THE FINANCIAL AND WELFARE IMPACT OF HOUSEHOLD TOBACCO EXPENDITURE IN MALAYSIA

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FACULTY OF MEDICINE
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ABSTRACT

The tobacco epidemic is a public health threat in Malaysia and around the world. This project is mainly motivated by concerns about the non-health financial and welfare impact of tobacco-smoking on tobacco smokers and their households. Household tobacco expenditure was examined using data from five comparable nationally representative Household Expenditures Surveys conducted in 1993, 1998, 2004, 2009 and 2014. First part of the study estimated the household tobacco expenditure and the household tobacco expenditure share across the various living standards and the distribution of tobacco expenditure in Malaysia. The study revealed that the burden of tobacco-smoking in the country has remained persistently high whereby the proportion of tobacco expenditure at household level has always been above 35.0% over five points of time and that the middle quintile has gradually emerged as the highest consumer of tobacco between 2004 and 2014. The proportion of households with tobacco expenditure was declining between 1993 and 2009 across all consumption quintiles but resurged in 2014. Although the burden of tobacco-smoking was high, the monthly per capita adult equivalent tobacco expenditure was relatively low among tobacco-smoking households, ranging from MYR39.51 to MYR52.40. In addition, the household tobacco expenditure share of total household expenditures had reduced from 7.00% to 4.60%, which indicates that there has been a reduction in the amount of money spent for the purchase of tobacco products. From concentration curves and indices, the household tobacco expenditure is more concentrated among the richest quintile of the Malaysia population irrespective of region, urban-rural stratum and ethnicity. The second part of the study estimated the impoverishment attributable to direct tobacco expenditure in Malaysian households, as based on an increase in the estimate of the poverty headcount. While overall, there was

impoverishment due to direct tobacco expenditure; the proportion was very small and declined from 1.08% in 1993 to 0.01% in 2014 irrespective of regions, urban-rural stratum and ethnicity. The third part of the study estimated the crowding out of essential goods and services due to tobacco expenditure. The crowding out effect was analysed using one of the consumer demand models, namely the Quadratic Almost Ideal System (QUAIDs). In addition, seemingly unrelated regression was used to estimate the crowding out effect on five expenditures groups simultaneously as each of the expenditures groups affects the others. The analysis showed that the crowding out of essential goods and services was present but very modest among tobacco-smoking households in Malaysia, where the tobacco-smoking households significantly reduce their expenditures on food(1.64% less), education(0.47% less), medical care(0.35% less), housing(1.88% less) and clothing(0.20% less) compared to non-smoking households. This observation was rather consistent across all consumption expenditures quintiles irrespective of living standards. Additionally, sub-population analysis showed that the dose-response relationship between the crowding out effects and the intensity of tobacco expenditure was present for food, medical care and housing. Overall, this study found that household tobacco expenditure in Malaysia was low and its share in total household expenditure was declining. Moreover, the impoverishment and welfare impact from direct tobacco expenditure although present, was very modest. All of the major findings of this study could be explained by the affordability of cigarettes which may be contributed by suboptimal taxation of cigarettes, rampant availability of illicit cigarettes and pace of the increase in income has exceeded the increase in the tobacco price. The main message here is that the effectiveness of tobacco taxation is intrinsically linked to the availability of illicit cigarettes and, as such, an increase in tobacco taxation must be concurrently complemented by extensive control of illicit cigarettes to ensure that action to reduce tobacco usage through the utilization of fiscal measures is effective. In light of the

foregoing, future research could concentrate on assessing the actual burden of illicit cigarettes in Malaysia as well the tobacco tax mitigation strategies to fill the knowledge gap identified in this study.

Keywords: household tobacco expenditure, financial burden, tobacco smoker

ABSTRAK

Epidemik merokok merupakan satu ancaman kesihatan awam di Malaysia dan di peringkat global. Dorongan utama penghasilan tesis "Perbelanjaan Merokok Isi Rumah Serta Kesan Kewangan Dan Kebajikan Di Malaysia" ini adalah berpunca dari kebimbangan tentang kebajikan isi rumah perokok terutamanya di kalangan ahli keluarga akibat kesan langsung daripada perbelanjaan merokok. Perbelanjaan merokok isi rumah dikaji dengan menggunakan data dari lima siri kajian perbelanjaan isi rumah yang dijalankan pada 1993, 1998, 2004, 2009 dan 2014 dan kajian tersebut mewakili populasi Malaysia. Dalam bahagian pertama, kajian ini menilai beban isi rumah yang menpunyai perbelanjaan merokok dan juga purata perbelanjaan merokok isi rumah merentasi kelima-lima siri kajian berkenaan. Kajian ini menunjukkan beban merokok di Malaysia masih agak tinggi di mana prevalen isi rumah yang mempunyai perbelanjaan merokok adalah selalu melebihi 35.0%. Pada waktu sama, kuintil kedua dan ketiga telah muncul secara beransur-ansur menjadi kumpulan isi rumah utama yang menpunayi perbelanjaan merokok tertinggi di antara tahun 2004 hingga 2014. Secara keseluruhan, prevalen untuk isi rumah yang belanja untuk rokok adalah menurun bermula 1993 hingga 2009, akan tetapi, prevalen tersebut melonjak naik pada 2014. Walaupun prevalen isi rumah merokok adalah agak tinggi, tetapi perbelanjaan dalam pembelian rokok di kalangan isi rumah adalah agak rendah, di mana hanya RM39.51 hingga RM52.40 setiap bulan. Pada waktu sama, kadar perbelanjaan merokok berkurang dari 7.0% kepada 4.6% menunjukan bahawa perbelanjaan yang lebih kecil diperlukan untuk membeli rokok di Malaysia. Perbelanjaan rokok isi rumah per kapita dewasa pula lebih tertumpu di kalangan penduduk berpendapatan tinggi di Malaysia tanpa mengira kawasan, strata bandar-luar bandar serta suku kaum. Dalam bahagian kedua, kajian ini menilai kemiskinan yang berpunca dari pembelian rokok secara langsung oleh isi rumah. Pertambahan anggaran bilangan kemiskinan digunakan untuk menilai kemiskinan yang disebabkan secara

langsung oleh perbelanjaan untuk membeli rokok. Kemiskinan disebabkan oleh perbelanjaan secara langsung untuk membeli rokok sememangnya wujud namun kesan kemiskinan tersebut adalah kecil dan semakin berkurangan dari 1993 hingga 2014 tanpa mengira kawasan, strata bandar-luar bandar serta suku kaum. Bahagian ketiga kajian ini mengkaji impak kepada aspek kebajikan seperti pengurangan pembelian barangan dan perkhidmatan asas yang diperlukan dalam kehidupan harian. Analisa ini dijalankan dengan menggunakan *"Consumer Demand Model"* yang dinamakan sebagai *"Quadratic Almost Ideal System (QUAIDs)"*. Dalam analisis, *"Seemingly unrelated regression"*digunakan untuk menganalisa pengurangan perbelanjaan kelima-lima kumpulan barangan dan perkhidmatan asas isi rumah. Daripada analisa kajian ini, isi rumah yang menpunyai perbelanjaan rokok didapati mengurangkan perbelanjaan dalam makanan(kurang 1.64%), pendidikan(kurang 0.47%), perubatan(kurang 0.35%), perumahan(kurang 1.88%) dan pakaian(kurang 0.20%) dibandingkan dengan isi rumah tanpa perbelanjaan merokok. Fenomena pengurangan pembelian barangan dan perkhidmatan asas adalah konsistan untuk semua kuintil. Tambahan lagi, analisa di kalangan isi rumah merokok menunjukkan bahawa peningkatan dalam pembelian rokok akan menyebabkan pengurangan pembelian makanan, perubatan dan perumahan. Walaubagaimanapun, pengurangan dalam pembelian barangan dan perkhidmatan asas adalah semakin berkurangan dari kuintil termiskin ke kuintil terkaya. Secara keseluruhan, kajian ini menunjukan bahawa perbelanjaan isi rumah dalam merokok adalah rendah di Malaysia di mana kadar perbelanjaan merokok adalah semakin berkurangan. Tambahan lagi, kajian ini menunjukan kesan kemiskinan dan kebajikan dari perbelanjaan merokok sememangnya wujud di kalangan isi rumah dengan perbelanjaan merokok, tetapi kesan tersebut adalah kecil. Hasil kajian ini boleh dikaitkan dengan kebolehdapatan rokok di Malaysia disebabkan oleh kadar cukai rokok yang tidak optima, rokok haram yang berleluasa dan pertumbuhan gaji di kalangan isi rumah melebihi kadar peningkatan harga

rokok. Mesej utama di sini ialah keberkesanan cukai tembakau berkait rapat dan tidak dapat dipisahkan dengan rokok haram.

Keywords: perbelanjaan merokok isi rumah, bebanan kewangan, merokok

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LIST OF SYMBOLS AND ABBREVIATIONS

For examples:

AE_h	:	Adult equivalent scale
AIDS	:	Almost Ideal Demand System
CI	:	Confidence interval
CMTM	:	Confederation of Malaysian Tobacco Manufacturers
CPI	:	Consumer Price Index
DOS	:	Department of Statistics
EBs	:	Enumeration Blocks
EPU	:	Economic Planning Unit
FCTC	:	Framework Convention on Tobacco Control
GATS	:	Global Adult Tobacco Survey
GST	:	Goods and services tax
HES	:	Household Expenditures Survey
IPH	:	Institute of Public Health
ITC	:	International Tobacco Control
LCH	:	Life Cycle Hypothesis
LES	:	Linear expenditures model
LMIC	:	Low-middle income countries
LQs	:	Living quarters
MPL	:	Minimum Price Law
MYR	:	Malaysian Ringgit
NHMS	:	National Health Morbidity Survey
OR	:	Odd ratio
PIH	:	Permanent Income Hypothesis

PLI	:	Poverty line income
QUAIDS	:	Quadratic almost ideal system
S.E	:	Standard error
SEATCA	:	Southeast Asia Tobacco Control Alliance
SUR	:	Seemingly unrelated regression
WHO	:	World Health Organization

CHAPTER 1: INTRODUCTION

1.1 Introduction

Globally, the epidemic of tobacco consumption has been an important public health threat for some time, and it has been estimated that there are over 1.1 billion tobacco smokers worldwide (WHO, 2016b). Adult males are the major contributors to the high burden of tobacco-smoking worldwide (WHO, 2016b). Projections for the prevalence of tobacco-smoking vary across the different regions of the world. For instance, the prevalence of tobacco-smoking is projected to drop in the Americas and Europe, which directly contributes to the overall projected drop in the global prevalence of tobacco-smoking from 22.1% in 2010 to 18.9% in 2025. Nonetheless, an increase in the prevalence of tobacco-smoking is projected for Africa and Eastern Mediterranean (WHO, 2016f).

In Malaysia, the prevalence of tobacco-smoking in the total population was 27.0%, 23.1% and 22.8% in 2006, 2011 and 2015, respectively. In Malaysia, the prevalence of tobacco-smoking is higher among the adult male population than other population groups, at 49.2% in 1996, 48.8% in 2006, 36.4% in 2011 and 42.4% in 2015 (NHMS, 2006, 2015). The prevalence of tobacco-smoking among the adult male population in Malaysia has always been in the region of 40.0% with no obvious reduction despite numerous tobacco control measures being implemented by the Malaysian Government.

In view of the high burden of tobacco consumption worldwide, its morbidity and mortality have been relatively well studied and explored. For instance, the mortality rate of tobacco smokers is known to be two-to-three times higher than that of non-smokers (Jha & Peto, 2014). This adverse health impact has escalated the healthcare cost in many countries, irrespective of whether they are high-income countries or LMICs (Aljunid, 2006; Batscheider et al., 2012; Djutaharta, Thabrany, Sung, Ong, & Hu, 2012; Xu,

Bishop, Kennedy, Simpson, & Pechacek, 2015). For instance, tobacco-related illnesses consumed up to approximately 16.5% of the total healthcare budget in Malaysia in 2004 and 2005, while, the direct and indirect medical costs of tobacco-related illnesses, namely chronic pulmonary airway disease, ischaemic heart disease and cancer amounted to USD790 million (Aljunid, 2006). By way of comparison, in the case of the United States(US) 8.70% (95% CI: 6.80%, 11.20%) of the country's annual medical expenditures was due to tobacco-smoking in 2010, which amount to approximately USD170 billion (Xu et al., 2015).

Unfortunately, the negative impact of tobacco-smoking do not stop at healthcare per se, it also negatively jeopardizes non-health components such as the financial, social and welfare status of tobacco smokers (Assunta, 1999; De Beyer, Lovelace, & Yürekli, 2001; Hu, Mao, Liu, de Beyer, & Ong, 2005; S. John, Vaite, & Efroymson, 2002; Liu, Rao, Hu, Sun, & Mao, 2006; WHO, 2004). To make matters worse, the adverse impact on the financial, social and welfare aspects do not solely affect the smokers but also their families (WHO, 2004). Indeed, tobacco-smoking is believed to cause a spectrum of non-health financial and welfare impact. Money spent on tobacco products may result in less money spent on essential goods such as food, a phenomenon referred to as crowding out of essential goods and services. Money spent on tobacco products may also lead to impoverishment. Impoverishment from tobacco-smoking could be viewed from two perspectives, either via direct tobacco expenditure or the indirect healthcare cost incurred due to tobacco-related illnesses.

In this context, the poor, who have been the major consumers of tobacco products, are at a higher risk of suffering financially and socially under their constrained financial budget (Hiscock, Bauld, Amos, Fidler, & Munafò, 2012; Hiscock, Bauld, Amos, & Platt, 2012). Not only that, their financial hardship is likely to be compounded by the healthcare

costs incurred due to tobacco-related illnesses in the long run, which in turn leads to a vicious cycle of poverty. Moreover, the adverse social impact could be intergenerational and thus affect their children (Liu et al., 2006; WHO, 2004). On average, the poor smoke more than the rich, therefore, the issue of impoverishment due to direct tobacco expenditure should not be underestimated. For instance, studies conducted in China and India have revealed that impoverishment caused by direct tobacco expenditure is concentrated among the poor in both of these countries (R. M. John, Sung, Max, & Ross, 2011; Liu et al., 2006).

Other than poverty, another adverse welfare impact of tobacco-smoking is the crowding out of essential goods and services at the household level. In the context of this study, the crowding out effect refers to the reduced consumption of essential goods and services in the household that is attributed to spending on tobacco products (R. M. John, 2008). To determine whether the crowding out effect is present, an assessment is carried out to ascertain whether there is a reduction of expenditures on essential goods and services such as food, medical care, housing, education and clothing among tobacco-smoking households as compared to non-smoking households. In this regard, studies in China, India and Cambodia have reported reduction in spending on various essential goods and services due to direct tobacco expenditure (R. M. John, 2008; R. M. John, Ross, & Blecher, 2012; Wang, Sindelar, & Busch, 2006).

To overcome the extensive adverse impact of tobacco-smoking on health and non-health aspects, the World Health Organization launched the WHO Framework Convention on Tobacco Control (WHO-FCTC), which is the first global public health and evidenced-based treaty to tackle the root cause of the tobacco epidemic. Under article 6 of WHO-FCTC, tobacco taxes are highly recommended to combat the tobacco epidemic via demand reduction whereby tobacco taxes are raised to increase tobacco prices, which

in turn reduces the demand for tobacco products (WHO-FCTC, 2015). Although tobacco taxes have been scientifically proven to effectively reduce tobacco consumption in the long run (Ahmad & Franz, 2008; Chaloupka, Yurekli, & Fong, 2012; Van Baal, Brouwer, Hoogenveen, & Feenstra, 2007), there are ethical arguments concerning its distributional impact over households of different living standards as it might burden the poor who are the major consumers of tobacco products (Warner et al., 1995). Hence, before introducing a tobacco tax rise in Malaysia it is crucial to gain an insight into the actual distribution of tobacco expenditure by households across the income distribution.

Therefore, this thesis consists of three main parts focussing on three major issues: (1) household tobacco expenditure, household tobacco expenditure share and the distribution of household tobacco expenditure across households of different living standards, (2) populational impoverishment due to direct tobacco expenditure and (3) the crowding out effect on essential goods and services due to household tobacco expenditure. The key findings of the research are then discussed and compared to those reported in other relevant studies. Finally, the thesis discusses the policy implications of the findings and makes some recommendations for the policymaker as well as offers some suggestions for future research directions.

Following this introductory section, this chapter continues with Section 1.2, which explains the motivations for this study. Next, Section 1.3 precisely describes the study objectives. Then, Section 1.4 highlights the significance of the study, and lastly, Section 1.5 describes the organization of the thesis.

1.2 Motivations for the study

Tobacco-smoking was responsible for the death of roughly 100 million people in the 20th century, and this figure is projected to reach one billion in the 21st century based on the current tobacco-smoking trends (WHO, 2016f). To be specific, worldwide, tobacco-related deaths stood at 3.4 million in 2010 and this figure is estimated to double reaching 6.8 million in 2030 if no stern and strong action is taken, especially in LMICs (Bloom et al., 2012). In relation to health, tobacco-smoking is the most common modifiable risk factor for numerous chronic diseases such as cardiovascular diseases, cerebrovascular diseases, malignancies and lung diseases. Tobacco-smoking is an avoidable negative health behaviour; yet, the burden of tobacco-smoking remains relatively high even though various measures have been implemented in countries throughout the world.

Malaysia, an upper-middle income country with a high burden of tobacco-smoking especially among the adult male population is also facing a tobacco epidemic. In response to this epidemic, the Malaysian Government has carried out various control measures, such as tobacco taxation, banning of tobacco advertisements and sponsorship in sports, mandating the display of health warnings on cigarette packaging, banning of cigarettes sale to minors, banning of kiddie-packed[1] cigarettes, prohibition of tobacco-smoking in public areas and dining establishments and smoking cessation programmes. However, the goal of effectively controlling the epidemic is still far beyond the country's reach.

Theoretically, tobacco taxation is regarded as a relevant public health policy in LMICs as it is understood that the raising of tobacco taxes leads to an increase in tobacco prices, which should consequently reduce tobacco consumption (Gruber & Koszegi, 2008; Warner, 1990; WHO, 2013). The Malaysian Government has taken similar steps as those

[1] Small packaging of cigarettes containing only ten sticks of cigarettes.

seen in other countries and has also followed the WHO recommendation to raise tobacco taxes accordingly since 1990; yet, unfortunately, the desired effect of tobacco taxation has not materialised. This is evidenced by the persistent high prevalence of tobacco-smoking especially among the adult male population in Malaysia, which was 44.0% in 2015. The mismatch between the increasing tobacco taxes and the persistently high prevalence of tobacco-smoking in adult males raises questions as whether there is a knowledge gap in explaining the relationship between the increasing tobacco taxes in Malaysia and the high prevalence of tobacco-smoking. Hence, it is envisaged that an exploration of the trends in household tobacco expenditure from 1993 to 2014 in conjunction with an assessment of the progression of tobacco taxation since 1990 will indirectly provide an insight into the real household impact of tobacco taxes in Malaysia.

Another concern in relation to tobacco taxation is its financial impact on populations of different living standards. Although tobacco taxation is regarded as a universal public health tool that can be used to combat the tobacco epidemic; the impact of increasing tobacco taxes on the poor households are of particular interest as the poorer households in various countries have been found to be the major consumer of tobacco as compared to richer ones (Gospodinov & Irvine, 2009). Hence, it would be useful to examine the distribution of household tobacco expenditure to ascertain whether the poor or the rich have been spending more money on tobacco products. Given that tobacco taxation in Malaysia has gradually increased over the years, studying the tobacco expenditure pattern across households of different living standards would indirectly reveal whether the rich or the poor households had contributed the most to the revenue derived from tobacco taxation in Malaysia.

In general, the incidence of household poverty in Malaysia has reduced significantly from 49.30% in 1970 to 0.40% in 2016. This achievement is obviously enormous and

remarkable for a young nation. However, a recent report by UNICEF highlighted that urban poverty as revealed by the report's surrogate outcome of child malnutrition among the urban poor especially those living in low-cost apartments (Abdul Khalid, Rosli, Abdul Halim, & Shazlie Akbar, 2018). The key determinants of child malnutrition include poverty, low maternal education, poor nutrition during pregnancy, limited access to affordable nutritious foods and a poor living environment (Abdul Khalid et al., 2018). As these factors may be compounded by a high prevalence of tobacco-smoking among the urban poor population, it would be interesting to explore the extent of impoverishment that may possibly be caused by direct tobacco expenditure (H. K. Lim et al., 2013).

Other than poverty, the non-health adverse welfare impact of tobacco-smoking have rarely been explored in Malaysia. For instance, most of the tobacco studies conducted in Malaysia have concentrated on the epidemiology of tobacco-smoking or the factors contributing to youth smoking, while a few studies have investigated the economics and government policies related to the effects of the ban of cigarette smoking in public places as well as increased cigarette taxes (Hum, 2016). However, as yet, it seems that no study has examined the non-health financial impact and household welfare impact of tobacco-smoking. Elsewhere in the region, there are studies that have been conducted in China and India that show that there are adverse welfare impact of tobacco expenditure among tobacco-smoking households in both countries (R. M. John, 2008; Wang et al., 2006). Hence, it is important to examine the extent of the adverse welfare impact, especially the crowding out effect on essential goods at the household level in tobacco-smoking household because these adverse impacts will also affect all household members including pregnant mothers and children. Thus, given the above scope of this thesis, its results will certainly provide an important insight into tobacco expenditure as well as its impact on poverty and household welfare in Malaysia.

1.3 Study objectives

The main interest of this thesis is the financial impact due to tobacco expenditure. As mentioned earlier, more evidence is required to establish the non-health financial impact such as crowding out of essential goods and services as well as impoverishment that may be attributable to tobacco expenditure.

First and foremost, the distribution of tobacco expenditure and tobacco expenditure shares at the household level will be examined to establish an overview of household tobacco expenditure in Malaysia at five selected time points. From the distribution of tobacco expenditure across households of different living standards, the study will then assess whether higher tobacco expenditure is borne by richer or poorer households. This is important as it will provide valuable information on equity with regards to who has paid more in tobacco expenditure as the tobacco taxes in Malaysia have gradually increased according to the recommendation in the WHO FCTC[1].

Then, the study will evaluate the contribution of direct tobacco expenditure to estimates of household impoverishment in Malaysia. Although Malaysia has achieved a great milestone in reducing the incidence of poverty in the last 30 years (EPU, 2016), the Government has not assessed the possible contribution of direct tobacco expenditure on poverty, the findings on which could be essential in ensuring a financially equitable society. In this respect, the study will be able to reveal the magnitude of impoverishment that is attributable to direct tobacco expenditure and which could then be reduced by combating the tobacco epidemic in Malaysia.

Lastly, the study will evaluate the extent of the crowding out of essential goods and services caused by tobacco expenditure at the household level. Crowding out will be assessed at household level because the intra-household allocation of monetary resources under a constrained budget affects all household members in the various aspects of their

daily life. In addition, the study will attempt to establish the dose response relationship between tobacco expenditure and the magnitude of the crowding out effect. This will be done to assess whether increasing tobacco expenditure will further crowd out essential goods and services.

Thus, the specific objectives of the study are as follows:

1. To estimate household tobacco expenditure across households with different living standards and examine the distribution of household tobacco expenditure shares at five selected time points: 1993, 1998, 2004, 2009 and 2014;
2. To estimate the extent of population impoverishment caused by direct tobacco expenditure by estimating the increase in impoverishment after accounting for direct tobacco expenditure at five selected time points: 1993, 1998, 2004, 2009 and 2014;
3. To estimate the crowding out of the consumption of essential goods and services due to household tobacco expenditure across households of different living standards at one selected time point, 2014; and
4. To examine the distribution of household tobacco expenditure in relation to the tobacco taxation policy in Malaysia from 1990 to 2014, and thereby identify the policy implications and lessons for policymakers in Malaysia and other countries with regards to ensuring effective tobacco control in the context of the changing trend in tobacco consumption in Malaysia.

1.4 Significance of the study

There is abundant epidemiological evidence that tobacco-smoking is an important public health burden globally, as well as in Malaysia where the prevalence of tobacco-smoking among the male adult population aged 15 years and above is considered to be relatively high at 44.0% compared to global prevalence at 36.9% in 2010 (NHMS, 2015; WHO, 2016f). In view of the high burden globally, numerous studies have been undertaken to obtain scientific evidence on the negative health impact caused by tobacco-smoking. From the economics perspective, researchers have also presented reliable evidence that indicates that tobacco-related illnesses have escalated healthcare costs enormously (Aljunid, 2006; Husain, Virk-Baker, Parascandola, Khondker, & Ahluwalia, 2016; R. John, Sung, & Max, 2009; Miller, Ernst, & Collin, 1999). With respect to tobacco research in Malaysia, most studies have mainly covered areas including smoking initiation, prevalence of tobacco-smoking and factors related to smoking initiation (Hum, 2016). However, there is a lack of evidence on the distribution of household tobacco expenditure in the nation. The financial and welfare impact associated with smoking, such as poverty and crowding out of essential goods and services also remain unknown in Malaysia.

Therefore, this thesis is of significance because it reveals the extent and magnitude of household tobacco expenditure at five points in time, spanning a 20-year period from 1993 to 2014. Other than the prevalence of tobacco-smoking, information on household tobacco expenditure indicate the actual financial impact caused by purchase of tobacco products at the household level. In addition, information on changes in household tobacco expenditure in response to increasing tobacco taxes can act as an important guide that can shed light on the potential effect of tobacco taxation in the future. In relation to tobacco taxes, there are studies that advocate tobacco taxes as a pro-poor policy to effectively reduce tobacco consumption especially among this socioeconomic group (Jha et al., 2012;

Verguet et al., 2015). In this context, Malaysia has clearly followed the strong recommendation to increase tobacco taxes accordingly since 1990 until now with the aim of reducing tobacco consumption. However, the desired outcome of implementing an increasing level of tobacco taxes in Malaysia has yet to fully materialise and some parties have blamed the lack of results on suboptimal taxation (Norashidah, NikMustapha, Rampal, & Zaleha, 2013; SEATCA, 2013). Hence, the findings on household tobacco expenditure in this thesis will possibly be able to fill the knowledge gap regarding the relationship between the raising of tobacco taxes and the persistently high prevalence of tobacco-smoking.

