual meets all the criteria for the full payout to be given. Where applicable, WIS payouts were averaged across bands to find amounts corresponding to specific income levels.

Goods and Services Tax (GST): Since we could not obtain data on the amount of GST payable by households from each income group, we estimated the values based on average household expenditure, as it is a per unit tax.

Motor Vehicle Taxes: Data available was based on daily car usage per household instead of car ownership. We assumed that daily car usage suggested car ownership for the household. The second assumption made is that higher the household income would result in households buying more expensive and powerful cars. We then approximated taxes for each household based on the expected number of cars each household of that income group should own.

Education Subsidies: We assumed that the total expenditure for Primary, Secondary, JC/Tertiary students should be fully borne by students in actuality. Thus, the total expenditure was calculated on a per student basis. It was assumed that on average, each household would have 1 school going child.