A Flexible Model for Fuel Subsidy Reform in Malaysia

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Due to the current spike in crude oil prices and the economic uncertainty, the government of Malaysia is in the midst of revising the current fuel subsidy scheme that imposes caps on both petrol RON95 and diesel. Under the current scheme, all citizens are allowed to refuel subsidised petrol without any restriction. In the year 2022, the projected amount of the fuel subsidy allocation is RM28 billion, compared to RM11 billion in the previous year. To avoid an unhealthy financial position, a more structured fuel subsidy scheme is needed. We propose a framework, namely flexible fuel subsidy scheme (FLEXFUEL), that allocates the fuel subsidy to targeted consumer groups based on some predetermined ratios. Eligible citizens will be classified according to certain factors that will determine the fuel subsidy they are entitled to. The framework improves the weaknesses of the current scheme, and it is more flexible where the total allocation and the ratios are all adjustable to match the latest development of the country. More factors could also be added to the framework when necessary. We believe this is a more effective scheme that benefits both the country and citizens in the long term and simultaneously helps in reducing the environmental impacts due to fuel production and consumption.

Keywords: energy; fuel subsidy; Malaysia government; reform; targeted fuel subsidy scheme

I.   INTRODUCTION

Over the years, the federal government of Malaysia (*the government*) provides a blanket fuel subsidy for both petrol RON9[1] and diesel, where the fuel prices are currently capped at RM2.05/litre and RM2.15/litre , respectively. The fuel subsidy scheme is a form of government intervention in the economy intended to supply affordable fuel for consumers. It is, however, subject to certain exclusions or limitations. One such example is the exclusion of a more refined petrol

with higher quality components, namely RON97, where its price is published on a weekly basis according to the global crude oil prices (see here for the historical fuel prices in Malaysia since 2017). While the economy of Malaysia is still on the recovery path due to the public health crisis (Hashim *et al.*, 2021), the recent spike in crude oil prices brings a huge impact on the financial status of the government where the fuel subsidy is projected at RM28 billion in the year 2022, compared to RM11 billion in the year 2021.

In general, citizens in Malaysia are classified into three income groups: Top 20% (T20), Middle 40% (M40) and Bottom 40% (B40), based on the information provided by

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[1]RON is an abbreviation for *Research Octane Number*.

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the Department of Statistics Malaysia (2019). Note that the current fuel subsidy scheme is meant to support those who are underprivileged, i.e., citizens from lower-income groups. There are however several flaws that have been identified in the current scheme, which include:

1. the subsidy is allocated in an ineffective manner where a recent report by Malaysia Today (**2022**) shows that more than **50**% of the fuel subsidy was in fact utilised by citizens from **T20**,

2. foreign-registered vehicles do not obey the regulations set by the government by refuelling the subsidised petrol and

3. citizens misuse the fuel subsidy scheme by re-selling the subsidised petrol to non-citizens for their own benefit.

Due to many other unforeseen factors such as inflationary pressure and policy changes, and to ease the financial burden of the country especially in the long term, the government is currently working towards a more effective fuel subsidy scheme to address the issues detected in the current scheme. It is worth noting that the fuel subsidy scheme, in general, might be controversial and have trade-offs. For example, subsidies can be a burden to the government and may not always reach the targeted groups. Furthermore, if it is not well-designed, it can be regressive as the majority of the benefits may go to higher-income groups.

An empirical study (Nwachukwu & Chike, 2011) shows that there exists a strong relationship between the fuel subsidy and fuel demand. There are also some past studies (Ellis, 2010; Chelminski, 2018; Shittu *et al.*, 2024) in phasing out fuel subsidies in other countries such as Indonesia and Nigeria, demonstrating that the fuel subsidy reform will bring a huge benefit to not just the economy (von Moltke *et al.*, 2004) but also the environment. Arzaghi and Squalli (2023) investigated the effect of fuel subsidy policies on environmental emissions and they discovered that high fuel subsidies lead to a higher emission. In addition, fuel subsidies also bring negative effects to society in which resources are taken away and it usually benefits the wealthier population (van Asselt, 2023).