Other than that, tobacco-smoking has always been more prevalent in the low socioeconomic groups and thus it has been argued that tobacco taxation has a greater impact on the poor than on the rich tobacco-smoking households. Thus, there are differing points of view on tobacco taxation that either support or object to its implementation. Those in support of tobacco taxation claim that tobacco taxation is a pro-poor policy and benefits the poor socioeconomic group (Jha et al., 2012; Verguet et al., 2015). On the other hand, other parties claim that tobacco taxation is regressive as it further burdens the poor under a constrained household budget if they persistently smoke (Remler, 2004). Hence, this study makes another important contribution to knowledge by examining tobacco expenditure across different living standards to ascertain who in Malaysia has paid more for tobacco products when tobacco taxes are raised. In addition, the information obtained on the distribution of tobacco expenditure according to different living standards will inform the discussion on the equity perspective on the tobacco taxation in Malaysia.

This thesis is also important because it seeks to establish the public health importance of the financial and welfare impact of tobacco expenditure as this type of expenditures

can potentially affect the well-being of all household members. In this context, the non-health financial impact of tobacco-smoking are essentially related to the Sustainable Development Goals(SDGs) introduced by the United Nations in 2016 as a universal call to action to end poverty, protect the planet and ensure peace and prosperity for everyone (WHO, 2016d). Moreover, the non-health financial impact of tobacco consumption is one of the key determinants of health in any society. For instance, the crowding out of essential goods and services as well as an increase in poverty will eventually jeopardize the health status of the society because a vicious cycle will be created by limiting the household financial resources available for medical care. Not only that, the non-health financial impact does not just affect the individual smoker, but also adversely affect the whole household, and if this matter is left unattended, it will lead to chronic social issues such as malnutrition, unemployment and vicious cycle of poverty (Husain et al., 2016; S. John et al., 2002; Nonnemaker & Sur, 2007; WHO, 2004). Furthermore, the adverse social impact may also be intergenerational and affect educational opportunities and human resource development (R. M. John, 2008; Wang et al., 2006).

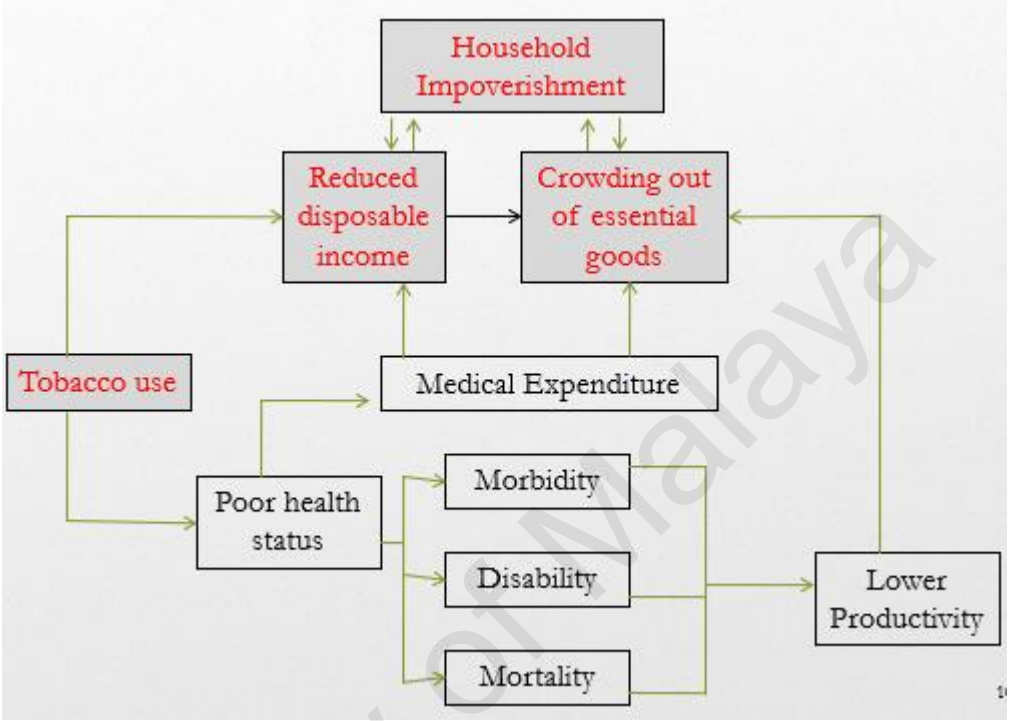
As mentioned in the section above on the study objectives, this thesis also examines the extent of population impoverishment attributable to direct tobacco expenditure in Malaysia at five selected time points. This aspect of the study is closely related to the essential goal in the SDGs of eradicating poverty by 2030. This is an issue that is still relevant for Malaysia; even though Malaysia has undeniably achieved a great milestone in eradicating extreme household poverty, which now stands at less than 1.0%. Despite of the low poverty prevalence, the recent revelation by UNICEF indicates that urban poor still exist even in the capital, Kuala Lumpur (Abdul Khalid et al., 2018). Hence, this thesis explores the unseen and the least-highlighted attribution of impoverishment, namely tobacco expenditure, the findings could provide a good insight into ways to further reduce poverty.

The lessons learned from this study are not only applicable locally but can also provide guidance to other countries. For Malaysia, the study will serve as a good insight into the success of the country's tobacco taxation policy by looking into the distribution of household tobacco expenditure. In addition, the updates to the current body of knowledge concerning crowding out impact as well as impoverishment from direct tobacco expenditure will serve to inform not only Malaysian society but also the global community on the possible adverse non-health financial impact caused by tobacco consumption.

1.5 Conceptual framework

The main conceptual framework of the study is depicted in Figure 1.

Figure 1.1 Conceptual framework of the study



* Elements written in red will be explored and examined in this thesis.

From the conceptual framework, the study would only explore into the elements written in red. In short, the study explores the non-health financial and welfare impact from tobacco use. On the other hand, the health-related adverse financial impact would not be explored in the current study as there are various studies that have examined this component.

1.6 Organization of the thesis

This thesis consists of eight chapters that answer the objectives stated in section 1.3.

Chapter 1 This chapter introduces the research topic and its objectives. It also, explains the motivations for and the significance of the study.

Chapter 2 This chapter reviews the global epidemiology of tobacco-smoking and tobacco control measures, as well as tobacco taxation and the related ethical issues. It also discusses the relationship between household socioeconomic characteristics and tobacco expenditure as well as the adverse non-health financial and welfare impact that is considered to be caused by household tobacco expenditure.

Chapter 3 This chapter describes the epidemiology of tobacco-smoking, tobacco control measures and tobacco taxation in Malaysia. It also covers the issues related to tobacco control in the specific context of Malaysia.

Chapter 4 This chapter describes the source of data used in the study, namely the Household Expenditures Survey (HES) by the Department of Statistics, Malaysia. It also covers the living standard measurements used in the study.

Chapter 5 This chapter presents the background to household tobacco expenditure, including specific details on the actual quantum and the household tobacco expenditure share of total household consumption. It also presents data on the distribution of household tobacco expenditure in the rich and the poor quintiles.

Chapter 6 This chapter covers the financial and welfare impact due to household tobacco expenditure. It also explores the increase in the estimate of impoverishment that is attributable to direct tobacco expenditure by region, urban-rural stratum and ethnic groups in Malaysia.

Chapter 7 This chapter discusses the crowding out of essential goods and services due to tobacco expenditure. In addition, it presents the dose response relationship between tobacco expenditure and the magnitude of the crowding out effect.

Chapter 8 In this final chapter, the results presented in chapter 5, 6 and 7 are discussed to enhance the understanding of the burden of household tobacco expenditure, as well as the non-health financial and welfare impact caused by tobacco expenditure in Malaysia. Lastly, it highlights the policy implications that arise from the findings of the study.

CHAPTER 2: HOUSEHOLD TOBACCO EXPENDITURE AND ITS WELFARE IMPACT

2.1 Introduction

Globally, approximately a third of males aged 15 years or older are current tobacco smokers. In 2015, there were over 1.1 billion tobacco smokers worldwide with a persistent male predominance in this risky health behaviour (WHO, 2016b). The overall global prevalence of tobacco-smoking is projected to drop to 18.9% in 2025, mainly in the Americas and Europe (WHO, 2016f); however, an increase in tobacco-smoking prevalence is projected to occur in Africa and the Eastern Mediterranean (WHO, 2016f). In short, the tobacco epidemic is still significant worldwide although the trend is different in various regions.

Tobacco expenditure is a parameter that can be used to measure the magnitude of tobacco consumption either at the individual or household level. Tobacco expenditure is affected by various factors such as sociodemographic characteristics of the smoker, tobacco control policies, availability of illicit cigarettes, and tobacco taxation (Siahpush, 2003). Increasing tobacco taxes is expected to reduce household tobacco expenditure when demand for tobacco products reduces in response to tobacco taxation. Overall, tobacco expenditure is closely related to tobacco taxation whereby tobacco taxation is a key determinant in tobacco expenditure.

Under WHO Framework Convention on Tobacco Control (WHO-FCTC), tobacco taxation has been strongly recommended to combat the epidemic due to the extensive and reliable evidence on its effectiveness in reducing tobacco-smoking via demand reduction in various countries (Dunlop, Cotter, & Perez, 2011; Jha & Peto, 2014; Tabuchi, Fujiwara, & Shinozaki, 2016). On top of that, tobacco taxation is regarded as the cheapest public health tool that can be used to combat the tobacco epidemic. Hence, this chapter

will mainly review various tobacco taxation systems, the reduction of tobacco-smoking in response to tobacco taxes, as well as various consumer responses towards tobacco taxes to enhance interpretation of the household tobacco expenditure assessment in this thesis.

This chapter begins with Section 2.2, which reviews the epidemiology of tobacco-smoking worldwide. The subsequent Section 2.3 reviews the household tobacco expenditure and sociodemographic factors affecting these expenditures. Next, Section 2.4 evaluates evidence on non-health financial and welfare impact from tobacco expenditure. Then, Section 2.5 concentrates on various tobacco control measures. The next section, Section 2.6 discusses tobacco taxation as a tool for demand reduction in the tobacco epidemic and as a key determinant in tobacco expenditure. Section 2.7 then discusses various consumer responses towards tobacco taxation. Lastly, Section 2.8 concludes the chapter by providing a summary of the salient points raised.

2.2 Epidemiology of tobacco-smoking

Tobacco is a green, leafy plant that is grown in warm climatic regions. Tobacco can be used in various ways, such as smoked in a cigarette, pipe and cigar; chewed as smokeless tobacco; or sniffed. Tobacco consumed via cigarettes is the most popular consumption method worldwide. Tobacco contains nicotine which is a stimulant and it makes tobacco addictive. The history of tobacco goes back to prehistoric times in the Americas before it was exported to the Europe after European colonisation of the Americas (Musk & De Klerk, 2003). It was massively manufactured during the First World War which contributed to a tremendous increase in the tobacco-smoking especially in developed countries (Musk & De Klerk, 2003). Following the dramatic rise of tobacco-smoking, an epidemic of smoking-related diseases rose to the centre of attention in healthcare.

Global progress in tobacco-smoking prevalence is essentially divided into three main phases: modest increase from 1980 to 1996, followed by a decade of rather rapid decline, then a deceleration in prevalence reduction attributed to an increase in tobacco-smoking prevalence in numerous highly populated nations, namely China, Bangladesh, Indonesia and Russia (Ng et al., 2014). Region wise, the prevalence of tobacco-smoking in the Western Pacific region is projected to drop by approximately 3.6% to 23.3% by 2025 (WHO, 2016f). Although the trend of tobacco-smoking seems to be declining worldwide, the burden of tobacco-smoking in the low- and middle-income countries (LMIC) of the Western Pacific region is increasingly evident and remains a public health threat (Eriksen, Mackay, Schluger, Gomeshtapeh, & Drope, 2015; Ng et al., 2014; WHO, 2016f).

2.2.1 Worldwide

Globally, prevalence of tobacco-smoking was 22.1% in 2010 whereby males were the major contributors (smoking prevalence of males was 36.9% vs smoking prevalence of females of 7.3%) (WHO, 2016f). In 2015, there were over 1.1 billion tobacco smokers worldwide with a persistent male predominance (WHO, 2016b). The overall global prevalence of tobacco-smoking is projected to drop to 18.9% in 2025, mainly as a result of a projected reduction in tobacco-smoking in the Americas and Europe. Nonetheless, an increase in tobacco-smoking prevalence is projected in Africa and the Eastern Mediterranean (WHO, 2016f).

In the United States, there were approximately 40 million adult tobacco smokers in 2014 and 17 out of 100 United States adults aged 18 years or above were tobacco smokers (16.8%) (CDC, 2016a). Men were evidently the major tobacco smokers in the country with nearly 19 of every 100 adult men being smokers (18.8%) while there were nearly 15 of every 100 adult women who were tobacco smokers (14.8%) (CDC, 2016a). In Europe, the prevalence of tobacco-smoking is projected to decline to 6.3% in 2025; however, the phenomenon of most concern in Europe is the increasing female tobacco-smoking prevalence. The prevalence gap between male and female adults has been now reduced to less than 5.0% in numerous European countries, such as Denmark, Ireland, the Netherlands, Norway, Sweden and the United Kingdom (WHO, 2016e). On top of that, the prevalence of female tobacco-smoking (19.0%) in Europe is evidently higher than other regions such as Africa, South-East Asia, the Eastern Mediterranean and Western Pacific (WHO, 2016e). Another emerging issue in this region is increasing tobacco-smoking among adolescents whereby the Czech Republic, Latvia and Lithuania have high tobacco-smoking prevalence among youths (WHO, 2016e).

Tobacco-smoking in the WHO African region has shown an upward trend with the projected prevalence of tobacco-smoking estimated to increase to around 5.3% (WHO, 2016f). For example, the prevalence of tobacco-smoking among men was relatively high in Sierra Leone (37.7%), Lesotho (34.1%) and Madagascar (28.5%) while in most of these countries less than 5.0% of the females smoke (Sreeramareddy, Pradhan, & Sin, 2014). The male dominance in tobacco-smoking is again demonstrated in South Africa where 29.2% of male adults were tobacco smokers which was four times that for females (7.3%) with an elevated odds ratio of 5.20 (95% CI 4.39; 6.16) (Reddy, Zuma, Shisana, Jonas, & Sewpaul, 2015). Tobacco-smoking among females was highest in Rwanda (12.6%) in Africa and the lowest in Ghana (0.2%) (Brathwaite, Addo, Smeeth, & Lock, 2015)

In 2015, most of the countries in Asia have prevalence of tobacco-smoking among men of more than 40.0% (WHO, 2016b). Indonesia topped the other countries in Asia with tobacco-smoking prevalence among men above 15 years old or older at 76.2% (WHO, 2016b) followed by Jordan (70.0%) (WHO, 2016b). China, which is the largest consumer of tobacco products globally, had the prevalence of tobacco smoking at 47.6% among men above 15 years old (WHO, 2016b). Other Asian countries that were among the top ten of tobacco consumers were Indonesia, Japan, India, Turkey, South Korea and Viet Nam (Eriksen et al., 2015). In India, the prevalence of tobacco-smoking was 34.6%, whereby the prevalence of tobacco-smoking for males and females was 47.9% and females 20.7% respectively (Bhawna, 2013). Moreover, the proportion of smoking in rural parts of India was found to be higher than the urban areas (Bhawna, 2013).

2.2.2 Southeast Asia (ASEAN)

Southeast Asia is a rapid growing region in Asia with a total population of 598 million in 2010. Out of the total population, 29.5% of adults were tobacco smokers (SEATCA, 2012). Indonesia has no doubt is the top tobacco smoking nation in Southeast Asia with the highest tobacco-smoking prevalence (76.2%) for men aged 15 years old or above (WHO, 2016b). Additionally, the number of tobacco smokers in Indonesia made up almost half (51.1%) of the total number of tobacco smokers in Southeast Asia (SEATCA, 2012). The second largest number of tobacco smokers was in the Philippines (13.6%), followed by Viet Nam (12.0%), Thailand (10.2%), Myanmar (7.0%) and Malaysia (3.4%). Brunei had the least number of smokers among all of its members in Southeast Asia (SEATCA, 2012). Nevertheless, the proportion of tobacco-smokers in the region does not indicate the severity of tobacco-smoking in every country due to their different population sizes.

Despite the low share of tobacco-smoking in the region, Laos had the second highest prevalence (56.6%) of tobacco smokers for men aged 15 years old or above, followed by Viet Nam (47.1%), Cambodia (44.1%), Malaysia (43.0%), Philippines (43.0%) and Thailand (41.0%) (SEATCA, 2012; WHO, 2016b). Singapore, the metropolitan country had the lowest prevalence (28.0%) compared to her counterparts in the region (WHO, 2016b). According to the Tobacco Atlas in 2014, the rising trend of tobacco-smoking prevalence has been observed in Indonesia, Timor-Leste, Malaysia and Laos (Eriksen et al., 2015). This is clearly a worrying public health issue in Southeast Asia which requires multifaceted interventions and prevention to halt the rising trend.

Tobacco-smoking among females aged 15 years old or above was generally low in all Southeast Asian countries with the prevalence at less than 10.0% except for Laos (WHO, 2016b). Nevertheless, a slight increase in trend of female tobacco consumption has been

observed in Laos, Cambodia, Singapore, Indonesia, Philippines and Timor-Leste (Eriksen et al., 2015).

2.3 Burden of household tobacco expenditure

2.3.1 Socio-demographic distribution of household tobacco expenditure

Tobacco-smoking is a leading disease risk factor which has substantial negative impact on the health status and economic status of the population at national level. In relation to healthcare related expenditures, tobacco-smoking was found to escalate healthcare cost enormously due to the extensive tobacco-related illnesses (Aljunid, 2006; Batscheider et al., 2012; Djutaharta et al., 2012; Wacker et al., 2013; Xu et al., 2015). For instance, 8.7% (95% CI: 6.8%, 11.2%) of the annual medical expenditures in the United States was contributed by tobacco-smoking in 2010, amounting to approximately USD 170 billion per year (Xu et al., 2015). In Malaysia, total direct and indirect medical cost of tobacco-related illnesses, namely chronic pulmonary airway disease, ischemic heart disease and cancer, amounted to USD 790 million in 2004 to 2005 (Aljunid, 2006). In short, healthcare and medical cost attributed to tobacco-related illnesses is enormous and generally well-studied. Yet, estimation of direct tobacco expenditure at the household level is rarely explored.

Although the economic impact has always been highlighted at national level, the financial impact at household level should not be underestimated. Direct tobacco expenditure could possibly jeopardise the household members' welfare and social aspects. On top of that, tobacco-smoking has been blamed for causing poverty at household level in a few countries such as China and India (R. M. John et al., 2011; Liu et al., 2006). In relation to tobacco-smoking, it does not only differ between countries but also within a country by socioeconomic status, ethnicity and urban-rural stratum (Djibuti, Gotsadze, Mataradze, & Zoidze, 2007; Siahpush, 2003). The information on tobacco expenditure can enlighten us on the actual quantum of monetary resources spent on tobacco products in the country in accordance to the progression of tobacco taxation which can inform formulation of tobacco control policies.

Direct tobacco expenditure can be estimated from smokers' daily purchases of tobacco products such as cigarettes and so on. The expenditures data on tobacco products is usually available from household expenditures surveys in any country because consumption of tobacco products is essentially one of the expenditures categories in the household. As most of the household expenditures surveys usually collect aggregate data of the whole household, we can then estimate the aggregate of tobacco expenditure either at household or per capita level.

Tobacco expenditure is found to be significantly associated with socioeconomic status in both high-income countries and LMICs. Although the scale used to gauge socioeconomic status varies in different countries depending on its suitability, the tobacco expenditure has consistently been found to differ between various socioeconomic status (Djibuti et al., 2007; Efroymson et al., 2001; Siahpush, 2003). An Australian study revealed that smokers with lower education attainment had higher odds of having higher tobacco expenditure. Additionally, blue collar workers were found to have increased odds of spending more on tobacco products compared to professionals (Siahpush, 2003). Overall, education status and occupation were found to be associated with household tobacco expenditure.

In China, there was also significant differences in tobacco expenditure between high income and low-income households in urban stratum, whereby the high-income households spent four times more than the low-income households in terms of tobacco expenditure. This is largely because the high-income households tend to purchase more expensive cigarettes (Hu et al., 2005). In the rural stratum, the high-income households also spent two-times more on cigarettes than their low-income counterparts in rural strata of China (Hu et al., 2005). Another study in Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Russian Federation and Tajikistan also revealed a significant difference in

mean tobacco expenditure between rich and poor households whereby the rich spent significantly higher on tobacco (Djibuti et al., 2007). In spite of the rich households spending more on tobacco products, the poor households devoted a significantly higher proportion of their monthly income for tobacco products (Djibuti et al., 2007).

On the other hand, poor households in Nigeria were found to spend more on tobacco than the richest group. Moreover, the poorer smoked more tobacco cigarettes compared to the richest (Uguru et al., 2015). To make it worse, the poor households usually devoted a larger portion of their available household budget on tobacco products compared to richer households. For instance, the poor in Bangladesh and Indonesia spent a higher proportion of their income on tobacco (Efroymson et al., 2001; Semba et al., 2007). An example from Indonesia shows that the households with tobacco smokers spent approximately 22.0% of their weekly income on tobacco products (Semba et al., 2007). In Bangladesh, a study involving 600 families revealed that their average monthly household tobacco expenditure was equivalent to 2.6% of their food expenditures, 52.0% of medical expenditures and 55.0% of education expenditures (Nonnemaker & Sur, 2007). In Surat City of India, the poorest socioeconomic class spent nearly half (44.0%) of their income on tobacco products compared to 7.0% in the highest income group (Desai, Gharat, Nayak, Patel, & Bansal, 2012).

Tobacco expenditure has also been found to differ between urban and rural stratum in many countries (Hu et al., 2005; R. M. John et al., 2012). In Cambodia, the urban households spent an average 3.6% of their annual income on tobacco cigarettes compared to their counterparts in rural stratum who spent 2.8% (R. M. John et al., 2012). In China, the poor households in urban allocated lesser amount of their household income on tobacco cigarettes than their counterpart in rural stratum (6.6% VS 11.3%) (Hu et al., 2005). Another interesting finding from the study was that the urban tobacco smokers

consumed fewer cigarettes compared to rural tobacco smokers although the urban smokers had higher tobacco expenditure (Hu et al., 2005).

Other than urbanization, educational attainment was also found to affect tobacco expenditure (Bilgic, Florkowski, Yen, & Akbay, 2013; Siahpush, 2003). For instance, households headed by individuals with college education would refrain from smoking or spent less on tobacco products compared to households headed by individuals who achieved primary, secondary and high school diplomas (Bilgic et al., 2013).

Concluding from the aforementioned review, household tobacco expenditure varies by different socioeconomic parameters, namely household income status, educational attainment and occupation. Additionally, household tobacco expenditure also differs between urban-rural strata and ethnicities. Thus, these socioeconomic and demographic characteristics should be accounted for besides tobacco taxation in the country in examining tobacco expenditure.

2.4 Non-health financial impact from household tobacco expenditure

2.4.1 Crowding out effect of essential goods and services

Tobacco-smoking is well-known for its morbidity and mortality which subsequently contribute to enormous healthcare-related costs in many countries worldwide. The enormous financial healthcare burden attributed to tobacco-smoking is relatively well-studied; nonetheless, the morbidity and mortality usually appears rather late after years of tobacco-smoking. It would be rather too late to mitigate the financial impact due to tobacco-smoking when the long-term financial impact set in. On the contrary, short term non-health financial impact due to tobacco-smoking may appear early compared to adverse long-term financial impact from tobacco-related illnesses. However, the non-health financial impact is rarely explored and left unattended; yet, the short-term non-health financial impact from direct tobacco expenditure should be rectified early to prevent their long-term adverse social consequences such as morbidity, mortality and child malnutrition.

One of the adverse welfare impact directly caused by tobacco-smoking is reduction of household expenditures on essential goods and services due to tobacco expenditure under a constrained household budget. In other words, this phenomenon is referred to as the crowding out effect. In this respect, the crowding out effect is not confined only to the tobacco smokers but also their household members. This is because tobacco expenditure has an opportunity cost whereby other desired goods and services must be forgone under a constrained household budget. As such, the poor are always at higher risk of the crowding out effect from tobacco expenditure as their available household budget will be further constrained leading to reduction of expenditures on other essential goods and services.

In the long run, the crowding out effect does not only affect the household, but also the society and nation. For instance, reduced allocation on education due to tobacco expenditure could directly deprive the children in a household from enjoying good and high-quality educational opportunities although the choice of tobacco over education is very much short-sighted. The educational deprivation or lack of good quality educational opportunity will adversely affect human capital development at the society level and eventually at the national level. This will then adversely affect the overall national economic development such as lack of highly-skilled manpower in the labour market.

In China, the household expenditures on education, social activity, utility, rent and insurance were found to be lower in low- and moderate-tobacco expenditure households. In high-spending tobacco households, the percentage of spending on essential goods and services such as medical care, durable goods, education, food, utilities and farming was also lower (Wang et al., 2006). The reduction of expenditures on essential services such as medical care and education affected the human capital investment in the long run which can lead to a vicious cycle of poverty (WHO, 2004). Furthermore, reduction of spending on physical capital such as farming tools and seeds in the rural farming households due to smoking in China exacerbated the household poverty as farming productivity reduces (Wang et al., 2006). Consequently, the poor household with tobacco-smoking is at risk of being impoverished due to their choice of tobacco expenditure over other human capital development investment and the poverty impact could be intergenerational.

The crowding out effect on essential goods and services among tobacco-smoking households was also observed in India. A study by John *et al* revealed the crowding out effect of certain commodities such as education, milk, clean fuels and entertainment among tobacco-smoking households in India irrespective of their household income status (R. M. John, 2008). As a result of the crowding out of food and milk, the children

in the household suffered from reduced nutritional intake (R. M. John, 2008, 2012). On top of that, there is also the additional "gender effect" in the crowding out effect in India whereby the crowding out effect in women and children was greater compared to men (R. M. John, 2008). In the long run, the crowding out of food and milk led to malnutrition among children which in turn affected their overall health and susceptibility to infectious diseases. This has also increased the morbidity and mortality among under five years-old in the poor households and incurred higher medical expenditures.