Li *et al.* (2017) developed a model and investigated the impacts of phasing out the fuel subsidy completely in Malaysia. Their simulation results suggested that the fuel subsidy scheme in Malaysia should be removed in order to reduce the budget deficit of the country. Hence, the plan to reform the current fuel subsidy scheme in Malaysia is on track so that a more efficient allocation of country resources can be implemented. To achieve this, several strategies (Tan, 2022) have been proposed by the government in the past in order to implement a targeted fuel subsidy. For instance, (1) a one-off fuel subsidy of RM625 will be paid to citizens who fulfil certain criteria when they renew their road tax, and (2) a full subsidy will be given to those who earn less than RM5,000 monthly, whereas a partial subsidy will be given to those who earn RM5,000 − RM10,000 monthly. These strategies are however not in force due to certain reasons, particularly the complexity during the implementation phase.

In view of the above reasons and to move towards a better and more effective fuel subsidy scheme, we propose a flexible framework that allocates fuel subsidies to targeted groups based on several predetermined ratios. Through this scheme, the government has some flexibility in controlling the allocated budget, which could be reduced from time to time before the fuel subsidy scheme is removed completely. We focus on a framework specifically designed for consumers. It is, however, possible to design a similar framework for corporates given that a fixed budget will first be allocated in the proposed scheme (more details can be found in Section 2). Ultimately, we also aim to reduce the fuel demand for a cleaner environment.

II. A FLEXIBLE MODEL

To avoid any negative impact on the country and to minimise the possible burden to all citizens resulting from the fuel subsidy reform especially in fighting against inflation, a framework must be designed carefully by considering various factors. It must be as comprehensive as possible so that the budget allocated to the scheme is utilised in a more effective manner. The implementation of the scheme should be straightforward without involving some lengthy process. Some major factors that are taken into consideration in our proposed framework are as follows:

1. *vehicle type*: motorbike or car

2. *income group*: **T20**, **M40** or **B40**

3. *tax resident*: tax resident or non-tax resident (i.e., whether they declare their income in the previous financial year)

It is worth noting that the list of factors is by no means exhaustive (more factors can be added in when necessary), but it does consider all the main components required in designing an effective framework.

The general idea is to classify all citizens into the respective categories based on the above factors, and the fuel subsidy will be allocated based on predetermined ratios. The predetermined ratio to each category shall be adjustable depending on the total budget and the number of citizens classified in each category. To achieve a higher accuracy, the latest data that could be extracted from various government agencies (including the Road Transport Department Malaysia, Inland Revenue Board of Malaysia and National Registration Department) should be used, and they must be updated regularly.

A. FlexFuel

Based on the above three factors, we now describe our proposed model, namely flexible fuel subsidy scheme (FLEXFUEL). We only consider eligible citizens who possess either cars or motorbikes.

Let x be the total amount allocated by the government for the fuel subsidy in a particular year. We first classify all citizens into two categories: *car* and *motorbike*. If a citizen is the owner of at least one car, then the citizen will be classified under *car*. Otherwise, the citizen belongs to *motorbike*. We suggest allocating 80% of the fuel subsidy to *car* and the remaining 20% to *motorbike*.

For *motorbike*, we employ a simple and direct strategy, where

• motorbikes with an engine capacity of at most **150cc**, or

• motorbikes with an engine capacity of more than **150cc** but **7** years and older,

are entitled to the subsidy that will be distributed evenly.

We now proceed with the next category *car*, by taking some other factors into considerations. Let t, m and b be the numbers of citizens classified under T20, M40 and B40, respectively. To address the issue of uneven distribution, we first split the remaining allocation $0.8x$ into three portions in the ratio of $2:4:4$, based on the factor *income group*. These portions will be allocated to the three defined categories T20, M40 and B40 accordingly, which implies that the allocated amount for each of these categories is $0.16x$, $0.32x$ and $0.32x$, respectively. The rationale of this distribution is that we believe $t \gg m \gg b$ in general, and hence lower income citizens will be allocated with a higher amount of subsidy even though both M40 and B40 receive the identical portions. The ratio can however be adjusted based on the latest scenario to assist those who are underprivileged.

Before we consider the next factor, we set an upper limit on the subsidy that each citizen under the respective category is entitled to. For T20, the upper limit is set at

$$\max(T) = \frac{0.16x}{t}$$

(1)

Similarly, we have $\max(M) = 0.32x/m$ and $\max(B) = 0.32x/b$. These limits are used to prevent citizens in certain categories from receiving subsidies that are higher than others (the number of citizens in some categories might be significantly lesser, which will be explained later). These limits will be updated accordingly each time a new factor is added in.

We now proceed with the three categories under *car* by examining the next factor *tax resident*, and further split the citizens according to whether they are tax residents in the previous financial year. We assume that T20 are all classified as tax residents under FLEXFUEL; hence, the allocated amount remains unchanged. For tax and non-tax residents under M40 and B40, we allocate to them 75% and 25% of the current allocated amount, respectively. This implies that tax residents under M40 (or B40) will now share $(0.32 \times 0.75)x = 0.24x$ and non-tax residents under M40 (or B40) will share $(0.32 \times 0.25)x = 0.08x$ evenly among each other. The relevant distributions for each category can be found in Figure 1.

Note that citizens classified under certain categories could be much lesser compared to their conjugate. For instance, tax-residents in B40 could be much lesser than non-tax residents in B40. Suppose b_t is the number of citizens under B40 who are tax residents (numbers of citizens under other categories are defined similarly where the subscript nt will

be used to represent non-tax residents). If the proposed subsidy $0.24x/b_t$ for this category is higher than $\max(B)$, then the allocated subsidy for each citizen will be $\max(B)$. Otherwise, the subsidy will remain at $0.24x/b_t$. For the case when $0.24x/b_t > \max(B)$, the balance $0.24x - (\max(B) \cdot b_t)$ is an *excess*. If an excess is derived from a non-tax category, it will be transferred to its conjugate, the tax category, and be distributed evenly. Otherwise, it will be treated as a reserve fund that can be used to increase the fuel subsidy when needed.

Based on this framework, the fuel subsidy will be distributed in a more effective manner according to the predetermined ratios. This helps in preventing a certain group of people from utilising an excessive amount of fuel subsidy. In addition, by paying the subsidy in the form of cash directly to the citizens, foreigners will definitely be excluded from purchasing the subsidised petrol. Meanwhile, it also prevents citizens from re-selling subsidised petrol to others for their own benefit since there will be a quota on the subsidy given to each citizen under FLEXFUEL. More importantly, the fuel demand may also be reduced due to a fixed amount of fuel subsidy given to each eligible citizen.
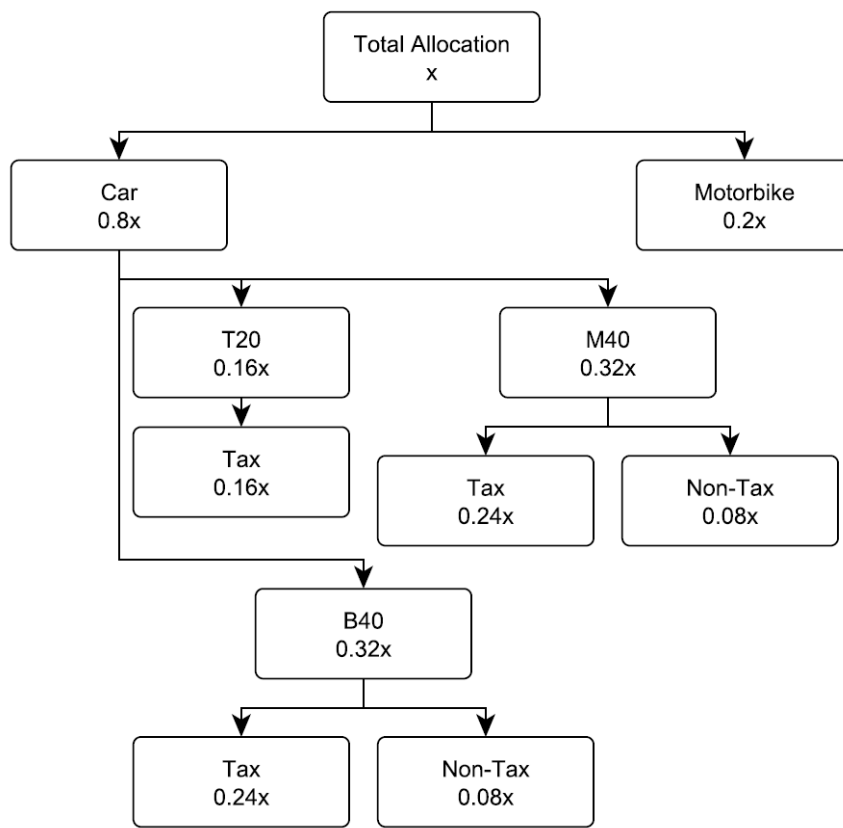