Crowding out of essential goods and services was also observed in Bangladesh. Among the impoverished Bangladeshi households, the per capita expenditures on cigarettes was twice that of their expenditures on clothing, housing, health and education (Efroymson et al., 2001). On the contrary, the impoverished households could have easily added 500 calories to the diet of one or two of their children by shunting their tobacco expenditure to food expenditures (Efroymson et al., 2001). Hence, reduction of tobacco-smoking in LMICs does not only reduce tobacco-related illnesses but would also directly reduce malnutrition among children. This would then improve the health status of their children and could directly reduce mortality among neonates and those below five years-old.

In Cambodia, the crowding out effect varied between different income groups. For instance, the low- and middle-income tobacco-smoking households reduced expenditures on food but not the high-income households. On the other hand, the high-income tobacco-smoking households crowded out their spending on education and clothing (R. M. John et al., 2012). Importantly, the crowding out effect was relatively common irrespective of their household income status, nonetheless, it merely differed by the type of goods or services.

In another larger study involving 40 low- and middle-income countries worldwide, tobacco expenditure was found to adversely affect investments in education (Do & Bautista, 2015). This finding is not shocking as the tobacco smokers usually placed a lower value on future benefits of education, being less future-orientated. This has led to critical long-term impact on human capital development and economic development since improving the quality and availability of education is proven to have significant positive impact on a national economic progress (Duflo, 2001). On the other hand, the crowding out effect of tobacco expenditure on food was rather inconsistent even after adjustment for household socioeconomic status (Do & Bautista, 2015). As for healthcare, tobacco-smoking households were found to have higher expenditures on medical-related expenditures (Do & Bautista, 2015). This finding was not consistent with other studies whereby healthcare-related cost was usually lower in tobacco-smoking households. The underlying reason for the different findings could either be due to increased medical cost for tobacco-smoking related illnesses or because the tobacco smokers would opt for tobacco products rather than spending on medical care.

From the aforementioned studies, the common expenditures groups that were studied in the crowding out effect included food, education, healthcare, housing and clothing because these items are the basic essentials in daily living. Any reduction in these essential goods and services will significantly impair the household members' welfare. Hence, these essential goods and services were frequently used as a proxy to represent the welfare of household members. In crowding out effects, the impact can be instantly experienced by household members as the available post-tobacco expenditure household budget for essential goods and services is certainly reduced under a constrained household budget.

In a summary, the crowding out effect of essential goods and services is an important immediate financial impact from tobacco expenditure. The crowding out effect has critical long run adverse social and health impact on their household members especially their children. At a more macro level, the crowding out effects will also affect the human capital developments and economic development in the coming decades which deserve our attention in tackling tobacco epidemic.

2.4.2 Impoverishment effects of household tobacco expenditure

Another adverse financial and welfare impact from household tobacco expenditure is impoverishment. Tobacco related impoverishment can either be attributed to direct tobacco expenditure or indirect financial impact from tobacco expenditure such as healthcare costs incurred for treatment of tobacco-related illness, loss of productivity and unemployment due to severe morbidity to these same illnesses. The indirect financial impact from healthcare cost incurred by tobacco-smoking has been relatively well studied at the national scale (Aljunid, 2006); however, information on impoverishment due to direct tobacco expenditure has been scarce.

Poverty is a major social determinant of health and this economic indicator is closely linked to life expectancies. For instance, the lower socioeconomic group that suffered from poverty has higher mortality rates (Jha et al., 2006; WHO, 2012). This is because poverty can potentially affect various aspects of health, via poor water and sanitation, poor nutrition, poor housing and lastly high-risk behaviour such as drug abuse Consequently, it is imperatively important to explore impoverishment attributed to direct tobacco expenditure to enhance our understanding between tobacco expenditure and poverty.

In India, household poverty levels in rural and urban localities were found to be higher after accounting for tobacco expenditure. To be specific, direct tobacco expenditure increased the rural and urban poverty rates by 1.50% and 0.70% respectively (R. M. John et al., 2011). Furthermore, out-of-pocket costs for tobacco-related illnesses contributed to a 0.09% and 0.07% higher poverty rate in rural and urban areas respectively (R. M. John et al., 2011). The worst is that almost half of the households in India are tobacco-smoking household. Every tobacco-smoking household spent on average 1.28% of their household income on tobacco products. Thus, it is not surprising that tobacco-smoking impoverishes approximately 15 million people in India and this reminds us that impoverishment attributed to tobacco-smoking should not be underestimated (R. M. John et al., 2011).

China, which is the largest tobacco consumer worldwide, also had a similar finding whereby the poverty level of rural and urban population rose by 6.4% and 1.9% respectively, after accounting for direct tobacco expenditure (Liu et al., 2006). In relation to this, the urban lower income group was found to actually spend 46.0% of their available total household income on tobacco products. Compared to their counterparts in rural localities, the tobacco-smoking household allocated approximately 11.0% of their available households income on tobacco products (Hu et al., 2005; Liu et al., 2006). Consequently, it would not be surprising to find that direct tobacco expenditure can actually push the urban poor into poverty via their continuous expenses on tobacco products. By including the medical expenses attributable to smoking, the poverty rate increased further by 1.5% and 0.7% for the urban and rural populations (Liu et al., 2006). To make it worse, the combined impact of both medical expenses attributable to smoking and direct expenses on tobacco products were found to impoverish 30.5 million urban population and 23.7 million rural population in China (Liu et al., 2006).

The impoverishment at household level was also evident in Indonesia which has the highest prevalence of tobacco-smoking in Southeast Asia. Semba and colleagues explored the long term impact of tobacco-smoking and they found a significant association between child stunting and paternal smoking practice from 1999 to 2003 (Semba et al., 2007). In this respect, child stunting and malnutrition is a surrogate outcome of household poverty due to inadequate food supply. The lack of food supply could be attributed to the high direct tobacco expenditure or the increased medical expenditures on tobacco-related illnesses. For instance, the study revealed that the tobacco-smoking household with child stunting had a relatively high (22.0%) proportion of tobacco expenditure in their weekly per capita household expenditures (Semba et al., 2007). Moreover, the inability to provide adequate food supply to their children could be because of their loss of productivity and income after falling sick due to tobacco-smoking.

Countries with a lower burden of tobacco-smoking are also not spared from suffering impoverishment due to tobacco expenditure. Taiwan, a country with low burden in tobacco expenditure, is also vulnerable to impoverishment by tobacco expenditure especially the lower income households (Pu, Lan, Chou, & Lan, 2008). Not only the low socioeconomic households, the higher income households were particularly at risk of falling into a lower standard of living due to tobacco expenditure in the country (Pu et al., 2008). In the United States, which has a rather low prevalence of tobacco-smoking compared to nations such as China, India and Indonesia, tobacco-smoking was also found to be significantly associated with food insecurity especially among lower income household (Armour, Pitts, & Lee, 2008). In short, the welfare aspects of household members especially impoverishment attributed to tobacco expenditure is relatively homogenous and common among lower income households irrespective of the tobacco-smoking burden of the country.

2.5 Tobacco control measures

In response to the globalization of the tobacco epidemic, WHO Framework Convention on Tobacco Control (WHO-FCTC) was launched in February 2005 as the first global public health and evidenced-based treaty to tackle the causes of the tobacco epidemic globally. The WHO-FCTC encompasses measures to combat complex factors with cross-border effects contributing to the tobacco epidemic, such as trade liberalisation and direct foreign investment, tobacco advertising, promotion and sponsorship, as well as beyond national borders on illicit tobacco products (WHO-FCTC, 2015). Currently, there are 181 parties that have ratified the WHO FCTC, which literally translate to more than 90.0% of the world population.

The WHO-FCTC is divided into numerous sections specifying measures to tackle the tobacco epidemic. One of the measures is reducing demand for tobacco products by raising tobacco tax to increase the sales price of tobacco products. Other than that, the conventions include non-price measures to reduce the demand for tobacco by having comprehensive smoke-free policies such as protection from exposure to tobacco smoke in indoor workplaces, public transport, and indoor and outdoor public places (WHO-FCTC, 2015). In addition, the convention also prohibits misleading tobacco packaging and labelling; and ensures that tobacco product packages carry a large health warning and messages describing the harmful health effects (WHO-FCTC, 2015). Other methods include using education, communication, training and promotion to raise public awareness of tobacco control issues. Another non-price measure includes a comprehensive ban on all tobacco advertising, promotion and sponsorship in any form of mass media (WHO-FCTC, 2015). The convention also specifies support to reduce tobacco dependence and cessation of its use via counselling, psychological support, nicotine replacement and education programs (WHO-FCTC, 2015).

To ensure the effectiveness of other tobacco combating measures, one of the most important steps is to essentially eliminate all forms of illicit tobacco products. Measures to effectively eliminate illegal tobacco products include tracking and tracing of marked tobacco packaging, monitoring of cross-border trade, enactment of legislation, and confiscation of illicit tobacco products. Furthermore, there should be strict prohibition of tobacco product sales to or by persons under the age set by the domestic law, national law or 18 years. Furthermore, prohibition on selling of tobacco products in small packets, as well as ensuring that tobacco vending machines are not accessible to minors such as adolescents and children should be strictly upheld to protect adolescents from initiating tobacco-smoking.

2.6 Tobacco taxation as a key determinant in tobacco expenditure

2.6.1 Tobacco taxation system

Tobacco tax has been viewed as the cheapest public health tool to combat the tobacco epidemic via demand reduction of tobacco products. There are various types of taxation that can be imposed on tobacco products depending on the national circumstances in different nations. The government can adopt the most appropriate taxation system in accordance with the local setting to achieve its public health and fiscal objectives. Tobacco tax system can be made up of purely specific taxes, ad valorem taxes, a combination of two mixed or hybrid systems, and complex tax systems. Under this tobacco tax system, there are various types of taxes, namely specific excise taxes, ad-valorem excise taxes, mixed specific and ad valorem excise taxes, and other taxes such as general sales tax (GST) and value added taxes (VAT).

Specific excise taxes are taxes that are imposed specifically on tobacco products, whereby they can be either uniform or tiered. Specific excise tax is levied based on quantity whereby a fixed amount per cigarette or weight of tobacco. Under uniform specific taxes, there is a price floor or a minimum price and it tends to lead to relatively higher prices of tobacco products, irrespective of higher- or lower-priced brands. Hence, this will reduce brand switching with the price rise under this taxation system. The specific tax is also easy to implement and administer as it is based on the volume rather than on prices which in turn enables easier forecast of tax revenue and the tax is less dependent on industry pricing strategies. Nonetheless, the real value of the specific tax will be eroded if the tax rate is not regularly updated in accordance with inflation.

Ad valorem taxes are defined as a percentage of a certain base value, which can either be the retail selling price, the manufacturer's price, or the cost, insurance and freight price. Ad valorem excise taxes will lead to larger differences in price between the higher- and

lower-priced brands which in turn promotes brand switching. In addition, the ad valorem taxes are difficult to implement and administer as they depend on the volume and value of the product. Furthermore, it is difficult to forecast the revenues from ad valorem taxes and it is more dependent on industry pricing strategies. However, the benefit of ad valorem includes the fact that its tax rate maintains the real value in accordance with inflation.

In view of the benefits and shortcomings of the aforementioned taxes, they can be mixed under a system that seeks to combine the advantages of specific taxes and the ad valorem system. This is because the specific taxes have relatively higher impact on less expensive brands complemented with the ad valorem tax which has a greater absolute impact on more expensive brands. However, there is no doubt that it is more complex to implement and administer the mixed system due to the fact both the volume and the value of the tobacco products need to be ascertained. In addition, the tax is less stable and more dependent on industry pricing strategies.

Other non-tobacco specific taxes that can be levied on tobacco products are GST, VAT, and import duties. There is argument that the non-tobacco specific taxes generally do not affect the tobacco price relative to the prices of other goods and services, hence, tobacco pricing has less public health impact.

There is no single optimal level of tobacco taxes that is applicable to all nations due to differences and disparity in tax systems and economic circumstances. In relate to this, WHO has recommended that tobacco excise taxes should at least account for at least 70.0% of the retail prices for tobacco products (WHO, 2010). On top of that, all countries are recommended to establish long-term policies on their tobacco taxation system by monitoring, increasing or adjusting the tax rate regularly. To ascertain that the tobacco taxation system is intact, tax- and duty-free sales should be prohibited as tax-free sales

would generally erode the effects of tax and price measures aimed at reducing the demand for tobacco products. In short, tax-free tobacco products sale is essentially counterproductive to the health purpose behind taxation and it promotes tobacco consumption which is against the promotion of public health.

2.6.2 Demand reduction in tobacco taxation

2.6.2.1 Price elasticity in tobacco consumption

Overall, the main idea of imposing tobacco tax is aimed at directly raising tobacco pricing which in turn will reduce tobacco-smoking. This theory is basically explained by the interaction between buyers and sellers. Demand refers to both willingness and ability to pay(Cochrane & Bell, 1956). The demand of a good is affected by its price, buyers' income and wealth, price of substitutes, population, preferences (Cochrane & Bell, 1956) and expectations of future prices. In the demand curve, all of the demand determinants aforementioned will be fixed while focusing on the association between demand and price. A perfectly elastic demand curve is horizontal, due to the fact that an infinitely small change in price corresponds to an infinitely enormous change in quantity. Nevertheless, a perfectly inelastic demand curve is vertical; due to the fact quantity will not change regardless of the price fluctuation.

In view of its addictive nature in tobacco products, the economic perspective of tobacco cigarettes is unique as it was initially believed that it did not follow the downward-sloping demand curve. Nevertheless, the disagreement between tobacco demand and its pricing was gradually proven to be inaccurate. On top of that, the responsiveness toward tobacco price was found to be affected by other tobacco combating efforts such as the gazetting of non-smoking areas, age limitations on tobacco cigarette

sale and education on health consequences of tobacco-smoking (Chaloupka & Warner, 2000).

In relation to the aforementioned theory, price elasticity of demand is generally defined as the percentage change in quantity demanded divided by the percentage change in price. In tobacco economics, price elasticity has been widely studied to estimate the response of tobacco consumers towards the rise of tobacco price in the market. According to WHO, price elasticity for tobacco is the percentage change in tobacco consumption in response to a 1% change in tobacco price (WHO, 2016a). For instance, a price elasticity of -0.4 indicates that when price increases by 10.0%, demand reduces by 4.0%.

2.6.2.2 Reduction in tobacco-smoking due to tobacco taxes

Tobacco tax is viewed as the cheapest and the single most cost-effective tobacco control measure. Over the past few decades, there were numerous studies exploring the extent of tax and price increases on tobacco-smoking. Under the International Tobacco Control (ITC) Project, there were generally 90 surveys conducted across 22 countries evaluating the impact of FCTC implementations such as health warnings, smoke-free laws, advertising, promotion and sponsorship banning, illicit trade and price-reduction consumer strategies as well as tobacco tax policies.

Under the ITC Bangladesh in 2009 and 2010, it was agreed that raising tobacco prices via increased taxation could reduce tobacco-smoking, increase tobacco tax revenue and potentially decrease socioeconomic inequality. The price elasticity of demand for cigarettes was estimated to be -0.49. On top of that, the price elasticity of tobacco-smoking was found to be higher among lower socioeconomic status people (Nargis et al., 2013). In China, ITC China revealed that the tobacco smokers chose their most-used

cigarette brand mainly based on the cigarettes' price, particularly among lower-income and less educated tobacco smokers (Huang et al., 2013). Another study by Huang et al in China revealed that the conditional cigarette demand price elasticity ranges from -0.12 to -0.14 with no differential response across educational level as well as no differential response between different income status due to price-reducing behaviour such as brand switching and trading down (Huang, Zheng, Chaloupka, Fong, & Jiang, 2015). According to Jha et al in LMIC, a tripling excise tax would essentially raise the cigarette price by approximately 100.0% and eventually reduce tobacco-smoking by 40.0% (Jha & Peto, 2014).

Tobacco taxes are also found to significantly reduce tobacco-smoking in high-income countries. For instance, the tobacco tax rise was associated with the increase in tobacco cessation among tobacco smokers in Australia which suggested that regular price increase might further encourage quitting activity (Dunlop et al., 2011). In Japan, tobacco price increase was significantly associated with smoking cessation (Odd ratio (OR):2.14, 95% Confidence Interval (CI) 1.90 to 2.41) among tobacco smokers and prevents relapse among the quitters. Their further analysis revealed that the reduction in tobacco-smoking in response to tobacco price increase was significantly higher in the lowest-income quintile (Tabuchi et al., 2016). Consistent with findings in many countries, tobacco-smoking among lower socioeconomic status is more responsive to price than higher socioeconomic groups.

In the United States, there was substantial reduction in tobacco-smoking among youth and young adults during the 2009 tobacco tax increase. To be specific, the tobacco tax increase had decreased smoking initiation among the youth as well as decreased the tobacco-smoking among young adults. However, there were no differential impact across gender and different ethnicity (van Hasselt et al., 2015). A simulation model in the United

States had also demonstrated a reduction from 21.0% of tobacco-smoking prevalence in 2004 to 15.2% in 2025 provided there is a 40.0% tax increment. Furthermore, the health gain is expected to be large with an overall 20-year gain in quality adjusted life years and a drop in tobacco-related health cost of as much as USD 217 billion. In short, tobacco taxation is a win-win public health intervention in reducing tobacco-smoking prevalence while generating additional tax revenue (Ahmad & Franz, 2008).

Comparing price elasticity of cigarettes, there have been findings that LMICs are more sensitive to tobacco cigarette price than high-income nations. For instance, price elasticity for the United States was -0.37 in 2008 (Franz, 2008) compared to Indonesia with price elasticity of -0.61 (Adioetomo & Djutaharta, 2005) and Bulgaria -0.80 (Sayginsoy, Yurekli, & De Beyer, 2002) in 2005 and 2002 respectively. In Malaysia, price elasticity of tobacco cigarettes was estimated to be -0.57 and -0.08 in the long-run and short-run respectively (Ross & Al-Sadat, 2007). On top of that, young adults were found to be more responsive toward cigarette pricing (Franz, 2008) and income level was positively related to cigarette smoking (Ross & Al-Sadat, 2007).

Due to its efficient tobacco cessation impact, tobacco taxation will essentially improve the life years gained among tobacco smokers as the health benefits from tobacco cessation set in rather quickly. Nonetheless, merely 3.0% of additional tax revenue was required from the tobacco taxation to compensate for the additional health care cost in life years gained after tobacco cessation. In conclusion, tobacco taxation is inarguably a cost-effective public health intervention in combating the tobacco epidemic whereby significant increases in tobacco taxes will reduce tobacco-smoking (Chaloupka et al., 2012; Van Baal et al., 2007).

2.7 Consumer responses and ethical arguments on tobacco taxation

2.7.1 Consumer responses towards tobacco price increase

Although tobacco price increase via taxation is effective in reducing demand for tobacco products, there are various responses from tobacco consumers to mitigate the tobacco price increase. Tax avoidance has been the main priority among those who continue tobacco-smoking. Brown *et al* found out that there was a substantial increase in roll-your-own cigarettes in the UK, France, Germany and the Netherlands between 2006 and 2012 because the roll-your-own cigarettes are relatively cheaper than the manufactured cigarettes (Brown et al., 2015). Furthermore, the tobacco smokers indicated that the low price of roll-your-own was the main driver of their purchase of roll-your-own cigarettes (Brown et al., 2015). Another study by Curti *et al* in Uruguay also revealed that increase in the price of legal cigarettes due to tobacco taxation had prompted tobacco smokers to switch to roll-your-own cigarettes (Curti, Shang, Chaloupka, & Fong, 2018).

In China, tobacco smokers would instead switch to cheaper brands rather than rolling their own cigarettes. Price increase due to tobacco taxation had been associated with tier-switching between different brands. The switching phenomenon was found to be more common among the low income and less educated groups compared to the higher socio-economic groups. The brand switching was possible in China because different brands of cigarettes were taxed in different price tiers, resulting in a wide dispersion of cigarettes prices within the country (Li, White, Hu, Fong, & Yuan, 2015). The brand switching as a price-reducing purchase behaviour has promoted the increased in cigarettes smoking especially among a portion of Chinese urban adult tobacco smokers. On the contrary, brand choices in Australia had been relatively stable over time, despite price increase in tobacco products. Brand loyalty was found to be significantly higher among older and higher income groups (Cowie, Swift, Borland, Chaloupka, & Fong, 2014).

Another means to mitigate the price rise of tobacco products is tax avoidance and evasion across countries. The tobacco tax evasion across countries varies considerably across various countries, ranging from relatively little in Australia, Thailand, Ireland, The Netherlands, Scotland and Mexico to relatively high in China, Canada, the UK and Malaysia (Guindon, Driezen, Chaloupka, & Fong, 2013). Other than resorting to illegal tobacco products, some educated and higher-income groups would opt for cross-border cigarettes purchase. This phenomenon was popular among those in France and Germany to avoid tax by crossing the borders to shop for cheaper tobacco products (Nagelhout et al., 2013). To counteract the increasing price of tobacco products, some tobacco smokers had also been reported to purchase the cigarettes from definite duty-free shops to avoid paying taxes (Cornelius et al., 2015).

Resorting to illicit cigarettes is another way of mitigating the tobacco price hike in any country. Globally, the burden of illicit cigarettes is estimated to range from 1% up to 50% of the market in various countries. On average, the burden of illicit cigarettes was estimated to be approximately 11.6% globally, 16.8% in low-income countries and 9.8% in high income countries (Joossens, Merriman, Ross, & Raw, 2010). Malaysia is also not exempted from the threat of illicit cigarettes as illicit cigarettes constituted approximately 24.5% of the cigarette market in Malaysia in 2008 (The Star, 2009). In 2015, the burden of illicit cigarettes in Malaysia rose to approximately 45.6% of the total cigarettes market (FMTnews, 2016). It is evident that illicit cigarettes are a significant threat to public health efforts in combating the tobacco epidemic in Malaysia.

Although tobacco taxes are repeatedly proven to be an effective demand reduction tool in combating the tobacco epidemic, tobacco smokers would still attempt various mitigation strategies to overcome the price hike. For instance, tobacco smokers would either reduce their smoking or even quit completely, or some smokers would adopt

various price-reducing mitigation plans to minimize impact from the price increase. Hence, the impact from tobacco taxation would directly affect the tobacco expenditure. If the negative behaviour fails to cease under the circumstances of increasing tobacco taxes, the tobacco expenditure would logically increase. Conversely, tobacco expenditure may reduce if the tobacco taxes successfully reduce the tobacco-smoking. This is evidently an uphill challenge for policymakers to design an efficient tobacco tax system complemented with various tobacco combating efforts to ensure the tobacco taxation system is able to meet its public health objectives.

2.7.2 Ethical arguments in tobacco taxation

Traditionally, tobacco-smoking was viewed in a similar manner as the consumption of all other goods. Unfortunately, the adverse impact from tobacco-smoking are more than just internal, because tobacco-smoking also jeopardises the surrounding people. This situation is called the negative externalities whereby tobacco-smoking imposes a cost on the third parties. For instance, the tobacco-related illnesses suffered by the tobacco smoker would raise health care cost as a whole in the society, as the smoker stays in the society. It is argued that tobacco taxation is fair[2] if tobacco smokers who consume higher public funded health care resources are subjected to tobacco taxes especially since their smoking behaviour results in negative externalities for non-smokers (Warner et al., 1995).

[2] Equity refers to the fairness of a tax. Evaluated according to main principles, namely the benefit principle and the ability to pay principle. Under the benefit principle benefit principle, the individuals who use the services provided by the government should pay for the services in proportion to the benefits received. This applies to tobacco smokers who use the public funded healthcare services in tobacco-related illnesses.

Hence, government intervention to halt tobacco-smoking via taxes is required due to its negative externalities on other people in the society.

Nonetheless, setting the appropriate and optimal tax rate has always been the greatest argument in tobacco taxation. Conservative arguments had stated that tobacco taxes should be equal to the level of negative externalities, which implied that there should be a lower tax on tobacco products. On top of that, conservative arguments stated that there are undesirable distributional impact caused by tobacco taxes on low-income groups as they are the largest group of tobacco smokers (Warner et al., 1995). In relation to this, high tobacco taxes had also been regarded as a violation to vertical equity[3]. This means that the poor had been paying a higher proportion of their income in cigarettes taxes than the more affluent group. Consequently, this argument had traditionally regarded tobacco taxes as regressive. Furthermore, the high prevalence of tobacco-smoking among the poor had further exacerbated the regressivity of tobacco taxes.

Although the poor have been the largest group in tobacco-smoking compared to the rich with no doubt that they bear a disproportionate share of tobacco-related illnesses, a study has suggested that the poor are more sensitive and responsive to price changes (Townsend, 1996). Hence, cigarettes tax increase has been argued to favour the poor as they respond to the price increase more compared to the rich (Verguet et al., 2015). In view of the fact that the overall negative externalities imposed by tobacco-smoking are enormous, compounded by the price elasticity among the poor tobacco smokers, tobacco

[3] Vertical equity means the people in different circumstances should be treated unequally in a fair manner; for instance, the rich individuals should be paying more of the tax burden comparing to the poor.

taxes have been argued as the most appropriate fiscal measure to reduce tobacco-smoking.

Other than the benefits to tobacco smokers, tobacco taxation obviously has substantial benefits at the population level via health protection. In this context, tobacco taxation will deter new uptake of tobacco-smoking among youth and potential tobacco smokers, promoting quitting among the current tobacco smokers and eventually reducing harm from second hand smoke exposure. This enormous public health benefit is evident as it promotes justice from an ethical aspect to the population at large. On top of that, justice is served via reducing health inequalities after increase in tobacco taxation (Thomas et al., 2008; Wilson & Thomson, 2005). This is because non-communicable diseases related to tobacco-smoking have been disproportionately higher among the lower socioeconomic group (Bloom et al., 2012; Boutayeb & Boutayeb, 2005; Lantz et al., 1998); thus, reducing tobacco-smoking in this group of society will eventually reduce their risks of non-communicable diseases. Nonetheless, some have argued that tobacco taxes, which contribute to financial hardship among those who persist in smoking, can be considered as unjust.

From an autonomy point of view, tobacco taxation is justified as it reduces second-hand smoke exposure to non-smokers and provides freedom to tobacco smokers to quit tobacco-smoking or prevents them from starting tobacco-smoking due to high priced tobacco. Based on the ethical aspects of tobacco taxation, it can be considered as an ethically justifiable health policy due to its overall substantial benefit to society. However, policy changes are required to account for any harm and injustice to the subpopulation who opt to persist in their tobacco-smoking habits.

2.8 Summary

Concluding from the epidemiology of tobacco-smoking, tobacco-smoking still poses an enormous health burden globally, although there is a projected decline in a few regions. On top of that, tobacco combating measures have been repeatedly emphasized by WHO via its WHO-FCTC. Under WHO-FCTC, tobacco taxation has been evidently regarded as a cost-effective demand reduction strategy, while being complemented by other tobacco combating measures. While there is extensive evidence on its effectiveness in demand reduction, tobacco-smokers seem to have responded differently to counteract the increasing tobacco price so as to continue their negative health behaviour. In short, tobacco tax is a key determinant of affecting tobacco expenditure among tobacco smokers. For instance, increased tobacco price will either reduce or increase tobacco expenditure. Hence, it would be important to comprehend tobacco taxation, evidence of underlying demand reduction and ethical arguments related to tobacco taxes.

Other than tobacco taxes, tobacco expenditure differ by various socio-demographic characteristics as well, such as household income, education status of household head, employment status and urban-rural strata. Thus, the aforementioned socio-demographic characteristics should be taken into account when exploring household tobacco expenditure in the thesis later.

Through direct tobacco expenditure, tobacco-smoking does not only adversely affect the health of tobacco smokers, but also negatively impairs the household's social welfare. This adverse financial impact can be felt almost immediately after the tobacco expenditure is made. The financial impact from tobacco expenditure include crowding out effects of essential goods and services as well as poverty. In relation to this, WHO has emphasized on tobacco-smoking leading to a vicious cycle of poverty among poor households especially in low-to-middle income countries (WHO, 2004). To worsen the

situation, the chronic social impact from the financial impact due to tobacco expenditure could be intergenerational.

In a nutshell, our concern on tobacco-smoking should not stop at morbidity and mortality per se, but should extend to the hidden adverse financial impact on tobacco smokers and their households. Furthermore, tobacco taxation should be used diligently and appropriately to address the tobacco epidemic.

CHAPTER 3: TOBACCO CONSUMPTION AND TAXATION IN MALAYSIA

3.1 Introduction

Malaysia, a country in the Western-Pacific region, is not exempted from the threat of tobacco epidemic. The prevalence of tobacco-smoking stood at 22.8% (95% CI: 21.9; 23.8%) in 2015 for the overall population (NHMS, 2015). However, the sex-specific prevalence for the adult male population was relatively high at 42.4% whilst the prevalence among females was low (1.4%) (NHMS, 2015). By age, almost a third (28.0%) of the smokers were in the productive age group who are contributors to the nation's growth. To make it worse, tobacco-smoking among adolescents is getting more prominent in Malaysia whereby 20.0% of 5 million tobacco smokers were younger than 18 years old (Al-Sadat, Misau, Zarihah, Maznah, & Su, 2010).

Due to the heavy burden of tobacco-smoking in Malaysia, the Malaysian Government is committed to fighting the epidemic. The government has taken various measures to combat the tobacco epidemic in Malaysia whereby one of the measures is by raising tobacco taxes. Looking at the history of tobacco taxes in Malaysia, the nominal excise taxes for cigarettes have increased from MYR0.013 per cigarette in 1990 to MYR0.40 per cigarette in 2015. Although the tobacco taxes have gradually increased; yet, the prevalence of tobacco-smoking does not seem to decrease as expected according to the theory of demand reduction strategy in tobacco control in Malaysia. There are studies blaming this on the suboptimal tax burden in failing to reduce tobacco-smoking (Norashidah, NikMustapha, Rampal, et al., 2013; Ross & Al-Sadat, 2007). In short, the burden of tobacco-smoking in Malaysia does not seem to fall in accordance with the rise of tobacco taxes, hence, it is crucial to examine the household tobacco expenditure as to whether the spending for tobacco has been increasing or reducing when the tobacco taxes are raised. Logically, the tobacco expenditure is expected to increase as tobacco taxes

have been on the rise while more than 75.0% of tobacco smokers in Malaysia smoked 10 or more cigarettes daily (NHMS, 2015).

As the tobacco taxes have been increasing in Malaysia since 1990, the tobacco expenditure at the household level is logically projected to increase if tobacco-smoking persists as evidenced by the persistent high burden of tobacco-smoking in Malaysia. This phenomenon has raised queries on financial and welfare impact on the household members living with tobacco smokers as international evidence has pointed out the impoverishment from direct tobacco expenditure as well as the crowding out effects from tobacco expenditure. Hence, both the financial and welfare aspects at the household level may be imminent in tobacco-smoking households as the number of cigarettes smoked does not seem to decrease in 2015 and the prevalence of tobacco-smoking was also high especially among the adult male population. Nonetheless, there is no documented evidence on the extent of impoverishment attributed to direct tobacco expenditure as well as welfare impact such as crowding out of essential services and goods in tobacco-smoking households in Malaysia.

This chapter starts with Section 3.2, which evaluates on the current evidences on epidemiology of tobacco-smoking in Malaysia. The subsequent Section 3.3 reviews overall tobacco control measures in Malaysia. Next, Section 3.4 discusses tobacco taxation in Malaysia, price elasticity of tobacco demand and external factors affecting tobacco taxation. Lastly, the chapter concludes with Section 3.5, which provides a chapter summary.

3.2 Epidemiology of tobacco-smoking in Malaysia

Tobacco-smoking has been an endless battle for health care providers in Malaysia as it has persistently been a major health threat in the country. The latest update on tobacco-smoking prevalence for Malaysia by Institute of Public Health (IPH) states that the prevalence stood at 22.8% (95% CI: 21.9; 23.8%) of Malaysian adults in 2015 (NHMS, 2015). After gender stratification, the prevalence of tobacco-smoking among men was 42.4% while the prevalence among females was 1.4%. By age, there was almost a third (28.0%) of the smokers aged between 25 and 44 years, followed by age group 45 to 64 years (20.0%) (NHMS, 2015). By urban-rural stratum, the prevalence of tobacco-smoking has been slightly higher among adults residing in rural areas compared to their urban counterparts (27.7% [95% CI: 26.1; 29.4] VS 20.9% [95% CI: 18.0; 20.2]) (NHMS, 2015).

Overall, manufactured tobacco cigarettes were the most smoked tobacco products in Malaysia while hand-rolled cigarettes were the most popular in rural areas. In relation to sociodemographic characteristics, the level of education was found to be inversely related with tobacco-smoking whereby the proportion of tobacco-smoking was evidently lower in Malaysians who attained tertiary education (15.2%) compared to those who attained secondary education (27.8%) (NHMS, 2015). Another study utilising data from NHMS from 1986 to 2006 revealed that the odds ratio of tobacco-smoking for no formal education (2.09 [95% CI: 1.67; 2.60]), primary (1.95 [95% CI: 1.65; 2.30]) and secondary education (1.88 [95% CI: 1.63; 2.11]) was higher compared to tertiary education (H. K. Lim et al., 2013).

By ethnicity, the prevalence of tobacco-smoking was found to be higher in Malay (2.29 [95% CI: 1.98; 2.66]), Chinese (1.23 [95% CI: 1.05; 1.91]) and other *Bumis*[4] (1.75 [95% CI: 1.46; 2.10]) compared to Indians (H. K. Lim et al., 2013). Another study in 2011 revealed that the odds ratio of tobacco-smoking among Malays was 2.57 (95% CI: 1.67; 3.96) and other *Bumis* was 2.58 (95% CI: 1.29; 5.15) compared to the Chinese among the elderly population (60 years or above) (K. Lim et al., 2016).

On top of that, tobacco-smoking among adolescents is another public health challenge in Malaysia. This is because most of the smokers started their smoking habit at a young age and persisted until adulthood. In Malaysia, 20.0% of 5 million tobacco smokers were younger than 18 years old (Al-Sadat et al., 2010). Another study by Hammond and colleagues found that 13.7% of 1002 adolescents sampled in 6 states of Malaysia were tobacco-smokers (Hammond et al., 2008). Male adolescents were the predominant tobacco smokers in Malaysia with 23.1% of them having been tobacco smokers. Of the 23.1%, 4.7% were current smokers, 17.5% were experimenters, and 0.8% were puffers (Hammond et al., 2008). Among the adolescents surveyed, most of the current smokers were aged between 16 and 17 years old in Malaysia (Hammond et al., 2008).

Factors leading to adolescent tobacco-smoking were extensively explored in Malaysia whereby the important factors associated with adolescent tobacco-smoking included curiosity, peer pressure, and a feeling of being more matured (Al-Sadat et al., 2010). Compared to Indonesia, the negligence of health risks caused by tobacco smoking was the most significant determinant among adolescents (Al-Sadat et al., 2010). In Thailand, predisposing factors for adolescent tobacco-smoking were having close friends, siblings and parents who are smokers (Al-Sadat et al., 2010).

[4] Including *Dayak, Bidayuhs, Kadazan, Kadazan-Dusuns, Bajaus, Orang Asli* and Malaysian Siamese.

3.3 Tobacco control measures in Malaysia

Tobacco control in Malaysia is based on the WHO-FCTC since Malaysia became a signatory in 2005. Under the FCTC, the tobacco control measures can be simply abbreviated as MPOWER. Malaysia is committed to fighting the tobacco epidemic using MPOWER whereby it is a package of technical measures and resources developed by WHO and each of which corresponds to at least one demand-reduction provision. M stands for monitoring of tobacco-smoking and prevention policies, P stands for protecting people from tobacco smoke, O stands for offering help to quit tobacco-smoking, W stands for warning about the dangers of tobacco, E stands for enforcing bans on tobacco advertising, promotion and sponsorship and lastly R stands for raise taxes on tobacco products.

Firstly, Malaysia participated in the Global Adult Tobacco Survey (GATS) to systematically monitor adult tobacco-smoking and tracking key tobacco control indicators in accordance with global standards. GATS is a new component of the ongoing Global Tobacco Surveillance System (GTSS) by conducting a nationally representative household survey of adults who age 15 years old or more using a standard core questionnaire, sample design, and data collection and management procedures that were reviewed and approved by international expert (GATS, 2015). The GATS is mainly aimed at generating comparable data within and across countries and monitoring the key indicators of MPOWER. The information from GATS is used to design, implement and evaluate tobacco control intervention. Other than GATS, the Ministry of Health also acts as a key agency with research agencies to conduct relevant research on tobacco (Zarihah, 2012).

Secondly, protecting the public from tobacco smoke exposure has also been enforced in Malaysia. For instance, a smoke-free law has already been enforced for all-eating

places, working places as well as public places such as shopping malls and open parks. To ensure its enforcement, dedicated teams in the district health offices such as health inspectors, will carry out the enforcement process at the designated smoke-free areas. This is a legislative provision to protect passive smokers at the eating places, workplace and homes. At the same time, the Health Ministry also conducts nationwide health promotion on the dangers of second-hand smoke and the right of non-smokers to be not exposed to second-hand smoke (Zarihah, 2012).

Thirdly, efforts have been increased to assist cessation of smoking among current tobacco smokers in Malaysia. One of the measures is through extensive promotion on quitting tobacco and promotion of the available cessation of smoking services. The smoking cessation services are available in government and private health facilities such as health clinics, hospitals and private clinics and hospitals. To ascertain the availability of smoking cessation services, a quit-line which is a public telephone line is also available to the public. Tobacco-smoking programmes are also conducted by corporate bodies and cessation techniques are taught to undergraduate students. Financial allocation for pharmacotherapy in nicotine-replacement therapy to enhance tobacco-smoking cessation has also been increased (Zarihah, 2012).

The fourth principle in fighting the tobacco epidemic is by educating and warning the public about the dangers of tobacco-smoking. In relate to this, the Malaysian Health Ministry has launched a health campaign named *"Tak Nak Merokok"* which carries the message "Say No to Smoking". The campaign was launched in 2004 by the Malaysian Health Ministry aimed at informing the public about the dangers of tobacco-smoking; and this campaign has been improved and intensified (My Health Portal, 2018). On top of that, *MySihat* which is a Malaysian Health Promotion Board, was also involved in promoting smoking cessation and prevention of tobacco-smoking. The effort of warning

the smokers in Malaysia has gone another step further when the health pictorial warning on cigarette packing was enforced. In 2016, the Malaysian Health Ministry has suggested on the use of plain packaging for cigarettes; however, the policy has yet to be implemented at this moment (My Health Portal, 2018; Zarihah, 2012).

Another tobacco measure used to combat the tobacco epidemic in Malaysia is by banning tobacco advertising and promotion. Malaysia has banned all forms of direct and indirect tobacco advertising and promotion as well as the display of tobacco products at the point of sale. In addition, tough enforcement and rigorous monitoring were applied to ensure the full ban of tobacco advertising and promotion (Zarihah, 2012).

Tobacco taxation is another crucial measure recommended under WHO-FCTC to combat the tobacco epidemic in Malaysia. Tobacco taxes in Malaysia are imposed on cigarettes manufacturers or cigarette importers whereby taxes were levied on tobacco according to its weight until 2004. In 2005, Malaysia changed to specific excise tax per stick whereby the tax structure is easier to administer. Although the tobacco taxes are already in place, there is an urgent need to review the tobacco tax increase because excise tax should at least constitute 70.0% of the cigarettes retail price to reduce tobacco affordability according to recommendation by WHO (WHO, 2010; Zarihah, 2012). To ascertain its effectiveness, tobacco smuggling must also be addressed to ensure there is no cheaper option for tobacco smokers which might lead to brand switching.

In a nutshell, the Malaysian Government has strong insight into the tobacco epidemic in Malaysia and had taken various measures to combat the epidemic. Nonetheless, there is more to be done in order to effectively reduce the tobacco burden in Malaysia.

3.4 Tobacco taxation in Malaysia

3.4.1 Cigarette Taxes and Minimum Price Law (MPL) in Malaysia

In Malaysia, excise taxes are imposed on all cigarettes whereby excise tax per stick is levied on locally manufactured cigarettes, while import duty is levied on imported cigarettes. At the same time, both domestic and imported cigarettes are also subjected to sales tax. The excise taxes on cigarettes are passed on to the consumer with the aim that the increase in retail price of cigarettes will reduce cigarette smoking. However, the increase in retail price is more than the increase in the excise tax due to the fact that the tobacco company has to consider other factors such as the trade margin, royalties and inflation. Table 2.1 below shows the excise tax and import tax imposed on cigarettes from 1990 to 2017.

Table 3.1 Cigarettes taxes from 1990 to 2017

Year	Import Tax (RM/kg or RM/stick)	Nominal Excise Tax (RM/kg or RM/stick)	Sales Tax (%)	GST (%)
1990	80 or 0.08	13/0.013	15	
1991	135 or 0.12	14/0.014	15	
1992-1998	162/0.15	28.60/0.028	15	
1999-2000	180/0.16	40/0.039	15	
2001	180/0.16	40/0.039	25	
2002	216/0.2	48/0.047	25	
2003	259/0.24	58/0.056	25	
2004	200/0.18	58/0.056	25	
2005*	0.2	0.081	25	
2006*	0.2	0.12	25	
2007*	0.2	0.15	25	
2008*	0.2	0.18	25	
2009*	0.2	0.225	25	
2010*	0.2	0.26	25	
2011*	0.2	0.22	25	
2012*	0.2	0.22	25	
2013*	0.2	0.25	25	
2014*	0.2	0.28	25	
2015*	0.2	0.40		6
2016*	0.2	0.40		6
2017*	0.2	0.40		6

*Specific tax per stick was introduced (1 kg = 1100 sticks)

Source: Royal Customs Malaysia and Confederation of Malaysia Tobacco (CMTM), various years.

From 1990 to 2004, the tobacco taxes in Malaysia were levied based on weight. Since 2005, the taxes were changed to excise tax per stick as the system is relatively easier and simpler whereby it requires counting of sticks than weighing them. In the case of imported cigarettes, the import tax stood at RM 0.20 per cigarette from 2005 until 2010. As for excise tax, it has gradually increased from RM 0.013 per cigarette to RM 0.26 per cigarette in 2010. Although the increase seem enormous by percentage from 1990 to 2010, however, the excise tax rate stood at 52.0% of the retail price in 2010 which was suboptimal to what was recommended by WHO-FCTC (WHO, 2010). As for the sales tax, it was increased once in 2001 from 15.0% to 25.0%.

Other than imposing taxes on cigarettes, the Malaysian Government has also moved to introduce minimum price law (MPL) to govern the price of cigarettes. In January 2010, Malaysia adopted the first MPL by setting the minimum retail price at MYR 0.32 per cigarette or MYR 6.40 per 20-stick pack (Food Act 1983, 2009). The Malaysian Government subsequently raised the MPL to MYR 0.35 per cigarette or MYR 7.00 per 20-stick pack (Food Act 1983, 2011). However, the MPL is applicable only to machine-made cigarettes and not roll-your-own cigarettes. The main aim of introducing MPL is to address the affordability of the cigarettes, especially among the youth and low income group (Liber, Ross, Omar, & Chaloupka, 2015).

In short, the Malaysian Government noticed the threat of the tobacco epidemic and has laid out measures including tobacco taxation to combat it. Cigarette taxes in Malaysia are generally increasing; yet, the tax level of the retail price is below the optimal level recommended by WHO FCTC. On top of that, the Malaysian Government has indicated its determination to combat the epidemic by introducing MPL as a measure to reduce tobacco-smoking especially among the financially vulnerable group such as youths and the low-income group.

3.4.2 Price elasticity of tobacco in Malaysia

Knowing that tobacco taxes are generally aimed at reducing tobacco smoking, the price elasticity of cigarette demand after taxes is crucial to enlighten us on the effectiveness of taxation. There is a study from Malaysia that explored the price elasticity as well as income elasticity of cigarettes using data from 1990 to 2004. The study showed that the short-run and long-run price elasticities were -0.08 and -0.57 respectively. In other words, their model predicted that an increase in cigarette excise tax from MYR 1.60 to MYR 2.00 per pack would reduce cigarette smoking by 3.37% in Malaysia. Translated

into tobacco mortality, this reduction would reduce 165 tobacco-related lung cancer deaths per year; on the other hand, the government revenue would increase by 20.8% in excise tax revenue from cigarettes (Ross & Al-Sadat, 2007).

Another study by Norashidah et al utilised data from 1990 to 2009 to estimate price elasticity for cigarettes demands in Malaysia. Their study revealed that the short-run and long-run price elasticities were -0.28 and -0.49 respectively. They also showed that the estimated optimal real excise tax rate was MYR 0.186 per cigarette in 2009 whereby the real excise tax rate was 27.4% lower. They argued that the suboptimal excise tax rate contributed to the inelastic or less responsive cigarette price changes (Norashidah, NikMustapha, & Mastura, 2013).

Another study under ITC Malaysia explored the impact of the 2011 Malaysian MPL. After the passage of the MPL in 2011, the purchase of licit cigarettes fell substantially from 3.90% to 1.8%; on the other hand, the proportion of illicit cigarette purchase rose from 13.4% to 16.5%. This was mainly because the real price of illicit cigarettes remained unchanged. Their study concluded that the MPL seemed not to have meaningful change in cigarette price in Malaysia, especially for illicit cigarettes. They also advised studying the illicit cigarettes sector in Malaysia to address the actual magnitude of illicit cigarette usage (Liber et al., 2015).

To conclude from the three aforementioned studies on cigarette smoking in response to cigarette taxes as well as MPL, the desired public health impact from the policies undertaken are still beyond our grasp. Although the relevant policies are already in place, however, the suboptimal tax rate as well as the readily available option of illicit cigarettes have actually impaired the desired outcome of the policies. Hence, the Malaysian Government may need to look again the related policies to ascertain their desired outcomes.

3.4.3 Relevant factors affecting the tobacco taxation

One of the prominent issues in Malaysia related to tobacco taxes is the most optimal excise rate. There is no doubt that Malaysia has imposed a cigarette tax rate for years and the taxes have been increasing since then. However, the excise tax burden from the retail price stood at 46.0% in 2014. Compared to our counterparts in Southeast Asia, Singapore had the highest tax burden at 71.0% followed by Thailand (70.0%), Brunei (62.0%), Indonesia (59.0%) and Philippines (53.0%). According to Southeast Asia Tobacco Control Alliances (SEATCA), there has been periodic tax increment in Malaysia, however, the increase was ad hoc and small (SEATCA, 2013). It is not only the regional report that has highlighted the suboptimal tax rate burden in Malaysia; domestic research has also pointed out the issue (Norashidah, NikMustapha, & Mastura, 2013; Norashidah, NikMustapha, Rampal, et al., 2013). For instance, Norashidah et al pointed out that the estimated optimal real excise tax rate for cigarettes was MYR 0.216, which was 16.5% higher than the excise tax rate in 2009 (Norashidah, NikMustapha, Rampal, et al., 2013).

Another pressing issue in Malaysia on tobacco consumption is illicit cigarettes. The availability of illicit cigarettes is intrinsically tied to the effectiveness of tobacco taxation. The desired effects from tobacco taxes would be reduced with the presence or option of illicit cigarettes to active tobacco smokers. Joossens et al had revealed that the size of the illicit cigarettes trade ranged from 1.0% to 50% of the market in various countries globally, and the trade was evidently higher in low-income countries(Joossens et al., 2010). The illicit cigarettes reduced the government revenue gained from tobacco taxes while contributing to an enormous number of premature deaths among tobacco smokers (Joossens et al., 2010).

The availability of illicit cigarettes was also argued to substantially reduce the desired impact of MPL in Malaysia besides impairing the effectiveness of tobacco taxes. In

relation to this, the magnitude of the illicit cigarettes market in Malaysia was approximately 14.4% of the total cigarette market in 2004 and the illicit market expanded to 24.5% in 2008 (The Star, 2009). The demand for the illicit cigarettes was evidently increasing throughout the four years period, whereby the illicit cigarettes were either counterfeits or counter bands (The Star, 2009). In 2015, the Confederation of Malaysian Tobacco Manufacturers (CMTM) revealed that illicit cigarettes comprised approximately 45.6% of the tobacco market in Malaysia which subsequently led to a MYR 4 billion loss in government revenue (FMTnews, 2016).

3.5 Summary

Tobacco-smoking is evidently a public health threat to Malaysia and the government had taken the tobacco epidemic seriously by signing up as a party in WHO-FCTC. Hence, the long-term policies of tobacco control in Malaysia are principally based on recommendation from WHO-FCTC. Among the tobacco control measures, tobacco taxation has been regarded as a crucial fiscal measure used to reduce tobacco-smoking by reducing the demand for tobacco products. In this respect, tobacco taxes in Malaysia are still regarded as suboptimal according to the excise tax burden of the retail price of 70.0% recommended by WHO-FCTC although the taxes have gradually been raised since 1900 (Norashidah, NikMustapha, & Mastura, 2013; Norashidah, NikMustapha, Rampal, et al., 2013; WHO, 2010). To make it worse, the rampant availability of illicit cigarettes has evidently weakened the effect of tobacco taxes because the cheaper illicit cigarettes are always the best option when there is a price hike in licit cigarettes (FMTnews, 2016; The Star, 2009). Unfortunately, there is no published information on the actual magnitude of illicit cigarettes in Malaysia.

By theory, tobacco taxes are supposed to reduce the demand of tobacco products, however, the desired impact from tobacco taxes is not evident in Malaysia whereby the prevalence of tobacco-smoking has been persistently high especially among the adult male population (NHMS, 2015). Logically, with the high burden of tobacco-smoking compounded with the increasing tobacco price, the tobacco expenditure is supposed to be increasing as well. This will also indirectly verify whether the tobacco smokers have been resorting to illicit cigarettes which escaped the legal taxation. This piece of information will provide a good insight on the extent of illicit cigarettes in Malaysia as there is limited published information on the actual burden of illicit cigarettes.

On top of that, the high burden of tobacco-smoking in Malaysia compounded by the gradual increase in tobacco taxes have also motivated the queries as to whether the welfare as well as the financial impact of household members are directly jeopardised if the tobacco-smoking has not decreased in response to the taxes. Although tobacco taxes will theoretically reduce tobacco smoking, other mitigation strategies such as resorting to illicit cigarettes, brand switching, cross border purchase, and hand-rolled tobacco could contribute to persistent tobacco-smoking. Under these circumstances, the welfare and financial aspects of household members could still be jeopardized. Thus, the exploration of impoverishment as well as crowding out of essential goods and services is relevant and timely in the Malaysian setting.

This chapter essentially discussed the current epidemiology of tobacco-smoking in Malaysia to inform us of its burden. The chapter then detailed the tobacco taxation system and the tax rate from 1990 in Malaysia as a basis for understanding the next few chapters. In short, this chapter provides an overview of tobacco-smoking and control in Malaysia to enhance our understanding and reasoning in the analysis and discussion of the household tobacco expenditure as well as the financial and welfare impact from tobacco-smoking at the household level.

CHAPTER 4: DATA AND MEASUREMENT

4.1 Introduction

The comprehensive and empirical assessment on immediate financial impact from tobacco expenditure such as crowding out effect requires nationally representative datasets to derive information on expenditures on various categories of goods and services as well as total household consumption expenditures as living standard. HES is a household survey conducted by Department of Statistics, Malaysia to collect information on the level and pattern of consumption expenditures by households on a comprehensive range of goods and services. The data collected is also used to update consumer price index annually. Hence, the datasets from HES is literally relevant to be used in this thesis to answer the objectives enlisted.