Figure 1. An illustration of the subsidy distribution for each category under FLEXFUEL.

III. DISCUSSION

In this section, we illustrate FLEXFUEL using an example by following the predetermined ratios as in Figure 1. We also round decimal numbers to two decimal places throughout.

Let the total allocation $x =$ RM12 billion. Suppose 12.5 million and 22.5 million citizens are classified under *car* and *motorbike*, respectively. Under FLEXFUEL, each citizen who belongs to *motorbike* is entitled to

$$\frac{0.2 \times \text{RM}12,000,000,000}{12,500,000} = \text{RM}192$$

fuel subsidy.

Based on FLEXFUEL, the total amount allocated to T20, M40 and B40 under *car* are RM1.92 billion, RM3.84 billion and RM3.84 billion, respectively. Out of 22.5 million citizens under *car*, we suppose $t = 6.5$ million, $m = 9$ million and $b = 7$ million. We also assume that 80% and 20% of citizens under M40 and B40 are tax residents, respectively. Using this setting, we determine the fuel subsidy for each eligible citizen under *car* based on FLEXFUEL. The relevant details

are all summarised in Table 1, where the subsidy allocated to each citizen is calculated and shown in the last column.

Recall that the upper limit is calculated according to Equation 1, and tax residents and non-tax residents for both M40 and B40 will get 75% and 25% of the allocated amount, respectively. Based on the above information, we can see that two (bolded) subsidies are more than the upper limits that were set earlier. Based on FLEXFUEL, the excess $(\text{RM}533.33 - \text{RM}426.67) \times 1{,}800{,}000$ derived from non-tax

residents under M40 will be transferred to its conjugate, i.e., tax residents under M40. This implies that each citizen under M40 will receive RM426.67 (which is equivalent to the upper limit) as their fuel subsidy regardless of their tax residency status. On the other hand, the excess $(\text{RM}2{,}057.14 - \text{RM}548.57) \times 1{,}400{,}000$ derived from tax residents under B40 will be kept as a reserve fund, and each citizen under this category will receive a fuel subsidy equivalent to its upper limit of RM548.57.

Table 1. An overview of the proposed subsidy for citizens under *car*.

Group	Upper Limit	Tax Status	Amount	# Citizens	Subsidy	Final Subsidy
T20	295.38	Tax	1.92 bil.	6,500,000	295.38	295.38
		Non-Tax	–	–	–	–
M40	426.67	Tax	2.88 bil.	7,200,000	400	426.67
		Non-Tax	0.96 bil.	1,800,000	**533.33**	426.67
B40	548.57	Tax	2.88 bil.	1,400,000	**2,057.14**	548.57
		Non-Tax	0.96 bil.	5,600,000	171.43	171.43

Based on this example, we can see that fuel subsidies are allocated to each eligible citizen across all the income groups. Among citizens from the same category, tax residents are in favour, and they receive a higher (if not equal) subsidy than non-tax residents. This somehow serves as an initiative to increase the number of tax residents in the country. We also observe that underprivileged citizens are entitled to higher fuel subsidies except for the non-tax residents under B40. This is logical given that citizens from this group usually have a lesser fuel consumption than others. The predetermined ratio can be adjusted accordingly if more financial assistance is needed for them during the transition period.

IV. CONCLUSION

We proposed a flexible fuel subsidy scheme in Malaysia based on three factors (*vehicle type*, *income group* and *tax resident*) which will:

- ensure every eligible citizen is entitled to the fuel subsidy that is allocated based on several factors, where the main focus is on those who are underprivileged,

- prevent foreigners from refuelling subsidised petrol in Malaysia,

- minimise chances for certain groups of citizens from abusing the subsidy scheme for their own interest,

- make sure that the financial position of the country remains healthy in the long-term basis,

- indirectly reduce the fuel demand and hence reduce the pollution due to fuel production and consumption (Arzaghi & Squalli, 2023).

Since the government is in the midst of abolishing the current framework that provides a blanket fuel subsidy, we believe that our proposed framework FLEXFUEL is on a par with current policies as well as global trends. We can also see that the framework is fairer and would certainly work in an effective manner if it is implemented appropriately. In addition, it is flexible where the predetermined ratios can be adjusted to ensure that targeted groups gain the most benefit. Furthermore, more factors can also be added based on the latest global development so that the well-being of each citizen in the country is well taken care of. Therefore, we believe that this framework plays a significant role in ensuring a smooth transition before the fuel subsidy scheme can be removed completely in Malaysia.

Last but not least, by reforming the fuel subsidy scheme in Malaysia, the government could consider reducing the

import and excise duties as well as the sales taxes imposed on motor vehicles, in which the current duties and taxes can be found on Malaysian Automotive Association's website (2019). This seems a reasonable move given that fuel prices will be fluctuated according to the global crude oil prices, and a ceiling will be imposed on the fuel subsidy given by the government. The additional resources derived from FLEXFUEL should also be managed wisely so that the budget deficit of the country can be reduced, and the inflation rate is well-controlled.

A. The Way Forward

We now point out some future directions or changes that could be made on FLEXFUEL.

Since FLEXFUEL highly relies on the availability and accuracy of the data, to implement this framework in an effective way, all the data extracted from various government agencies must be accurate and up to date. Therefore, a database that combines all relevant information could be developed, where each eligible citizen is required to register his/her details (that will be verified by relevant agencies) so that he/she can be classified accordingly under FLEXFUEL. Some techniques used on social network analysis (Nunes & Abreu, 2020; Mohd Zu & Yow, 2024) may also be employed so that relevant data can be analysed in a more effective manner.

Due to its flexibility, the framework can also be classified further by considering additional factors such as the market value of each vehicle, the amount of tax paid and the location (urban/rural) of the citizens. The reason is that we believe the market value of a vehicle can better reflect if one is eligible for the fuel subsidy compared to the engine capacity. In addition, those who pay higher income tax should obtain a higher subsidy compared to others in the same category. Nonetheless, a suitable threshold needs to be studied and set for this purpose. Lastly, citizens in each category could be classified according to locations given that those in urban areas will probably have higher petrol usage. Note also that the upper limit for each category needs to be updated whenever a new factor is added to the framework.

Since the framework may become complex when more determinative factors are included, we suggest extending it by employing some learning models (Yow *et al.*, 2022; Yow *et al.*, 2023) so that the overall performance especially the accuracy of the framework can be enhanced further.

Another framework could also be designed for corporates if commercial vehicles need to be covered under the fuel subsidy scheme, using different factors such as the nature of business. A thorough survey is, however, needed so that a suitable framework with similar objectives can be developed.

V.   ACKNOWLEDGEMENT

VI.   REFERENCES

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