This chapter begins in Section 4.2 with a description of the HES emphasizing its rigorous and reliable methods as well as its nationally representative coverage. Section 4.3 discusses on measures of household living standard which is crucial in the thesis. The discussions justify on the choice of living standard used in the study not only from theoretical aspects but also on the practical issues. This section also covers on methods used to improve the scale used to represent living standard by appropriate adjustments. The chapter concludes with Section 4.4 which summarises on all important data issues in the study.

4.2 Household expenditures surveys (HES)

4.2.1 Description of Surveys

HES is a household survey conducted by Department of Statistics, Malaysia to collect information on the level and pattern of consumption expenditures by households on a comprehensive range of goods and services. Data collected from HES serve as the basis for updating the consumer price index (CPI) in Malaysia (DOS, 1993, 1998, 2004, 2009, 2014). The household survey was firstly initiated in 1957/58 which covered Peninsular Malaysia only and it was known as Household Budget Survey of the Federation of Malaya. In 1967/68, the survey was initiated in Sarawak and known as the Family Budget Survey, Sarawak. The survey was also initiated in Sabah in 1968/69.

In 1973, the HES was first conducted simultaneously covering Peninsular Malaysia, Sarawak and Sabah. The subsequent HES was conducted in Peninsular Malaysia in 1980 while Sabah and Sarawak had their HES conducted in 1982. Beginning from 1993/94, HES was conducted at 5 years interval with national representative coverage for Peninsular Malaysia, Sarawak and Sabah. The subsequent HES was then conducted in 1998/99, 2004/05, 2009/10 and 2014/15 (DOS, 1993, 1998, 2004, 2009, 2014).

The surveys covered only private living quarters in Malaysia and excluded institutional households, namely those living in hostels, hotels, hospitals, old folk homes, military and police barracks, prisons, welfare home and other institutions. The surveys cover both urban and rural areas, except remote rural area in Sabah and Sarawak as well as the indigenous settlement in Peninsular Malaysia (DOS, 1993, 1998, 2004, 2009, 2014). In 2014/12 HES, the survey also excluded Eastern Sabah

Security Command (ESSCOM)[5] zones due to security and safety issues. In 1993/94, it was estimated that 3.0% of the total Malaysian population were excluded from the coverage of the HES. In the subsequent HES, 1.0% of the total population were excluded in HES 1998/99, HES 2004/05, HES 2009/10 and HES 2014/15 (DOS, 1993, 1998, 2004, 2009, 2014).

The HES used a two-stage stratified sampling design. The primary stratum was made up of the 13 states and 3 Federal Territories in Malaysia. The 3 Federal Territories include Kuala Lumpur, Labuan and Putrajaya which were established in 1974, 1984 and 2001 respectively. Hence, Putrajaya appeared as a separate entity started from the HES 2004/05. Within the primary stratum, there were secondary stratum composed of urban and rural areas. Samples were drawn independently within each level of the secondary stratum. In the first stage of sampling, Enumeration Blocks (EBs) which represented a cluster of households were randomly from each secondary stratum. In the second stage sampling, living quarters (LQs) were then sampled randomly within each selected EBs. All of the households within the selected LQs were included in the survey.(DOS, 1993, 1998, 2004, 2009, 2014)

Sampling frames for each HES were based on the preceding Population and Housing Census. For instance, the HES 1993/94 and HES 1998/99 utilised the sampling frame from 1991 Population and Housing Census while the HES 2004/05 and HES 2009/10 used the sampling frame from 2000 Population and Housing Census. On the same basis,

[5] A Malaysian security area that covers 1,400 km of the east coast of Sabah from Kudat to Tawau. It was established by previous Malaysian Prime Minister and announced on 7 March 2013.

the HES 2014/15 used the sampling frame from 2010 Population and Housing Census. Every EBs is a geographical contiguous area of land with identifiable boundaries, each containing about 80 to 120 LQs and about 600 persons. EBs are formed within boundaries, for example, within local authority areas. The EBs are further classified into urban and rural areas. Urban areas are defined areas with their adjoining built-up areas which have a combined population of 10,000 or more, yet, gazette areas with population less than 10,000 and none gazette areas are categorised as rural area. The definition of urban and rural areas had been consistent from HES 1993/94 to HES 2014/15 (DOS, 1993, 1998, 2004, 2009, 2014). Nevertheless, urban areas for every census might defer due to progressive urbanisation in the country.

The LQ is defined as independent and separate structures, which are usually places of abode. A structure is considered separate if it is surrounded by walls or fence and is covered by roof, whereas the structure will be considered as independent if it has direct access via public path, communal passageway or space. Each LQ may contain one or more household whereby a household consists of related or unrelated persons who usually live together and make common provisions for food and other essentials of living in the household. Household is defined as an arrangement made by persons, individually or groups, for food and other essentials for living within the same LQ. Each household is usually headed by a household head. By definition, a household head refers to any member in the household either male or female who is considered as head by other members. Furthermore, the household head could be an income recipient and age 15 years and above. The household members would only be considered in HES if he or she had stayed in the selected household for 16 days or more during the survey

month. Nonetheless, household members whose nature of employment required them to move from one place to another, namely fishermen, express bus drivers, long-haul lorry drivers, sale personnel, offshore oil and gases workers and timber loggers were also included although they might stay less than the required 16 days.

The HES was usually conducted over a period of 12 months to capture seasonal consumption variations (DOS, 1993, 1998, 2004, 2009, 2014). The EBs were divided equally and systematically into 12 survey months and every round consisted of approximately 2000 households whereby each household were interviewed over a period of 1 month. Table 3.1 shows the distribution of the sampled households by regions, urban/rural locality and ethnicity of household head for all 5 series of HES.

Table 4.1 Distribution of households for HES in Malaysia, 1993 to 2014.

Baseline of household	HES 1993/94	HES 1998/99	HES 2004/05	HES 2009/10	HES 2014/15
Total numbers of households	14631	9198	14084	21641	14838[2]
Response rate (%)	89.5	85.3	77.3	87.4	99.4
Household distribution					
By region					
Peninsular Malaysia	10955 (74.88)	7442 (80.91)	10800 (76.68)	16295 (75.30)	10665 (71.88)
Sabah and Labuan	1787 (12.21)	859 (9.34)	1574 (11.18)	2923 (13.51)	1992 (13.42)
Sarawak	1889 (12.91)	897 (9.75)	1710 (12.14)	2423 (11.20)	2181 (14.70)
By locality					
Urban	8227 (56.23)	5232(56.88)	9467 (67.22)	14989 (69.26)	10246 (69.05)
Rural	6404 (43.77)	3966(43.12)	4617 (32.78)	6652 (30.74)	4592 (30.95)
By ethnicity of household head					
Bumiputera[1]	8156 (56.86)	5059 (56.95)	9025 (65.87)	13941 (64.41)	10116 (68.18)
Malays	6888(48.02)	2443(27.51)	7966(58.14)	-	-
Non-Malays	1268(8.84)	2616(29.45)	1059(7.73)	-	-
Non *Bumiputera*	6187 (43.14)	3823 (43.05)	4677 (34.13)	7700 (35.59)	4722 (31.82)
Chinese	4201(29.29)	2636(29.68)	3200(23.35)	5126 (23.69)	-
Indians	1011(7.05)	650(7.32)	810(5.91)	1309 (6.05)	-
Others	975(6.80)	537(6.05)	667(4.87)	1265 (5.85)	-

Note: [1] *Bumiputera* is a Malaysian term to describe Malays and other indigenous of Southeast Asia, i.e. the Malay world, used similarly as in Indonesia and Brunei

[2] This is one third of the total sample in HES 2014/15 which were randomly selected for the thesis. The further explanation is provided in Section 4.2.4.

In all HES, household consumption expenditures were collected mainly utilising the acquisition approach, whereby all household members recorded expenditures made when purchases or payments were made. To ensure the quality of data, trained interviewers were assigned to visit or call the selected households every alternate day. Each household was given a daily record book to record all expenses made on goods and services for a period of month. Expenditures on durables, semi-durables and some selected items such as electrical items, house furniture and vehicles were covered for the reference period of 12 months including the survey month. Market values were recorded for the goods produced for own use in the household. Besides that, imputed rental values of owner-occupied houses were also included in the household expenditures.

The household expenditures items for HES 1993/94 and 1998/99 were classified into 9 main expenditures groups based on the Systems of National Accounts 1968(DOS, 1993, 1998). In contrast to HES 1993/94 and 1998/99, HES 2004/05 adopted the Classifications of Individual Consumption According to Purpose *(COICOP)* recommended by United Nations (DOS, 2004, 2009, 2014). Under the different classification, the 9 categories expenditures groups were re-categorised into 12 main groups of expenditures items. The consumption expenditures groups for all 5 series of HES is summarised in Table 3.2.

Table 4.2 Main household consumption expenditures groups in all 5 series of HES.

HES 1993/94 and 1998/99		HES 2004/05, 2009/10 and 2014/15	
Group 0[1]	Food	Group 1	Food and non-alcoholic beverages
Group 1[2]	Beverages and tobacco	Group 2	Alcoholic beverages and tobacco
Group 2	Clothing and footwear	Group 3	Clothing and footwear
Group 3	Gross rent, fuel and power	Group 4	Housing, water, electricity, gas and other fuels
Group 4	Furniture, furnishings and household equipment and operation	Group 5	Furnishing, household equipment and routine household maintenance
Group 5	Medical care and health expenses	Group 6	Health
Group 6	Transport and communication	Group 7	Transport
Group 7	Recreation, entertainment, education and cultural services	Group 8	Communication
Group 8	Miscellaneous goods and services	Group 9	Recreation services and culture
		Group 10	Education
		Group 11	Restaurants and hotels
		Group 12	Miscellaneous goods and services

Note: [1] Includes expenditures for non-alcoholic beverages in HES 1998/99.

[2] Contains expenditures for all beverages in HES 1993/94, however, only alcoholic beverages in HES 1998/99.

4.2.2 Household tobacco expenditure

Household expenditures on tobacco products was captured within the consumption expenditures items of tobacco and alcoholic beverages. In HES 1993/94, tobacco expenditure was captured in beverages and tobacco group whereby the expenditures group included both alcoholic and non-alcoholic beverages as well as tobacco products such as cigarettes, cheroots, tobacco, betel leaves and other tobacco-related products, namely cigarette paper and cigarette leaves. Nonetheless, non-alcoholic beverages were excluded from initial group in the HES 1998/99. The group was renamed as alcoholic beverages and tobacco, which included most of the alcoholic beverages and all tobacco products as aforementioned in HES 1993/94. Since then, tobacco expenditure had remained in the same group in the HES 2004/05, HES 2009/10 and HES 2014/15. Electronic cigarettes which gained popularity in the recent years was not included in all of the 5 series of HES.

In this study, the expenditures on tobacco products were separated from the alcoholic beverages as the study attempt to examine on tobacco expenditure only. In relate to the tobacco expenditure, the monthly expenditures collected is an aggregate of amount of expenses on tobacco products contributed by all household members who were tobacco smokers whereby the number of smokers within a household was not known. The number of tobacco smoker could be at least 1 or more than 1. All of the tobacco expenditure was aggregated in MYR.

4.2.3 Reference and recall periods for tobacco expenditure

The reference period for all household expenditure in the HES was one month which allowed the estimation of monthly household consumption expenditures. As aforementioned, each HES was conducted over 1-year period whereby all selected households were divided into 12 months round. Hence, a household group was surveyed for a month duration. The recall period for most of the expenditures items was one-day period whereby the household members would record the expenditures made on the day of purchase or consumption of the items during the survey month. In relate to this, tobacco consumption was literally daily or rather frequent in week. Hence, tobacco expenditure was recorded daily after purchase and then totalled to yield monthly tobacco expenditure.

4.2.4 HES response rate

The response rate in the HES 1993/94 was 89.5% (DOS, 1993), the HES 1998/99 was 85.3% (DOS, 1998), the HES 2004/05 was 77.3% (DOS, 2004), the HES 2009/10 was 87.4% (DOS, 2009) and lastly the HES 2014/15 was 99.4%[6] (DOS, 2014).

In view of two-stage stratified sampling used, all 5 series of the HES were analysed using inflationary weights. This is because two-stage stratified sampling led to different sampling probabilities for the sampling units and the data on expenditures obtained

[6] The response rate in the HES 2009/10 and 2014/15 was upon direct request to Department of Statistics, Malaysia.

from any one household need not represent expenditures from the same number of households in the country. In order to account for this unequal sampling probabilities, DOS has provided inflationary weights with HES datasets. The use of this weight together with data on household size and the number of household members in each household permit estimation of the total population in the country.

For HES 2014/15, the total number of households available in this study is one third of the original survey by DOS due to inability to access the whole set of data collected. In order to ensure that the household data are representative of the population in Malaysia, the dataset generated for this study was done randomly according to the state in Malaysia. On top of that, we did not manage to obtain specific data on ethnicity in the HES 2014/15. Hence, the ethnicity would be collectively grouped as *Bumiputera* and non-*Bumiputera.*

4.2.5 Analysis of HES data

The analyses of this study have been performed utilising STATA version 14 by accounting for the complex survey design of the HES. Even though the HES was essentially conducted in 1993/94, 1998/99, 2004/05, 2009/10 and 2014/15, for simplicity reference would hereafter be made to analysis conducted during the years 1993, 1998, 2004, 2009 and 2014 respectively.

4.3 Measures of Household Living Standard

4.3.1 Household consumption and household income

This study aims to examine the burden of household tobacco expenditure across household of different living standard. For instance, the study explores the actual quantum of household tobacco expenditure and its relative proportion from total household consumption across ascending living standards over 5 series of HES data in Malaysia. There are various living standards which can be utilised to represent a household, either "direct" measures or "proxy measure". The most commonly used direct measures of living standard include household income and household consumption. Income is defined as amount of money received during a period of time in exchange for labour or services, from the sale of goods or property, or as a profit from financial investments. On the other hand, consumption is the final use of goods and services, excluding intermediate use of some goods and services in the productions of others. Both of household income and household consumption are collected in HES.

The theoretical basis for opting consumption over income in the current study is firstly supported by two well-known hypotheses, namely Permanent Income Hypothesis (PIH) and Life Cycle Hypothesis (LCH). Permanent Income Hypothesis describes the behaviour of consumers whose consumption choices are determined not by their current income but by their longer-term expectations of income. Under this hypothesis, the consumers attempt to maintain constant living standard despite fluctuations in their income over a few months or years. Hence, temporary changes in income would not instantly affect the levels of consumption unless the consumers deem that changes would be permanent. LCH further introduces the idea of savings and

accumulation of assets to enable smoothening of consumptions over an individual's lifespan. For instance, a retired person will dissave to even out their consumptions the best possible manner to maintain similar level of consumptions. This smoothening is achieved by savings during the individual's working life and after retirement. On top of that, the individuals could also rely back on their accumulated wealth to maintain their standard of living. In short, both of the hypotheses reason out why current income will not be the best and accurate measure of current household living standard.

Other than the theoretical basis, household income collected during the survey month will not be able to portray the real income status among the households engaged in agriculture and fishery sectors because the aforementioned sectors will usually have seasonal income variation. The household income collected in HES was based on the month during the data collection. Hence, consumption is a better measure than household income to represent the household living standard. This is because the consumption is unlikely to fluctuate over a short period of time and thus monthly capture will produce a more accurate estimate of a household's living status.

As for data collection per se, it is easier to indeed collect data on household income than household consumption. Data on consumption is tedious and costly to collect as the consumption data composed of different consumption groups. Although household income is relatively simple and easy to collect compared to consumption, concern of reporting the real income is a sensitive issue (Meyer & Sullivan, 2003). The household would be more reluctant to share information on their income and assets than information concerning their level of consumption (Deaton & Grosh, 2000). Some

researchers think that the underlying reason for underreporting of income could be due to the individuals are primarily taxed on their income rather than their expenditures. On top of that, researchers have encountered high refusal rate on reporting income and the income is usually underreported among richer households (Meyer & Sullivan, 2003).

In short, it is argued that income is a less sensitive direct measure of living standard, not only because of its measurement challenges, but also due to possible temporary fluctuation in income over certain period. However, the household will attempt to the best to smoothen and maintain their consumption through savings or insurance. Thus, using the cross-sectional income data could be misleading and leads to wrong ranking of the households.

4.3.2 Adjusting for cost of living

Another concern in measuring living standard across a duration of years is the inflation, which the rate of price changes of goods and services. Hence, it would be important to convert the nominal consumption to real values to take into account differences in cost of living (Deaton, 1997). In the current study, the CPIs for the different years of the surveys were used to adjust household consumption to account for rates of inflation in different years. Consequently, this will permit valid comparison of living standard over a duration of year.

Other than inflation, price variation of goods and services across different regions within a country could also affect the consumption. Nonetheless, quantities of goods and services consumed by households were not included in the HES, thus, adjustment of the differential pricing across different regions in the country was not done.

4.3.3 Adjusting for household size and consumption of adults and children

Household consumption is utilised to represent household living standards in this study. Although the advantages of using total household consumption are obvious compared to household income as aforementioned, there is still a need to account for household size and household composition. Different household composition will indicate different needs, such as children and adult.

First and foremost, it is undeniable that total household consumption does not reflect the actual living standards between households with differing size. As the household size increases, the household consumption is logically assumed to be increasing as well. Nonetheless, the increase in household size may not be directly proportional to increase in household consumption because the household consumption could be constrained by available household resources. For instance, the living standard between two households made up of two and five household members with equivalent total household consumption will evidently be different. If without any household size adjustment, we would be overestimating the wellbeing of the household with five household members to a greater extent. Instead of using the household consumption,

the use of total household consumption adjusted for household size will yield per capita household consumption, which is obviously a better indication of living standard.

Under per capita household consumption, all of the household members are essentially assumed to consume equal amounts of the goods and services in the household. Unfortunately, that will not be the fact as children may consumed less than the adults. On the other hand, the productive age group household members may certainly exhibit higher consumption needs than others. For instance, a child will certainly consume lesser due to differences in physical and biological needs. In short, household composition is evidently crucial and should be considered in our attempt to use the correct parameter representing the living standard.

Hence, we will not only need to consider the household size but also the household composition to ensure the most accurate living standard for the household. The detail of the adjustment in mathematical equation will be further elaborated in the subsequent section.

4.3.4 Adjusting for household economies of scale

In a household, there are two types of goods, namely public good and private good. A public good is non-rivalrous, in that the use of the good by one person does not decrease its availability to others. The instances of public goods include a television, a radio, cooking utensils and etc. The existence of public goods in a household will confer some savings which can be used to increase the wellbeing of the household

members. On the other hand, a private good can only be consumed by one person especially food (Deaton & Paxson, 1998). For instance, a pure private good is a plate of rice which can only be eaten by only one person. In relate to public and private goods, household economies of scale are plausibly attributed to the shared "public" goods. The economies of scale from household public goods are most likely to benefit larger households. In another word, the economies of scale will free more resources to be diverted to consumption of other goods and services.

To infer an accurate individual living standard, the measurement of economies of scale together with the household size and the household composition are essential prerequisites. We can adjust all of the aforementioned prerequisites by dividing total household consumption by a factor known as equivalence scale. In regard to this, we employ an arbitrary approach advocated by Deaton whereby it sets the scale parameters using reasonable prior understanding of consumer behavior in a country.

The general formula for setting the household equivalence scales as recommended by Deaton is as followed:

$$AE_h = (A_h + \alpha K_h)\theta$$

Where A_h is the number of adults in the household h

K_h is the number of children 0 – 14 years old

α (value is set at 0.5) is the "cost of children" and

θ (value is set at 0.75) reflects the degree of economies of scale.

Referring back to the equation mentioned above, the parameter θ, which represents the economies of scale, range from zero to one. Setting the θ close to one will essentially indicates that economies of scale do not exist within the household and most of the household consumption would concentrate on private goods such as food which may generally be common for the poor household. In short, the θ is set closer to 1 for poorer economies while the θ will be set lower for the richer economies.

On top of that, the poorer households are assumed to allocate a larger share of their household consumption on economically productive adults who are able to earn income for the household compared to the cost of a child. Nonetheless, richer households may presumably have higher cost in raising up a child such as cost of education, clothing and entertainment. Hence, Deaton recommended that the α, which represent the cost of a child relative to that of an adult, be set at lower values for poor economies. For instance, the α can be set at 0.3 for very poor economies. As for richer economies such as the United States and Europe, the α should be set higher or closer to 1. In our study, the cost of a child is set at 0.5 which means the cost of a child is half of an adult in the household. It is undeniable that the method of adjustment is relatively arbitrary, however, the equation recommended by Deaton accounts for household size, adult-child composition and economies of scale within a household and this is certainly a realistic measurement of living standards for a household rather than using the total household consumption or per capita household consumption.

4.3.5 Use of adult equivalence scale

The adult equivalence scale is used in the current study to adjust the total household consumption for household size, household composition and the economies of scale for the household. From a few empirical studies on health financing, the adult equivalence scale was also utilized to adjust the living standards (Leung, Tin, & O'donnell, 2009; O'donnell et al., 2008; Yu, Whynes, & Sach, 2008). A study by O'Donnell across 13 Asia countries exploring into distribution of total health financing utilized adult equivalence scale to adjust for their living standards by employing cost of child as 0.5 and the economies of scale as 0.75 for all countries (O'donnell et al., 2008). In Hong Kong, there is also a study to explore the distribution of its mixed public-private health system whereby similar parameter values were used for the cost of child and the economies of scale (Leung et al., 2009).

In contrast to the aforementioned studies, Yu et al used 0.5 for the cost of child and 1 for the economies of scale in their analysis for progressivity of health financing in Malaysia. The study utilised data from HES 1998 by Department of Statistics, Malaysia and concluded that health financing in Malaysia was progressive. The author did not specifically explain on their decision on both of the parameter but they performed a sensitivity analysis using different scales and the findings were robust. In relate to the current study, we used the equivalence scale, $AE_h = (A_h + 0.5K_h)^{0.75}$ in parallel with the evidence from the empirical studies in different countries (O'donnell et al., 2008).

In short, the living standard in the current study is represented by total household consumption adjusted by adult equivalence scale. Its computation is by dividing the

total household consumption by the household's adult equivalence scale which would essentially yield monthly per capita adult equivalent consumption. This measure would be used in estimation of tobacco inequalities by living standard. Besides that, the monthly per capita adult equivalent consumption will be mainly used to represent the living standard of the household in any related analysis. The monthly per capita adult equivalent consumption will also be categorized into five quintiles in ascending order to represent the living standard from the poorest to the richest. All of the detailed analysis on distribution of tobacco expenditure by the ascending order of living standard will be further illustrated and discussed in Chapter 5.

4.4 Summary

The chapter highlighted the robustness and reliability of HES in its survey process. On top of that, the HES had wide geographical coverage and it is nationally representative. Hence, the datasets were relevant for the use of examining the household tobacco expenditure and financial impact attributed to tobacco-smoking at national level. In addition, the expenditures group of interest, namely household tobacco expenditure, was well defined in the expenditures group of alcoholic beverage and tobacco. The specific coding of tobacco products allowed us to purely differentiate the exact expenditures on tobacco products from the expenditures group. There would only HES 2014/15 be used in the analysis of crowding out effects of tobacco expenditure, whereby all relevant expenditures groups as outcome variables were available in the dataset.

As for recall period of tobacco expenditure, there was no imminent issues as all of the tobacco purchase were recorded on daily basis. The recall period for other expenditures groups was mostly one-day period whereby the household members would record the expenditures made on the day of purchase or consumption of the items during the survey month.

On the choice of household consumption as the scale of living standard, the PIH and LCH provided a solid and strong theoretical argument over the use of household income. The arguments were augmented by a few practical reasons such as under-reporting of income by richer households as well as seasonal variations in income for household enrolled in agricultural and fishery sectors. On top of that, arguments had

also been mentioned in the chapter on refining the household consumption by accounting household size, household composition of adults and children, and economies of scale. In relate to this, the use of per capita consumption is better than total household consumption. Nonetheless, the different level of consumption within a household between children and adult and sharing of public goods in a larger household has made per capita consumption slightly inaccurate. In order to adjust for this, an equivalence scale, $AE_h = (A_h + 0.5K_h)^{0.75}$ would be utilised to provide estimates of monthly per capita adult equivalent consumption as the measure of living standard.

In view of our adjustment to total household consumption, the adjustment is also extended to household tobacco expenditure. The household tobacco expenditure is also adjusted by $AE_h = (A_h + 0.5K_h)^{0.75}$ to provide a measure of monthly per capita adult equivalent tobacco expenditure. Nonetheless, there are some chapters in the thesis which use per capita household consumption expenditures and per capita household tobacco expenditure due to its limitations. Hence, the situation has been specifically mentioned in the relevant chapter.

CHAPTER 5: DISTRIBUTION OF HOUSEHOLD TOBACCO EXPENDITURE

5.1 Introduction

This chapter examines the distribution of household tobacco expenditure across households of differing living standards where the living standard is based on total household consumption expenditures as described in Chapter 4. The study will essentially examine the proportion of households with tobacco expenditure, whereby this is different from previous studies which analysed tobacco-smoking at the individual level. In the Malaysian setting, prevalence of tobacco-smoking was quoted to be at 42.4% among adult male populations in 2015. In this context, the adult male populations in Malaysia are mostly the heads of households which means they possess the authority to decide and allocate their household monetary resource. Hence, it would be important to know the proportion of households with tobacco expenditure.

The chapter begins with Section 5.2, which describes the data sources and specifications used in the analysis. This section will also describe the estimation methods for measuring tobacco expenditure and per capita adult equivalent tobacco expenditure. The subsequent section contains the results on the proportion of household with tobacco expenditure, the actual quantum of tobacco expenditure and the proportion of tobacco expenditure from the total household consumption expenditures in Malaysia at five points of time. Furthermore, the aforementioned results are organized into sections according to national and regional levels and urban-rural strata. The three regions included in this analysis are Peninsular Malaysia, Sabah and

Sarawak. Lastly, the chapter concludes with Section 5.4 which provides a summary of the findings.

5.2 Data and methods

5.2.1 Source of data and specifications

The data for the analysis in this chapter were obtained from the HES 1993/94, 1998/99, 2004/05, 2009/10 and 2014/15. The detail on the designs, conduct and extent of the data captured in HES have been elaborated in Section 4.2 of Chapter 4. The measure of living standard used in this chapter is monthly per capita adult equivalent household consumption expenditures. The underlying rationale for the use of this measure and its computation is well mentioned in Section 4.3 of Chapter 4. The household tobacco expenditure reported in this chapter have also been adjusted with per capita adult equivalent scale used to adjust the total household consumption expenditures. The detail of the adult equivalent scale can be obtained from Section 4.3.5 of Chapter 4.

Both the total household consumption expenditures and the household tobacco expenditure are presented in the 2014 prices and hence the changes across the years are in real terms. Total household consumption expenditures have been adjusted utilising general CPIs and the household tobacco expenditure has also been adjusted using the CPI of alcoholic beverages and tobacco in accordance to base year 2010. The CPI of alcoholic beverages was also used because the CPIs for tobacco and alcoholic beverages were collectively calculated in Malaysia. The CPIs used in the adjustment are listed in Table 5.1 below.

Table 5.1 General CPI and CPI of tobacco products and alcoholic beverages

Year	Consumer Price Index (CPI) Base Year=2010	
	General	Tobacco products and alcoholic beverages
1993	64.2	53.7
1998	77.0	65.2
2004	85.2	74.4
2009	99.4	93.9
2014	110.5	122.6

Source: Annual Report, Department of Statistics, Malaysia.

5.2.2 Methods

For this chapter, a repeated cross-sectional study utilising dataset from HES by Department of Statistics, Malaysia. This chapter essentially explores the household tobacco expenditure by its actual quantum and its relative proportion over total household consumption expenditures as well as the distribution of household tobacco expenditure across ascending living standards.

5.2.2.1 Quantum of tobacco expenditure

In this chapter, there are two main approaches to examine tobacco expenditure, namely on the actual quantum of tobacco expenditure and the relative proportion of tobacco expenditure from total household consumption expenditures. Before that, we studied the proportion of households with reported tobacco expenditure. The household is essentially considered to have tobacco expenditure if tobacco expenditure is reported in the household expenditures. However, the dataset from HES did not specify on the exact number of tobacco smokers in the households.

Under the actual quantum of tobacco expenditure, we analysed the overall household tobacco expenditure as well as per capita adult equivalent tobacco expenditure. The per capita adult equivalent tobacco expenditure is obtained by dividing the overall household tobacco expenditure with the adult equivalent scale. The details of the adult equivalent scale are fully discussed in Section 4.3 of Chapter 4. The underlying reason to use per capita adult equivalent tobacco expenditure is intrahousehold resource allocation for any group of goods is primarily affected by household composition, household size and scales of economies. Moreover, the household would maximise its utility subject to a budget constraint given the prices of all goods. For instance, a tobacco-smoking household has already "pre-allocated" a certain amount of monetary resources on tobacco products, which effectively means that the household now has to maximize its utility subject to the expenditures in excess of the pre-allocation expenditures on tobacco products. Thus, the tobacco expenditure is indirectly borne by the household members under the constrained household budgets.

5.2.2.2 Relative proportion of tobacco expenditure

Apart from the actual quantum of tobacco expenditure, another parameter used to represent tobacco expenditure is the proportion of tobacco expenditure from the total household consumption expenditures. The parameter is calculated by dividing the overall tobacco expenditure by the total household consumption expenditures. It is also called as tobacco expenditure share of the household consumption in the thesis. The parameter ranges from zero to one. This parameter is crucial as it would enable

comparison on the magnitude of tobacco expenditure relative to the households' total monthly consumption expenditures. As the proportion increases, it indicates that a higher amount of available monetary resource is spent on tobacco products. Conversely, the lower proportion will mean a smaller amount of their available monetary resources spent on tobacco products.

As compared to actual tobacco expenditure, this parameter allows direct comparison of magnitude in tobacco expenditure between households. A good instance is the rich household may evidently spend a higher amount of money on tobacco products compared to the poor household which spends a lesser amount; yet, the amount spent on tobacco products in the rich households constitutes only a small portion of their total household consumption expenditures because the rich household has higher disposable income and thus their abundant spending does not constrain their available monetary resource on other goods. On the contrary, the amount spent on tobacco products may be lower in poorer household but that amount constitutes a larger portion of their lower household income. Hence, less monetary resource is available in poorer households for other goods and services.

Overall, the tobacco expenditure share from the total household consumption expenditures is essentially a good parameter to indicate the magnitude of tobacco expenditure and it allows a relative comparison between households from different living standards. Under this approach, we analysed the tobacco expenditure share for all HES by their living standard, different regions in Malaysia, urban-rural stratum, and ethnicity.

5.2.2.3 Concentration curves

As discussed in Chapter 2, tobacco taxation is evidently an important public health tool to reduce tobacco-smoking in any country. However, there were opinions that tobacco taxation tends to burden the poor tobacco smokers. Hence, we explored the distribution of per capita adult equivalent tobacco expenditure by the living standards in Malaysia using concentration curve to determine the distribution of tobacco expenditure. This is to enlighten us on whether the poor or the rich households have been having higher spending on tobacco products.

A concentration curve is a cumulative graph plotting cumulative percentage of any health variable against the cumulative percentage of the sample ranked by living standards. In a concentration curve, the health variable must be measured in units that can be aggregated across individuals. In simple words, a concentration curve plots the cumulative percentage of a health variable *(y-axis)* against the cumulative percentage of the population, ranked by living standards, beginning with the poorest and ending with the richest *(x-axis)* (O'Donnell, 2008).

In the study, we plotted the cumulative percentages of tobacco expenditure against the living standards of the population. The tobacco expenditure was adjusted by an adult equivalence scale as discussed in the previous chapter and the tobacco expenditure was also adjusted to the real price in 2014. In the concentration curve, if everyone irrespective of their living standards has exactly the same value of the health variable, then the concentration curve will be at a 45-degree line, running from the bottom left-hand corner to the top right-hand corner. This line is referred to as the line

of equality. If a health variable is higher among the poorer group, then, the concentration curve will lie above the line of equality. And the farther the curve is above the line of equality, the more concentrated is the health variable in the poorer group. On the other hand, if the curve lies below the line of equality, the health variable is actually lower in the poorer group and higher in the richer group (O'Donnell, 2008).

The concentration curves for the same variable in the same countries and time periods can be plotted on the same graph for comparison purposes. Other than that, concentration curves of the same variable from different regions or countries can also be constructed on a graph to enable comparison. Yet, the concentration curve does not provide a measure of the magnitude of inequality that allows convenient comparison. In short, a concentration curve is one of the best graphical means to assess the degree of income-related inequality in the distribution of a health variable. In our study, cumulative percentage of tobacco expenditure was plotted against ascending level of living standards to assess income-related inequality in the distribution of tobacco expenditure. We plotted concentration curves for the aforementioned tobacco expenditure for every series of HES 1993, 1998, 2004, 2009 and 2014. In addition, we have also plotted the concentration curves for every series of HES stratified by different regions and urban-rural strata in Malaysia.

5.2.2.4 Concentration index

From the concentration curve, we derive the concentration index. The concentration index is defined as twice the area between the concentration curve and the line of

equality. Thus, the concentration index is zero if there is no socioeconomic-related inequality in the health variable. The index is essentially bound between -1 to 1. The index will take a negative value when the curve lies above the line of equality which indicates a disproportionate concentration of the health variable in the poorer group. On the contrary, an index with a positive value will mean the curve lie below the line of equality. And the positive value indicates that the health variable is more concentrated among the richer group (O'Donnell, 2008).

In short, the concentration index summarizes information from the concentration curve. Nonetheless, the concentration index loses a certain amount of information that is contained in the curves. In relation to this, the index of zero can either be due to the curve lying on top of the line of equality or because the curve crosses the line of equality and the areas above and below the line cancel out each other. Hence, it would be important to distinguish both of these cases by examining the index in conjunction with the concentration curves (O'Donnell, 2008).

As mentioned in relation to the concentration curve, tobacco expenditure is the health variable plotted against the living standards in our concentration curve. Our tobacco expenditure was measured in MYR which does not affect the interpretation and measurement of inequality in tobacco expenditure. In this respect, our tobacco expenditure is a ratio scale with non-negative value. On top of that, for the concentration index, it does not matter whether the tobacco expenditure was in terms of monthly expenditures or the monthly expenditures multiplied by 12 to yield a yearly figure. In summary, the concentration index does not vary according to local currency

used to quantify the health variable nor to the monthly tobacco expenditure utilised in the analysis.

In relation to this study, concentration indices were utilised to illustrate the tobacco expenditure inequality for the overall population by every series of HES. Moreover, the concentration indices were also generated in accordance to the regions, ethnicity and urban-rural stratum in Malaysia for all five series of HES. This was aimed at identifying the tobacco expenditure inequality in the Malaysian context which reflects the impact of tobacco taxation.

5.2.2.5 Description of Variables

In this chapter, the main variable of interest includes per capita adult equivalent tobacco expenditure and tobacco expenditure share of the total household consumption expenditures. The other variables involved include total household consumption expenditures, per capita adult equivalent household consumption expenditures, ethnicity, urban-rural stratum as well as regions in Malaysia.

The details on per capita adult equivalent tobacco expenditure, tobacco expenditure share and per capita adult equivalent household consumption expenditures are discussed in detail in Section 4.3 of Chapter 4 and Section 5.2.2.1 of Chapter 5 respectively.

Referring to variables on ethnicity, it includes all major ethnicities in Malaysia, namely Malay *Bumiputera*, non-Malay *Bumiputera*, Chinese, Indian and others.

However, the analysis was done in aggregate of *Bumiputera* and non-*Bumiputera* in HES 2009/10 and 2014/15 because the data for Malay and non-Malay *Bumiputera* were not provided separately. Urban-rural stratum include either urban or rural stratum. The definition of urban and rural stratum was mentioned in Section 3.2.1 of Chapter 3.

Malaysia is an upper middle-income country made up of 13 states and three Federal Territories. The states include Perlis, Kedah. Perak, Selangor, Negeri Sembilan, Melaka, Johor, Pahang, Kelantan and Terengganu located in Peninsular Malaysia while Sabah and Sarawak are located in the Borneo Island. The three Federal Territories includes Kuala Lumpur and Putrajaya in Peninsular Malaysia and Labuan in the Borneo Island. In the thesis, Malaysia is segregated into three main regions, namely Peninsular Malaysia, Sabah and Labuan, and Sarawak.

5.2.2.6 Statistical analysis

STATA version 14 was used for statistical analysis in this chapter. In the analysis, we employed a survey setting using household weight. Concentration curves were plotted with per capita adult equivalent tobacco expenditure at *y*-axis and ascending quintiles of per capita adult equivalent household consumption at *x*-axis. On top of that, concentration curves were also plotted by region in Malaysia, urban-rural stratum and ethnicity. From the concentration curves, we generated the concentration indices to examine social inequality in actual tobacco expenditure. The index is used to identify whether tobacco expenditure was more pronounced in higher or lower socio-economics group(O'Donnell, 2008).

5.3 Results

5.3.1 Distribution of tobacco expenditure in Malaysia, 1993 to 2014

Overall, the proportion of households with tobacco expenditure has been fluctuating between 38.0% to 48.0% during the period 1993 to 2014 in Malaysia. The proportion was highest in 1993 (47.64%) and gradually decreased in 1998 (42.50%), 2004 (38.41%) and 2009 (38.03%) but rebound in 2014 (44.76%). Across ascending living standard, the richest quintile households were evidently the lowest among households with tobacco expenditure from 1993 to 2014. On the contrary, the poorest households were the highest among households with tobacco expenditure in 1993, 1998 and 2004. In 2009, the trend was slightly different whereby the middle quintile gradually emerged with the highest proportion of households with tobacco expenditure. The trend was persistent in 2014, whereby the second quintile, middle quintile and fourth quintile remained to constitute higher proportion of household with tobacco expenditure. In short, the middle-income population was emerging as the majority of tobacco expenditure households in Malaysia.

Table 5.2 Prevalence of household with tobacco expenditure in Malaysia, 1993 to 2014

Household Consumption Quintiles	Proportion of household with tobacco expenditure				
	1993	1998	2004	2009	2014
Poorest quintile	57.23 (0.94)	52.32(1.22)	42.43 (1.22)	39.25 (0.97)	46.56 (1.02)
Second quintile	51.74 (0.95)	47.15(1.21)	38.73 (1.25)	39.87 (1.04)	47.79 (1.10)
Middle quintile	46.76 (0.94)	39.33(1.18)	40.28 (1.40)	40.27 (1.11)	45.61 (1.08)
Fourth quintile	44.95 (0.94)	39.10(1.19)	38.98 (1.42)	35.82 (1.10)	44.94 (1.14)
Richest quintile	36.04 (0.90)	34.59(1.16)	31.63 (1.44)	34.95 (1.09)	38.88 (1.10)
Overall	47.64 (0.41)	42.50(0.52)	38.41 (0.60)	38.03 (0.47)	44.76 (0.49)

Notes: The figures in the interval are the standard error for the prevalence of household with reported tobacco expenditure.

Table 5.3 shows the household tobacco expenditure and per capita adult equivalent tobacco expenditure from 1993 to 2014. In the table, all three main variables namely, per capita consumption, household tobacco expenditure and per capita adult equivalent tobacco expenditure were already adjusted to 2014 prices. Referring to household tobacco expenditure, the fourth quintile and the richest quintile had persistently recorded the highest household tobacco expenditure from 1993 to 2014. Although the poorest households were reported to have the highest proportion of household with tobacco expenditure in 1993, 1998 and 2004; the household tobacco expenditure were the lowest in these quintile groups. Another interesting finding is the increase in household tobacco expenditure was more obvious in middle quintile, fourth quintile and the richest quintile as compared to the poorest quintile and the second quintile. This mean that the aforementioned three quintiles had gradually paid more for their tobacco products at the household level.

Per capita adult equivalent tobacco expenditure also had a similar trend whereby the richest quintile had been spending the highest amount of their money on tobacco products compared to other quintiles from 1993 to 2014. The ascending trend in per capita adult equivalent tobacco expenditure across the living standards was persistent from 1993 to 2014 whereby it was lowest in the poorest quintile and gradually increased towards the richest end. In relation to this, the richest quintile spent four times as much as that paid by those in the poorest quintile.

Although the per capita adult equivalent tobacco expenditure has been increasing throughout the five points of times, the increase in per capita adult equivalent tobacco

expenditure was surprisingly not enormous. For instance, the per capita adult equivalent tobacco expenditure for the poorest quintile increased for about 10.00% throughout 21-year periods although the poorest quintile had been a major group of tobacco smokers in Malaysia. Not only that, the increase in per capita adult equivalent tobacco expenditure in the rich quintile had also increased by a small amount, approximately 15.00%. In short, the increase in per capita adult equivalent tobacco expenditure was small throughout the long period of 21 years.

From Table 5.3, we moved to assessing the equality of tobacco expenditure between the poorest and the richest quintiles using concentration curves. The curves representing per capita adult equivalent tobacco expenditure were all well below the line of equality from 1993 to 2014 which showed that the richest had been paying more for tobacco products all the time. Apart from the concentration curves, the assessment for equality in tobacco expenditure was also conducted via concentration indices as indicated in Table 5.5.

Overall, the concentration indices were on the positive side to indicate that tobacco expenditure was unequally more concentrated among the richest group. From 1993 to 2014, the concentration indices were gradually increasing which means the tobacco expenditure became unequally more concentrated among the richest quintile.

After the analysis for the overall population, the subpopulation analysis was conducted among tobacco-smoking households. The per capita adult equivalent tobacco expenditure among tobacco-smoking households was evidently higher in sub-populational analysis in view of absence of the averaging effect from non-tobacco-

smoking households. Compared to the overall populational analysis, the per capita adult equivalent tobacco expenditure was remarkably higher; however, the increase over the five points of time in 1993 to 2014 were small. For instance, the poorest quintile spent approximately MYR 14.19 for their monthly per capita adult equivalent tobacco expenditure in 1993 and this gradually increased to MYR 17.60 in 2009 and MYR 36.12 in 2014. The increase in monthly per capita adult equivalent tobacco expenditure was slightly small in the fourth quintiles and, on the contrary, the richest quintile experienced reduction in monthly per capita adult equivalent tobacco expenditure from 1993 to 2014, a reduction from MYR 86.09 to MYR 66.36.

Regarding tobacco expenditure share among tobacco-smoking households, there was evident a reducing trend for every quintile throughout the five points of times. For instance, tobacco expenditure share for the poorest quintile was 6.84% in 1993 and 5.01% in 2014. This indicates that lower monetary resource was required or allocated to purchase tobacco products although their actual tobacco expenditure increased. Besides the poorest quintile, the reduction in tobacco expenditure share among the middle and the richest quintiles too were obviously more prominent whereby the tobacco expenditure share in 2014 almost halved compared to 1993. In a nutshell, the tobacco products were either becoming more affordable or the usage had reduced over time among the tobacco-smoking household in Malaysia.

Table 5.3 Household tobacco expenditure and per capita adult equivalent tobacco expenditure in Malaysia, 1993 to 2014

Household Consumption Quintiles[1]	1993			1998			2004			2009			2014		
	Per capita consumption[2]	Household tobacco expenditure[3]	Per capita tobacco expenditure[4]	Per capita consumption[2]	Household tobacco expenditure[3]	Per capita tobacco expenditure[4]	Per capita consumption[2]	Household tobacco expenditure[3]	Per capita tobacco expenditure[4]	Per capita consumption[2]	Household tobacco expenditure[3]	Per capita tobacco expenditure[4]	Per capita consumption[2]	Household tobacco expenditure[3]	Per capita tobacco expenditure[4]
Poorest quintile	203.35 (0.98)	34.51 (1.11)	8.12 (0.25)	251.93 (1.58)	35.65 (1.57)	8.68 (0.38)	272.39 (1.68)	27.69 (1.32)	7.24 (0.37)	256.81 (1.49)	27.38 (1.04)	5.20 (0.20)	445.21 (2.38)	35.14 (1.26)	8.80 (0.31)
Second quintile	343.67 (0.72)	48.30 (1.58)	12.88 (0.41)	423.74 (1.07)	42.54 (1.75)	12.83 (0.54)	462.69 (1.35)	39.46 (1.98)	11.68 (0.58)	447.17 (1.13)	42.85 (1.83)	9.63 (0.41)	725.68 (1.59)	58.01 (2.53)	16.28 (0.63)
Middle quintile	495.73 (0.98)	52.23 (1.69)	16.76 (0.55)	606.89 (1.52)	45.48 (2.22)	14.64 (0.67)	665.52 (1.85)	51.19 (2.80)	17.85 (1.07)	633.93 (1.43)	55.39 (2.24)	14.14 (0.58)	1001.58 (2.03)	71.67 (2.53)	23.71 (0.91)
Fourth quintile	730.79 (1.78)	59.22 (1.96)	24.74 (0.87)	885.96 (2.67)	57.73 (2.55)	25.18 (1.17)	957.09 (3.23)	59.46 (2.89)	24.22 (1.25)	893.61 (2.43)	57.95 (2.62)	16.04 (0.74)	1400.96 (3.40)	86.89 (3.54)	31.82 (1.22)
Richest quintile	1653.46 (22.04)	57.79 (2.16)	31.02 (1.21)	1964.17 (30.12)	61.65 (3.44)	33.09 (2.00)	2055.05 (39.36)	51.73 (2.96)	29.31 (1.95)	1737.01 (17.75)	63.26 (3.02)	20.79 (1.05)	2787.75 (36.80)	80.52 (3.36)	36.66 (1.55)
Overall	685.35 (5.91)	50.41 (0.76)	18.70 (0.34)	826.38 (8.44)	48.61 (1.07)	18.88 (0.51)	882.43 (11.10)	45.90 (1.11)	18.06 (0.53)	692.88 (4.91)	49.37 (1.01)	12.03 (0.26)	1272.07 (10.67)	66.44 (1.23)	23.45 (0.46)

Notes: [1]Refers to populations quintiles of monthly per capita adult equivalent household consumption.

[2]Refers to monthly per capita adult equivalent household consumption in MYR. Real estimates for 2009, 2004, 1998 and 1993 had been adjusted to 2014 prices.

[3]Refer to monthly total household tobacco expenditure (unadjusted for adult equivalent scale) in MYR. Real estimates for 2009, 2004, 1998 and 1993 had been adjusted to 2014 prices.

[4]Refers to monthly per capita adult equivalent tobacco expenditure in MYR. Real estimates for 2009, 2004, 1998 and 1993 had been adjusted to 2014 prices.

The figures in parenthesis are standard error of the variable.

Table 5.4 Subpopulation analysis on per capita adult equivalent tobacco expenditure and tobacco share among tobacco-smoking household in Malaysia, 1993 to 2014.

Household Consumption Quintiles[1]	1993			1998			2004			2009			2014		
	Per capita consumption[2]	Per capita tobacco expenditure[3]	Tobacco share[4]	Per capita consumption[2]	Per capita tobacco expenditure[3]	Tobacco share[4]	Per capita consumption[2]	Per capita tobacco expenditure[3]	Tobacco share[4]	Per capita consumption[2]	Per capita tobacco expenditure[3]	Tobacco share[4]	Per capita consumption[2]	Per capita tobacco expenditure[3]	Tobacco share[4]
Poorest quintile	203.52 (1.30)	14.19 (0.37)	6.84 (0.17)	252.27 (2.22)	16.58 (0.61)	6.37 (0.21)	268.81 (2.65)	17.06 (0.72)	6.31 (0.24)	292.84 (2.33)	17.60 (0.50)	6.00 (0.15)	668.43 (17.05)	36.12 (1.75)	5.01 (0.15)
Second quintile	344.01 (1.01)	24.89 (0.65)	7.19 (0.18)	422.57 (1.58)	27.20 (0.90)	6.48 (0.22)	463.52 (2.01)	30.15 (1.17)	6.53 (0.26)	500.89 (1.86)	31.80 (0.99)	6.34 (0.19)	857.36 (12.29)	45.23 (1.61)	4.94 (0.14)
Middle quintile	494.04 (1.42)	35.85 (0.92)	7.22 (0.18)	603.15 (2.36)	37.23 (1.29)	6.17 (0.21)	663.97 (2.93)	44.30 (2.20)	6.68 (0.32)	705.26 (2.24)	47.15 (1.30)	6.70 (0.18)	1052.59 (16.79)	53.47 (1.74)	4.93 (0.13)
Fourth quintile	730.81 (2.62)	55.05 (1.57)	7.51 (0.21)	880.65 (4.33)	64.40 (2.26)	7.33 (0.26)	951.95 (4.95)	62.13 (2.40)	6.63 (0.27)	998.75 (4.47)	64.31 (2.17)	6.44 (0.21)	1345.83 (21.53)	60.71 (1.76)	4.60 (0.11)
Richest quintile	1593.97 (33.74)	86.09 (2.58)	6.23 (0.20)	1927.21 (54.80)	95.65 (4.87)	5.63 (0.20)	1980.31 (47.67)	92.68 (4.82)	5.21 (0.28)	1981.33 (36.80)	96.57 (3.26)	5.40 (0.19)	2156.07 (52.74)	66.36 (2.43)	3.46 (0.12)
Overall	603.37 (7.44)	39.51 (0.62)	7.03 (0.08)	743.15 (12.68)	44.43 (1.04)	6.41 (0.10)	811.36 (13.81)	47.01 (1.16)	6.32 (0.12)	867.04 (11.14)	50.14 (0.93)	6.19 (0.08)	1201.01 (13.75)	52.40 (0.83)	4.61 (0.06)

Notes: [1]Refers to populations quintiles of monthly per capita adult equivalent household consumption.

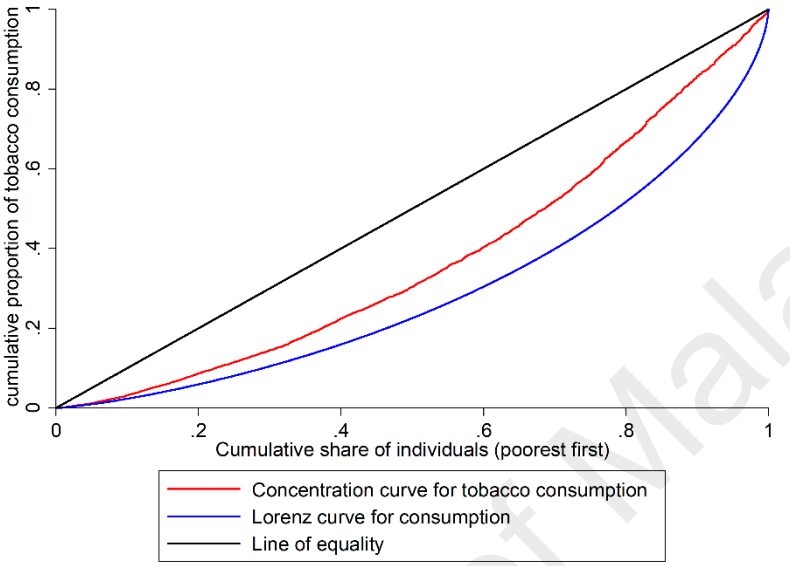
[2]Refers to monthly per capita adult equivalent household consumption in MYR. Real estimates for 2009, 2004, 1998 and 1993 had been adjusted to 2014 prices.

[3]Refers to monthly per capita adult equivalent tobacco expenditure in MYR. Real estimates for 2009, 2004, 1998 and 1993 had been adjusted to 2014 prices.

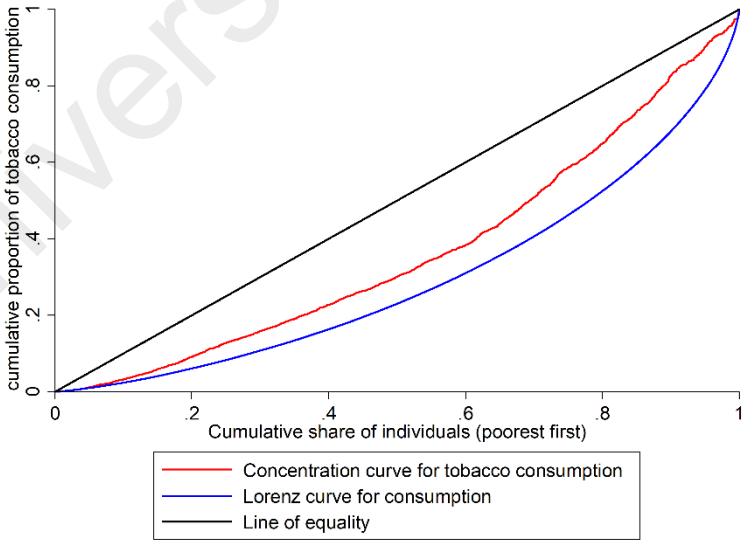
[4]Refers to the proportion of household tobacco expenditure from the total household consumption expenditures.

The figures in parenthesis are standard error of the variable.

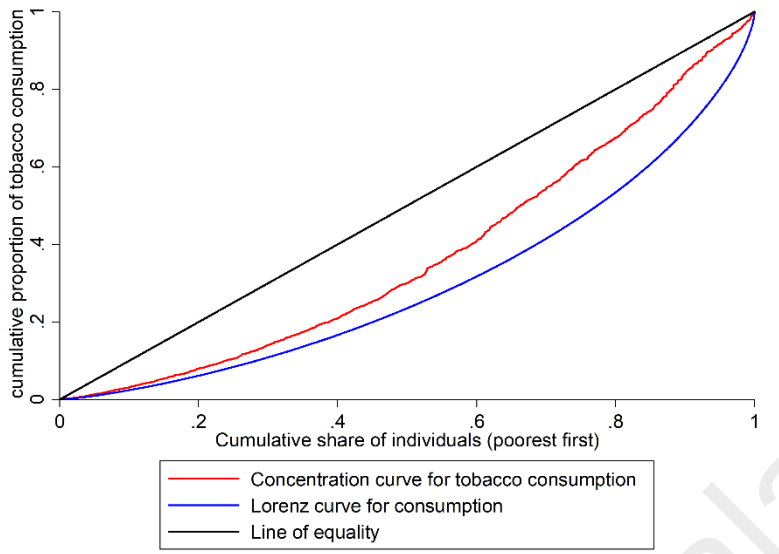
Figure 5.1 Concentration curves for per capita adult equivalent tobacco expenditure in Malaysia, 1993 to 2014



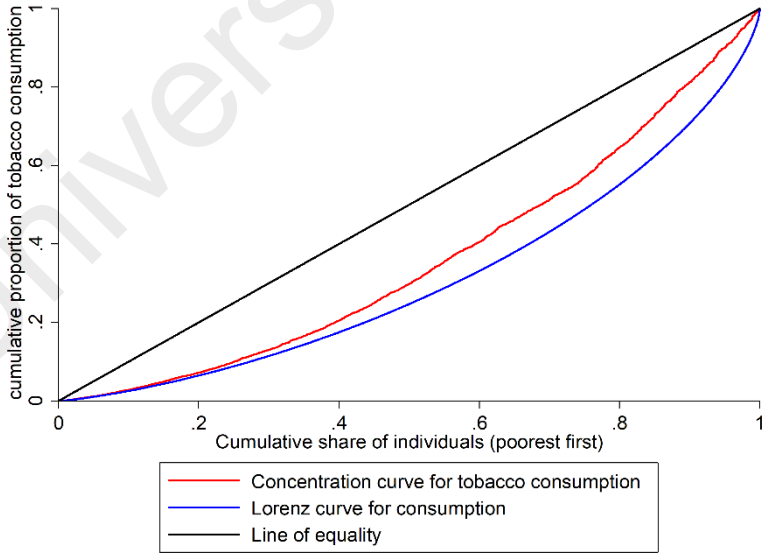
a. 1993



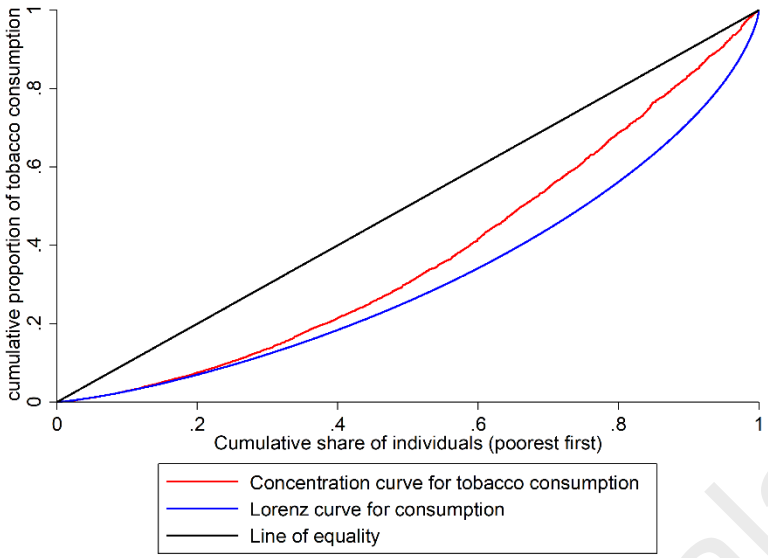
b. 1998



c. 2004



d. 2009



e. 2014

Table 5.5 Concentration indices for tobacco expenditure in Malaysia, 1993 to 2014

Year	Overall	
	Concentration index	95% CI
1993	0.2058	(0.1866, 0.2250)
1998	0.2204	(0.1895, 0.2514)
2004	0.2144	(0.1862, 0.2426)
2009	0.2593	(0.2340, 0.2846)
2014	0.2563	(0.2343, 0.2782)

Another measure utilised to assess the tobacco expenditure in the study is the tobacco expenditure share from total household consumption expenditures. From Figure 5.2, it is rather clear that the poorest quintile had the highest tobacco expenditure share compared to the rest of the quintiles from 1993 to 2014. In contrast, the richest quintile had been having the lowest tobacco expenditure share compared to the rest. This finding is in contrast to the actual amount spent by the richest in tobacco products either in household tobacco expenditure or per capita adult equivalent tobacco expenditure.

The trend of tobacco expenditure share between every quintile was rather persistent in every HES whereby the poorest quintile had the highest tobacco expenditure share of their household consumption expenditures and the tobacco expenditure share declines as it moves towards the richest end. This finding has indicated that the poorest quintile advocated a higher proportion of their available household monetary resource on tobacco products as compared to the richest quintile. This condition could be detrimental in the long-term under a constrained household budget. Overall, the tobacco expenditure share for every quintile seems to reduce from 1993 to 2014 which is contradictory to the actual tobacco expenditure for the same duration.

In Table 5.6, it is clear that the tobacco expenditure share for the overall population in Malaysia had declined from 3.33 in 1993 to 2.06 in 2014 which indicates that the money used for tobacco products had been reduced relative to the household income in Malaysia. Nonetheless, this contradicts with the increasing actual tobacco expenditure as well as the increasing prevalence of tobacco-smoking.

When stratified by living standards, the poorest quintile had higher tobacco expenditure share in 1993 and 1998, but the trend changes as the middle quintile gradually picked up and

had the highest tobacco share compared to the rest in 2004, 2009 and 2014. By region in Malaysia, the tobacco expenditure share had been higher in Peninsular Malaysia followed by Sabah and Labuan and lastly Sarawak. As for urban-rural stratum, the rural tobacco smokers seemed to allocate higher proportion of their money in tobacco products compared to their urban counterparts from 1993 to 2014.

Compared between ethnicities, *Bumiputera* Malays have been allocating a higher proportion of their household consumption expenditures to tobacco products compared to Chinese and Indians; however, the tobacco expenditure share has been declining from 1993 to 2014 for all ethnicities. Overall, the tobacco expenditure share was low in Malaysia whereby the tobacco shares barely exceeded 5.00% of their total household expenditures consumption.

Figure 5.2 Tobacco shares from total household consumption expenditures by consumption quintiles in Malaysia, 1993 to 2014.

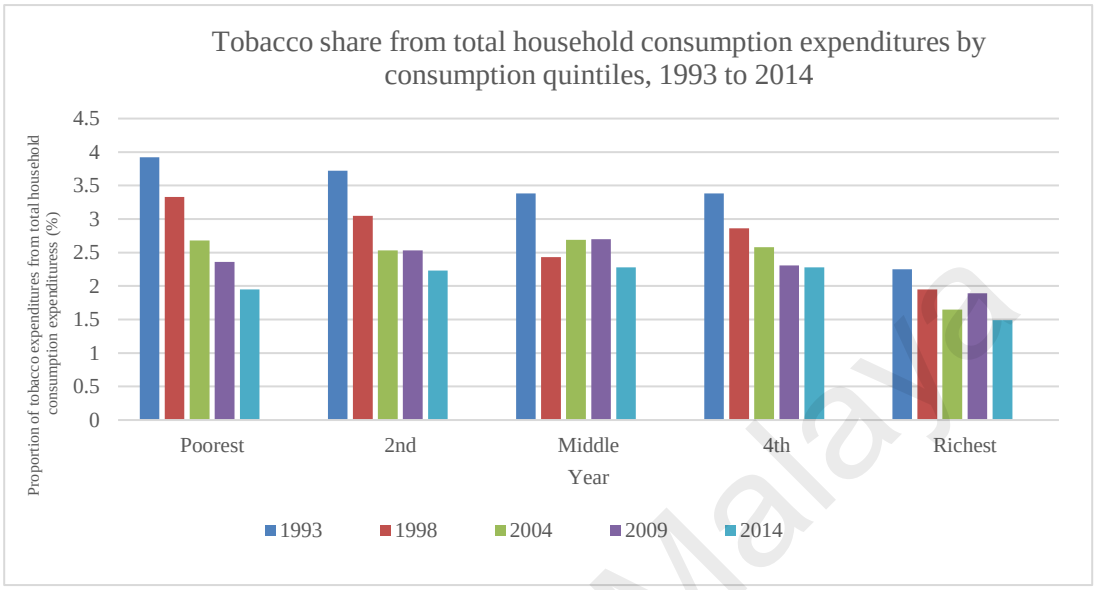


Table 5.6 Tobacco expenditure shares in Malaysia, 1993 to 2014

	Tobacco expenditure share from total household consumption expenditures				
	1993	**1998**	**2004**	**2009**	**2014**
Overall	3.33 (0.05)	2.73 (0.05)	2.43 (0.06)	2.35 (0.04)	2.06 (0.04)
By household consumption quintiles					
Poorest quintile	3.92 (0.12)	3.33 (0.14)	2.68 (0.13)	2.36 (0.08)	1.95 (0.07)
Second quintile	3.72 (0.12)	3.05 (0.13)	2.53 (0.13)	2.53 (0.10)	2.23 (0.09)
Middle quintile	3.38 (0.11)	2.43 (0.11)	2.69 (0.16)	2.70 (0.10)	2.36 (0.09)
Fourth quintile	3.38 (0.12)	2.86 (0.13)	2.58 (0.14)	2.31 (0.10)	2.28 (0.09)
Richest quintile	2.25 (0.09)	1.95 (0.09)	1.65 (0.11)	1.89 (0.09)	1.49 (0.06)
By regions in Malaysia					
Peninsular Malaysia	3.29 (0.06)	2.79 (0.06)	2.48 (0.07)	2.44 (0.05)	2.16 (0.04)
Sabah and Labuan	3.53 (0.15)	2.39 (0.13)	2.42 (0.15)	2.11 (0.10)	1.84 (0.09)
Sarawak	3.48 (0.14)	2.34 (0.14)	1.87 (0.14)	1.80 (0.11)	1.36 (0.05)
By urban-rural strata					
Urban	2.69 (0.06)	2.28 (0.07)	2.15 (0.08)	2.13 (0.05)	1.96 (0.04)
Rural	4.13 (0.08)	3.24 (0.09)	2.97 (0.09)	2.83 (0.07)	2.42 (0.06)
By ethnicity					
Bumiputera[1]				2.36 (0.05)	2.15 (0.04)
Malays	3.85 (0.08)	2.90 (0.08)	2.50 (0.08)		
Non-Malays	3.69 (0.16)	2.37 (0.16)	1.98 (0.16)		
Non *Bumiputera*					1.93 (0.07)
Chinese	2.22 (0.08)	2.03 (0.08)	1.87 (0.13)	1.72 (0.07)	
Indians	2.23 (0.14)	1.94 (0.17)	1.68 (0.17)	2.11 (0.16)	
Others	5.22 (0.27)	5.93 (0.35)	5.97 (0.38)	4.87 (0.27)	

Note: [1] *Bumiputera* is a Malaysian term to describe Malays and other indigenous peoples of Southeast Asia, i.e. the Malay world, used similarly as in Indonesia and Brunei.

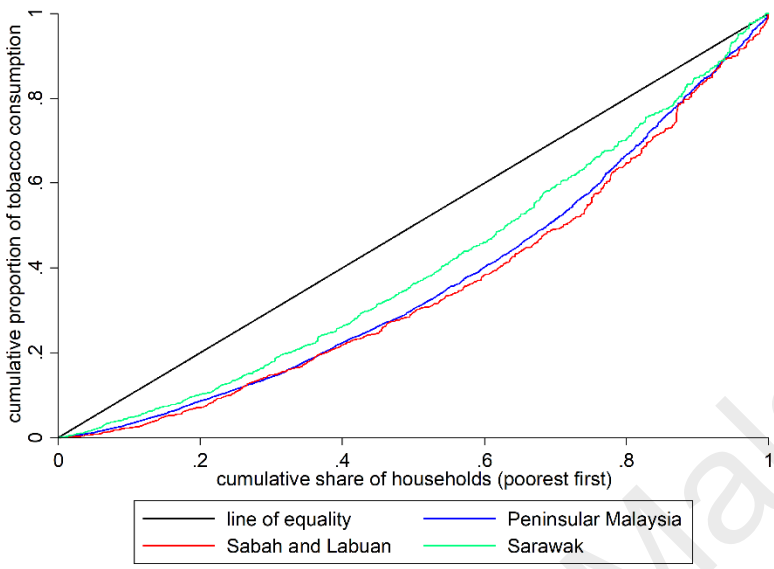
The figures in parenthesis are standard error of the variable.

5.3.2 Distribution of tobacco expenditure by regions in Malaysia, 1993 to 2014

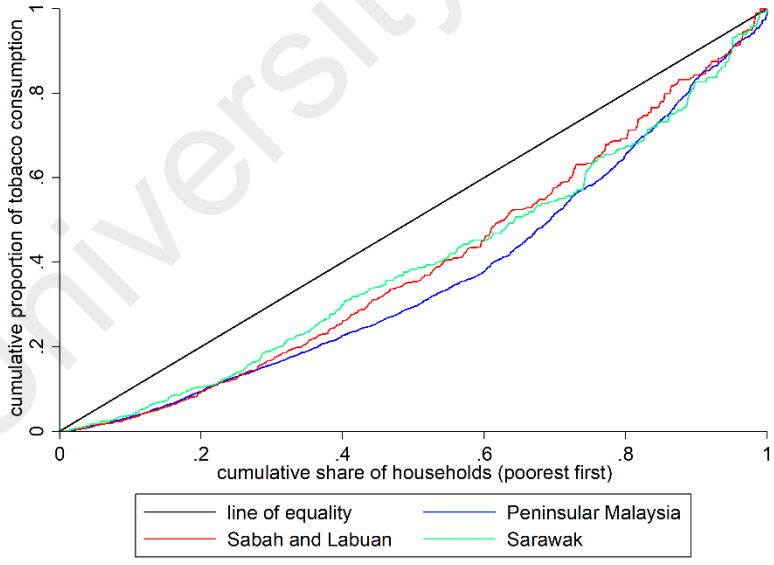
From all of the concentration curves, the per capita adult equivalent tobacco expenditure has been on the positive side. Although all regions in Malaysia had their concentration indices positive, Peninsular Malaysia had higher indices which implies the inequality of per capita adult equivalent tobacco expenditure among the richest quintile was greater compared to other regions. Conversely, the inequality in per capita adult equivalent tobacco expenditure was lesser in Sabah and Labuan as their concentration indices are lower and approximate zero compared to Peninsular Malaysia and Sarawak.

As for tobacco expenditure shares, it has been higher in Peninsular Malaysia compared to Sarawak as well as Sabah and Labuan. One thing for sure is that the tobacco expenditure share for every region has been reducing from 1993 to 2014 and the trends were similar for the three regions in Malaysia. In 2014, Sarawak had the lowest tobacco expenditure share at 1.36 compared to the rest. In short, tobacco-smoking households in both of the three regions did not spend an enormous amount of their available finds to purchase tobacco products.

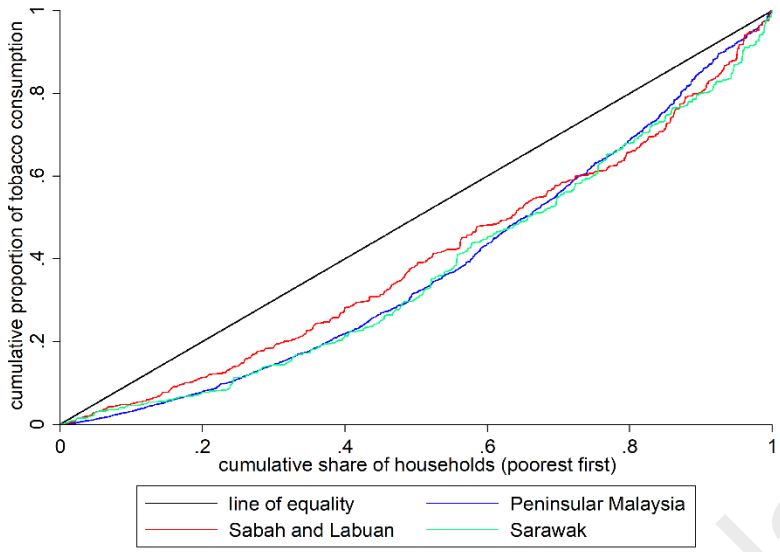
Figure 5.3 Concentration curves for per capita adult equivalent tobacco expenditure by regions in Malaysia, 1993 to 2014



a. 1993

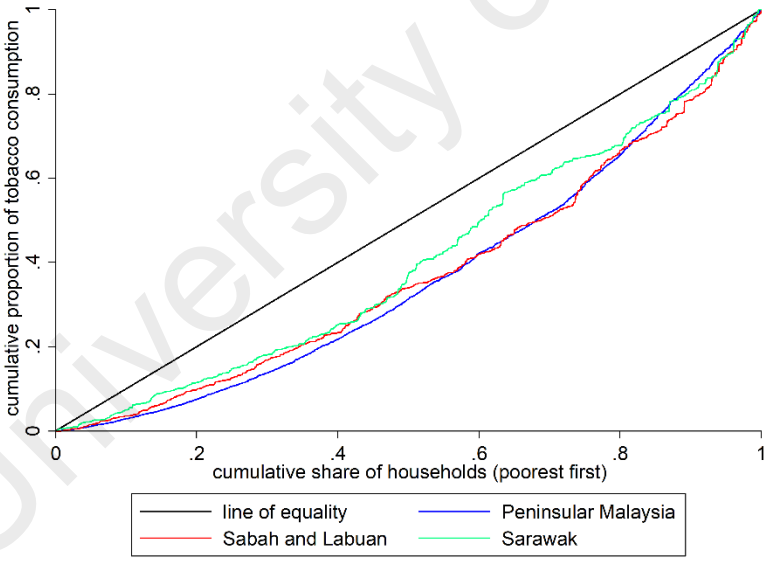


b. 1998

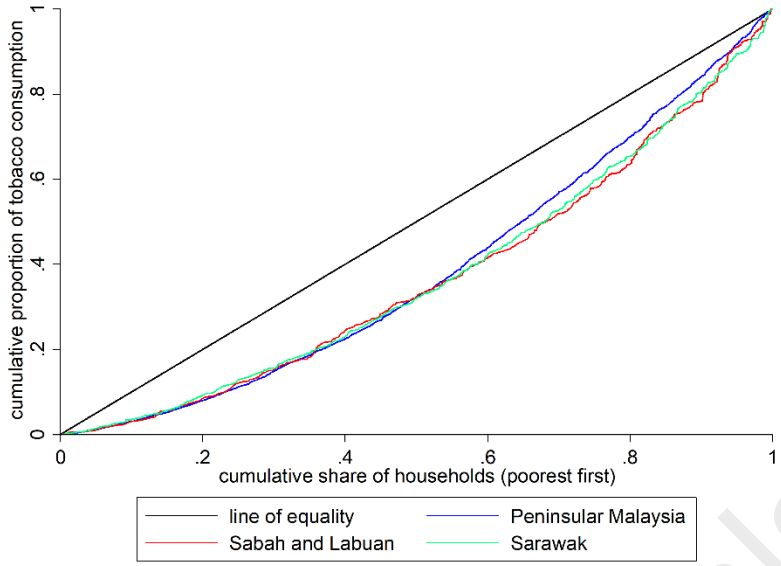


c. 2004

i.



d. 2009

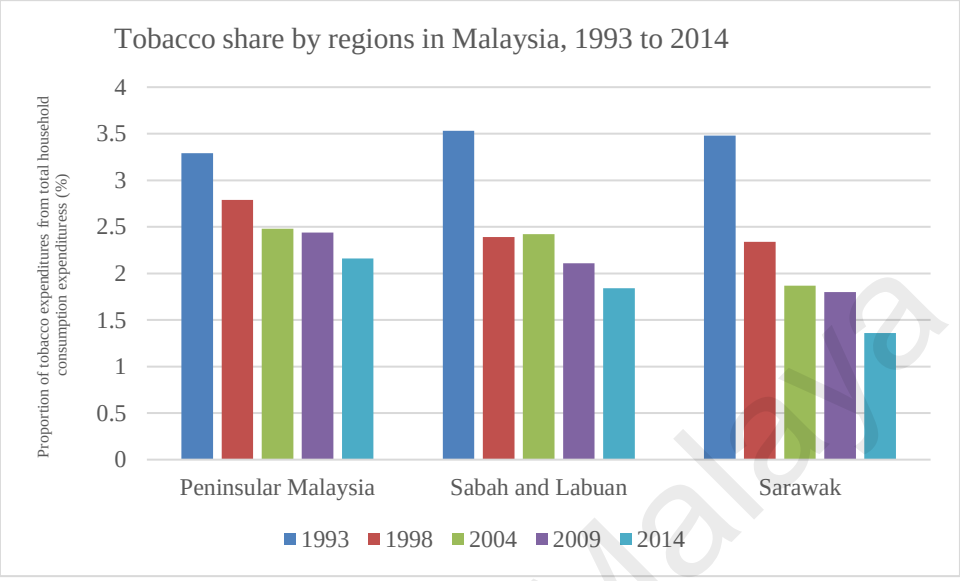


e. 2014

Table 5.7 Concentration indices by regions in Malaysia, 1993 to 2014

Year	Peninsular Malaysia		Sabah & Labuan		Sarawak	
	Concentration index	95% CI	Concentration index	95% CI	Concentration index	95% CI
1993	0.2069	(0.1845, 0.2294)	0.1787	(0.1385, 0.2189)	0.1795	(0.1245, 0.2345)
1998	0.2325	(0.1960, 0.2689)	0.0763	(0.0343, 0.1183)	0.1772	(0.0916, 0.2627)
2004	0.2246	(0.1901, 0.2590)	0.0767	(0.0336, 0.1197)	0.1521	(0.0922, 0.2120)
2009	0.2825	(0.2509, 0.3140)	0.0898	(0.0549, 0.1247)	0.1010	(0.0520, 0.1500)
2014	0.2619	(0.2357, 0.2881)	0.1518	(0.1173, 0.1863)	0.1226	(0.0942, 0.1511)

Figure 5.4 Tobacco expenditure share by regions in Malaysia, 1993 to 2014.

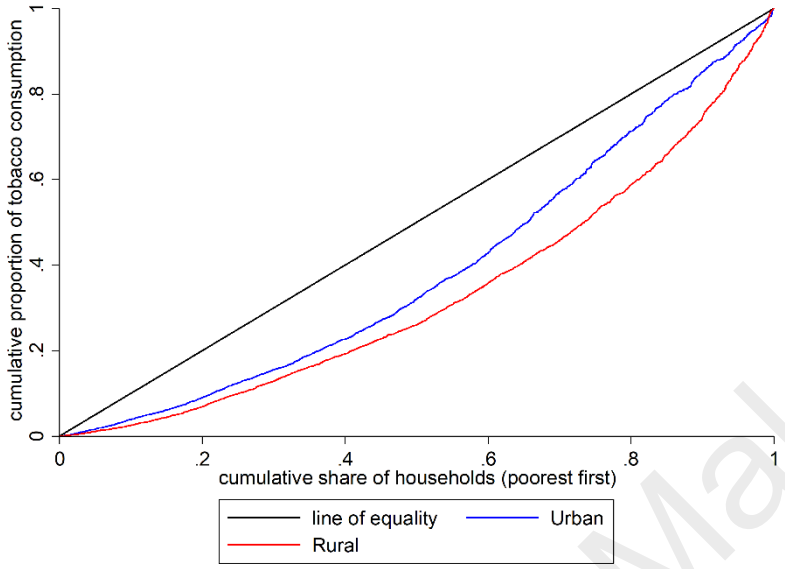


5.3.3 Distribution of tobacco expenditure by urban-rural stratum in Malaysia, 1993 to 2014

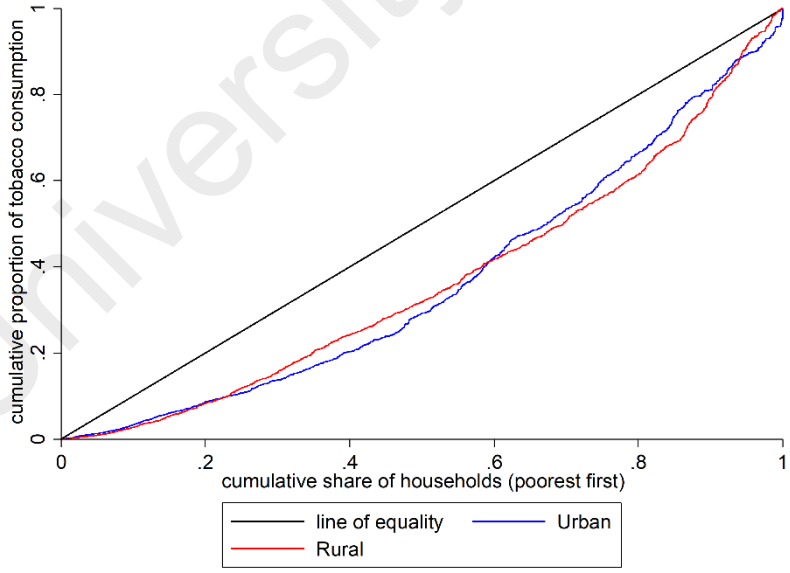
On average, the concentration indices in rural and urban strata were positive which shows that the richest quintile had unequally higher per capita adult equivalent tobacco expenditure in both of the strata. However, the magnitude of inequality in rural stratum was greater as the positive concentration indices in rural stratum were higher compared to urban stratum. Over a period of 21-years, the concentration indices for per capita adult equivalent tobacco expenditure in both strata had been fluctuating with no obvious reducing or increasing trend.

Not only did the rural stratum have higher concentration indices, the rural stratum was also found to have a higher tobacco expenditure share compared to their counterpart in urban stratum. Rural stratum had actually advocated a higher amount of their available monetary resources on tobacco products compared to urban stratum. Another situation leading to this finding could be due to their lower income amount which had magnified the relative proportion.

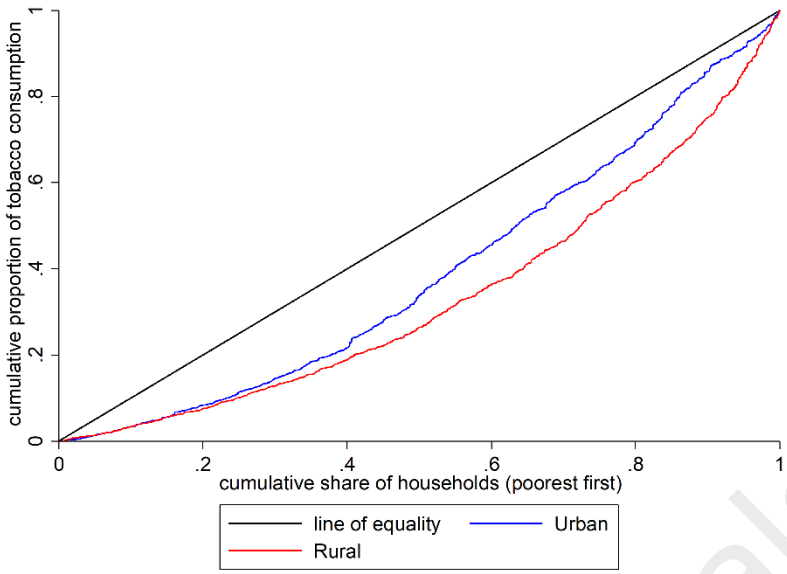
Figure 5.5 Concentration curves for per capita adult equivalent tobacco expenditure by urban-rural stratum in Malaysia, 1993 to 2014



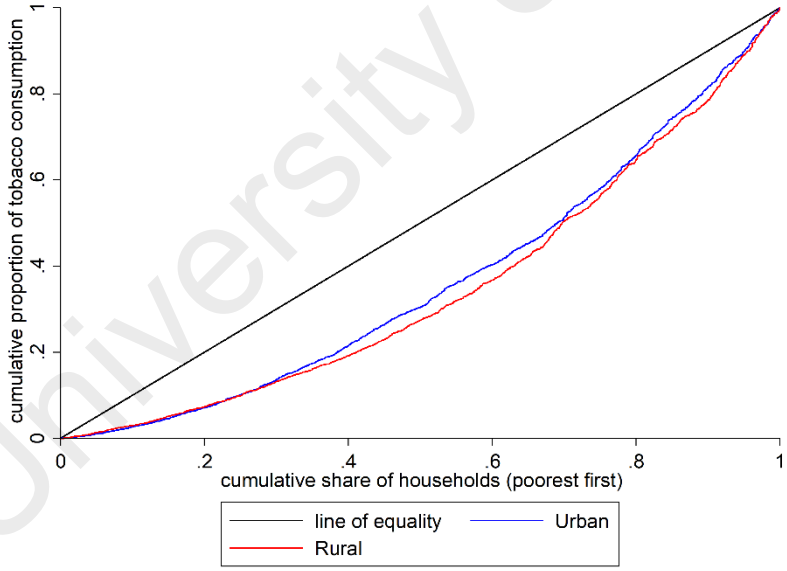
a. 1993



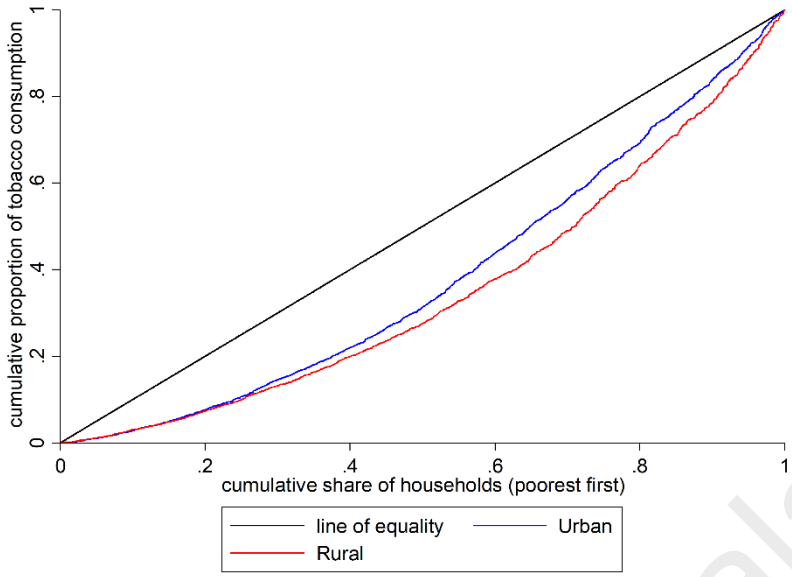
b. 1998



c. 2004



d. 2009



e. 2014

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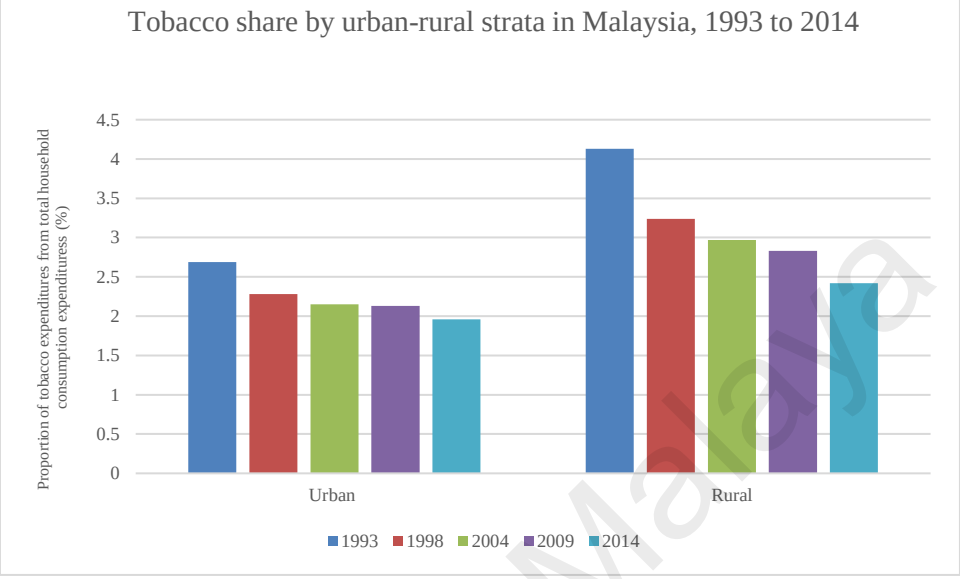
Table 5.8 Concentration indices by urban-rural stratum in Malaysia, 1993 to 2014

Year	Urban		Rural	
	Concentration index	95% CI	Concentration index	95% CI
1993	0.1796	(0.1536, 0.2056)	0.3524	(0.3160, 0.3887)
1998	0.2511	(0.2030, 0.2993)	0.2402	(0.2001, 0.2803)
2004	0.2044	(0.1678, 0.2411)	0.3273	(0.2796, 0.3751)
2009	0.2718	(0.2384, 0.3051)	0.2950	(0.2569, 0.3331)
2014	0.2574	(0.2312, 0.2836)	0.3184	(0.2729, 0.3639)

Figure 5.6 Tobacco expenditure share by urban-rural stratum in Malaysia, 1993 to 2014.



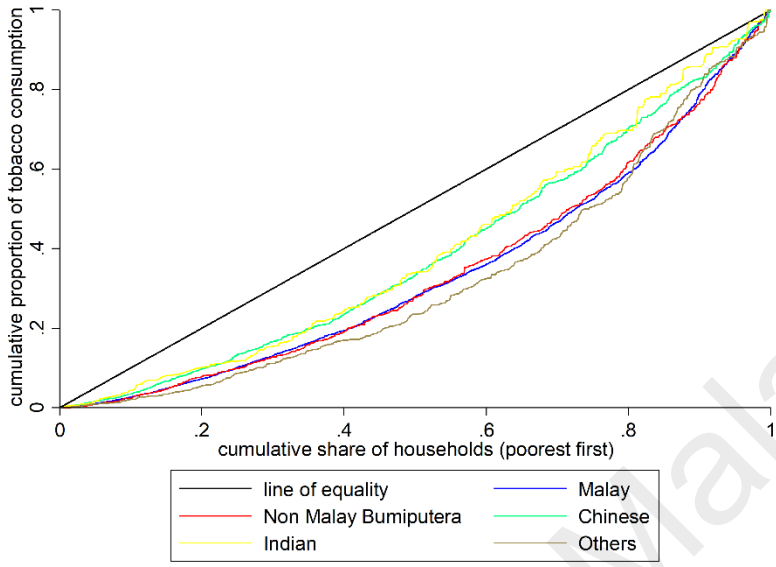
5.3.4 Distribution of tobacco expenditure by ethnicity in Malaysia, 1993 – 2014

In the analysis for distribution of tobacco expenditure, various ethnic categories were used in this chapter due to various categories of data provided by DOS. From 1993 to 2004, the ethnicity was analysed in the breakdown of *Bumiputera* Malays, *Bumiputera* non-Malays, Chinese, Indians and others. For 2010, the ethnicity was analysed according to the breakdown of *Bumiputera*, Chinese, Indians and others. Lastly, the analysis of ethnicity in 2014 was either *Bumiputera* or non-*Bumiputera.*

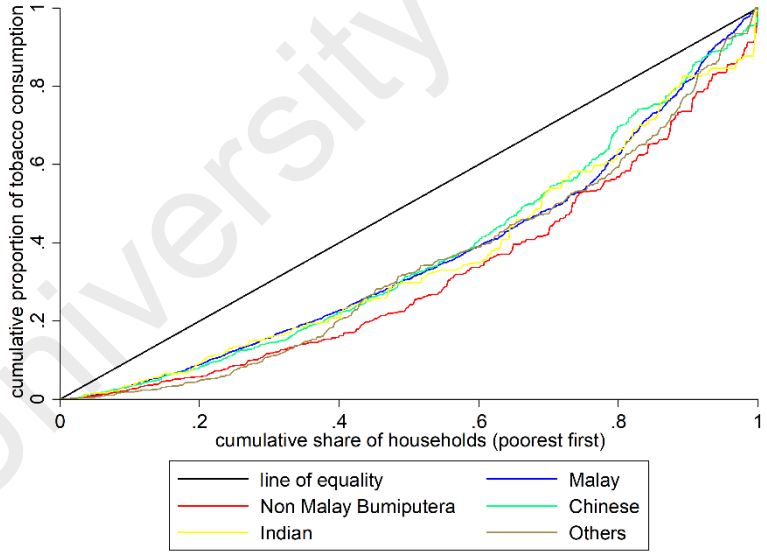
From the concentration curves, it was evident that all curves were below the line of equality for all ethnicities from 1993 to 2004. This indicates that the richest quintile was paying a higher amount of tobacco expenditure compared to the poorest quintile irrespective of ethnicity. For 2009 and 2014, a similar condition was also observed even though the ethnicity groups were combined into two major groups, namely *Bumiputera* and non-*Bumiputera.* There is no definite trend in concentration indices as the indices have been fluctuating throughout the years.

Referring back to Table 5.6 on tobacco expenditure shares, the *Bumiputera* Malays and *Bumiputera* non-Malays had been advocating a higher proportion of their available monetary resources on tobacco products compared to other ethnicities. In 2014, the *Bumiputera* were also found to have a higher tobacco expenditure share compared to non-*Bumiputera.* Otherwise, the trend of tobacco expenditure share has been reducing from 1993 to 2014 irrespective of ethnicity which indicates that lesser money was allocated to purchase tobacco products

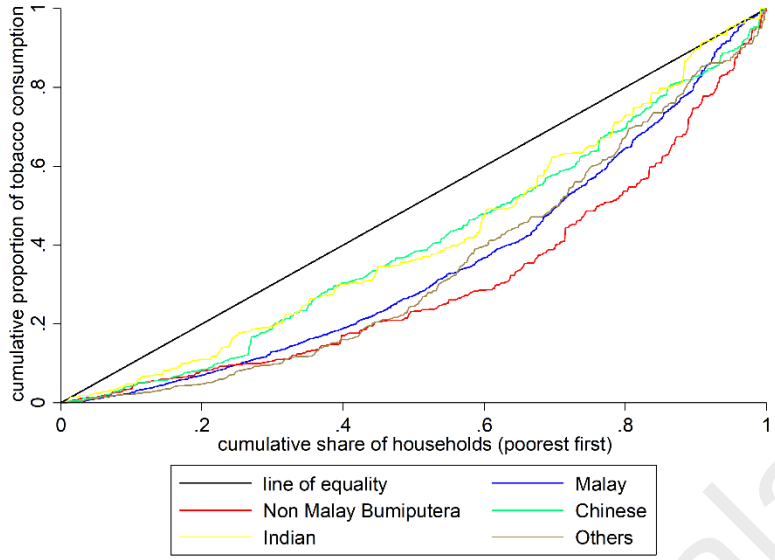
Figure 5.7 Concentration curves for per capita adult equivalent tobacco expenditure by ethnicity in Malaysia, 1993 to 2014



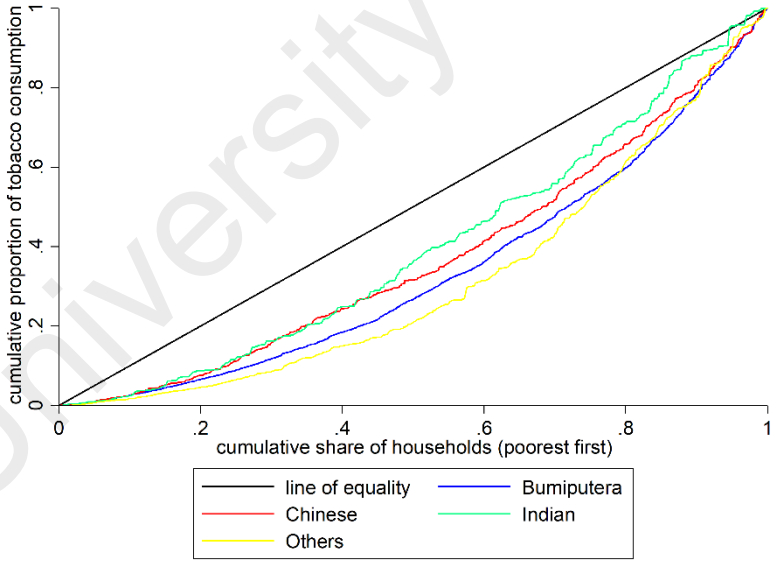
a. 1993



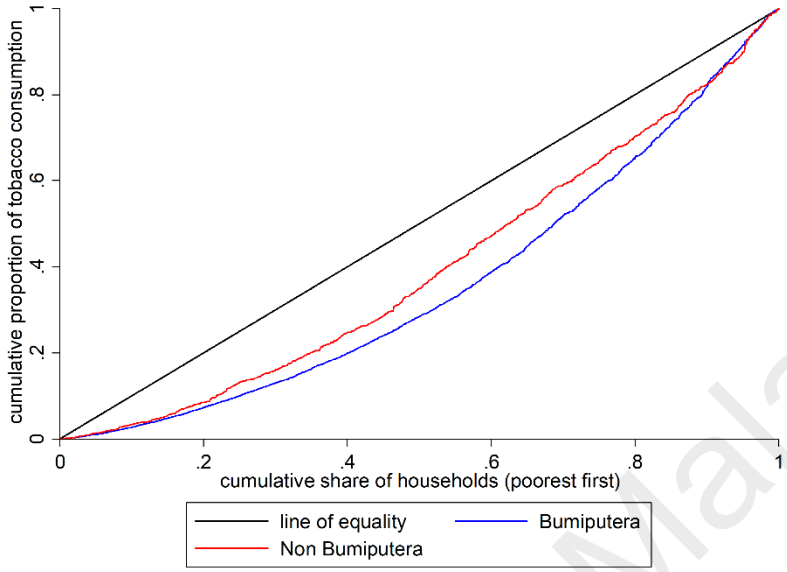
b. 1998



c. 2004



d. 2009



e. 2014

Table 5.9 Concentration indices by ethnicity in Malaysia, 1993 to 2014

Year	*Bumiputera* Malays		*Bumiputera* Non-Malays		Chinese		Indians		Others	
	Concentration index	95% CI	Concentration index	95% CI	Concentration index	95% CI	Concentration index	95% CI	Concentration index	95% CI
1993	0.2740	(0.2426, 0.3053)	0.2743	(0.2220, 0.3266)	0.1953	(0.1538, 0.2368)	0.1128	(0.0533, 0.1724)	0.4882	(0.3592, 0.6173)
1998	0.1999	(0.1662, 0.2337)	0.2008	(0.1323, 0.2693)	0.3250	(0.2289, 0.4212)	0.1533	(0.0667, 0.2399)	0.5018	(0.3385, 0.6651)
2004	0.2636	(0.2198, 0.3074)	0.2362	(0.1532, 0.3192)	0.1818	(0.1083, 0.2553)	0.1063	(0.0143, 0.1983)	0.4616	(0.2769, 0.6464)
2009	0.2871[1]	(0.2525, 0.3218)			0.2802	(0.2215, 0.3389)	0.1880	(0.0766, 0.2994)	0.6235	(0.4702, 0.7769)
2014	0.2750[1]	(0.0237, 0.0420)			0.2333[2]	(0.1962, 0.2703)				

Note: [1] Representing *Bumiputera* Malays and *Bumiputera* non-Malay

[2] Representing Chinese, Indian and others in combination.

5.4 Summary

Tobacco expenditure is another relevant measurement of tobacco usage other than prevalence of tobacco-smoking. Tobacco expenditure can be presented either as actual quantum or its relative proportion from total household consumption expenditures. In this chapter, the distribution of tobacco expenditure has been assessed by various variables, such as living standards, region in Malaysia, urban-rural stratum and ethnicity. This is done in view of the different tobacco-smoking prevalence in previous studies in Malaysia by the various sociodemographic characteristics. To improve the variable of tobacco expenditure, it has been adjusted with an adult equivalent scale to increase its accuracy.

Overall, the proportion of households with tobacco expenditure has been more than 40.00% in Malaysia. The proportion was declining from 1993 to 2009 and rebound in 2014. Across an ascending living standard, the richest quintile households have been the lowest in proportion of households with tobacco expenditure from 1993 to 2014; yet, the middle and second quintile have been gradually becoming the major group in the households with tobacco-smoking from 2004 until 2014. In relation to this, the proportion of households with tobacco expenditure in both the middle and second quintiles has exceeded the poorest quintile from 2009 onwards. In short, the middle-income population in Malaysia is emerging as the majority in the tobacco-smoking household.

The concentration indices were all on the positive side either at the national level or stratified by region, urban-rural stratum and ethnicity. These indicate that tobacco expenditure by actual quantum was more concentrated among the higher income population in Malaysia. One point to note is that the concentration indices were higher for rural stratum compared to urban stratum. By region in Malaysia, we noticed that concentration indices in

Sabah and Sarawak were approximating zero compared to Peninsular Malaysia. In a nutshell, the concentration indices of tobacco expenditure show that the actual quantum of tobacco expenditure was more concentrated in the higher income group.

In general, Malaysian tobacco-smoking households have been advocating approximately 2.00% to 3.00% of their total household expenditures on tobacco products which is relatively low for a country with high tobacco burden especially among the adult male population. By living standards, the poorer quintile allocated a higher proportion of their total household consumption expenditures on tobacco products from 1993 to 1998. Nonetheless, the middle quintile gradually increased their tobacco expenditure share from 2004 onward. Despite being the highest in per capita adult equivalent tobacco expenditure, the richest quintile indeed spent a relatively smaller proportion of their total household consumption expenditures on tobacco products. In summary, the middle-income group has gradually spent more of their available monetary resources on tobacco products as they gradually dominate the tobacco-smoking in Malaysia.

In the sub-populational analysis among tobacco-smoking households, the monthly per capita adult equivalent tobacco expenditure had increased from 1993 to 2014 and the increase was observed in all quintiles. On the other hand, the tobacco expenditure share of the total household consumption expenditures had declined from 7.00% in 1993 to 4.6% in 2014 which shows that less monetary resources were allocated to purchase the tobacco product compared to the increase in their income.

In conclusion, the middle-income group is becoming the major consumer of tobacco-smoking while the richest quintile remained as the highest in actual quantum of tobacco expenditure. As for tobacco expenditure share, the poorest quintile advocated a higher

proportion of their available monetary resources on tobacco products compared to the other quintiles. In addition, less money resource from their total household consumption expenditures was allocated for tobacco products.

CHAPTER 6: IMPOVERISHMENT ATTRIBUTED TO HOUSEHOLD TOBACCO EXPENDITURE

6.1 Introduction

This chapter examines the impoverishment attributed to household tobacco expenditure. Most of the time, medical impoverishment due to tobacco-related illnesses is usually estimated from healthcare related costs on tobacco-related illnesses. Other than medical impoverishment due to tobacco-related illnesses, the impoverishment attributed to tobacco-smoking can also be caused by direct tobacco expenditure. In Malaysia, this piece of information is relatively scarce; yet, it is crucial to highlight possible impoverishment attributed to tobacco expenditure among households in Malaysia as the nation is aiming to eradicate poverty (Hum, 2016).

Other than indirect cost due to healthcare on tobacco-related illnesses, direct tobacco expenditure was also found to increase the incidence of poverty in China and India (R. M. John et al., 2011; Liu et al., 2006). For example, direct tobacco expenditure was found to impoverish approximately 2.3 million people in India (R. M. John et al., 2011). In China, direct tobacco expenditure increased the poverty headcount in China by almost 6.40% and 1.90% in urban and rural areas respectively (Liu et al., 2006). Hence, impoverishment caused by tobacco consumption is not purely due to increased medical costs but also due to direct purchase of tobacco products.

If the impoverishment from direct tobacco expenditure is left for long, there are various adverse impact that could arise from poverty. For instance, poverty may lead to child malnutrition, poor living environment, unemployment and reduced educational opportunities which in turn could reinforce a vicious cycle of poverty among poor families. In addition,

tobacco-smoking could result in poverty among lower socioeconomic groups via loss of earning due to tobacco-related illnesses and higher medical costs (WHO, 2004). To worsen the condition, tobacco related illnesses will further incur extra expenses on medical care if the tobacco-smoking persists. Hence, the already impoverished households will be pushed into an endless vicious cycle of poverty. In short, it would be important to explore the impoverishment attributed to direct tobacco expenditure as it may act synergistically with medical impoverishment due to tobacco-related illnesses to cause poverty among tobacco-smoking households.

The chapter begins with Section 7.2, which will describe the data sources and specifications used in the analysis. This section will also explain the concepts related to poverty as well as poverty line income in the chapter. The subsequent section contains the results on the increases in estimate of impoverishment caused by direct tobacco expenditure. Lastly, the chapter concludes with Section 7.4 which provides a summary of the findings.

6.2 Data and methods

6.2.1 Source of data and specifications

The data for the analysis in this chapter were obtained from the HES 1993/94, 1998/99, 2004/05, 2009/10 and 2014/15. The design, conduct and extent of the data captured in HES have been described in Section 4.2 of Chapter 4. The main aim of this chapter was to examine the increases in estimation of impoverishment caused by direct tobacco expenditure at the individual level. This is to precisely inform us on the number of individuals impoverished by direct tobacco expenditure. In relation to this, we used individual weight in the analysis to obtain number of individuals impoverished rather than number of households. The total household consumption expenditures will be compared against the poverty line income officially released by the Malaysian Government to determine whether the household was impoverished or not.

6.2.2 Methods

In this chapter, we used the poverty line income (PLI) released by the Malaysian Government to determine poverty levels. A repeated cross-sectional study utilizing datasets from HES by Department of Statistics, Malaysia was carried out to determine the impoverishment attributed to tobacco-smoking in every HES.

6.2.2.1 Defining poverty

Poverty is one of the main indicators indicating the well-being and progression of the population in any country worldwide. Poverty is easy to recognize, yet, its definition could

be challenging. In simple words, poverty is perceived as lack of sufficient money or means to survive. Poverty is essentially defined in terms relative to the society or country in which it is found. There are two broad concepts of poverty, namely relative poverty and absolute poverty. The most widely used absolute measurement is the incidence of poverty, which is the proportion of the population whose level of income falls below the poverty line.

Absolute poverty is defined as a condition in which the gross monthly income of a household is insufficient to purchase certain minimal necessities of life that have been measured on the basis of minimum expenditures level or the PLI. PLI is in turn defined as an income sufficient to purchase a minimum food basket to maintain household members in good nutritional health and other basic needs such as clothing and footwear, rent, fuel and power, transport and communications, healthcare, education and recreation. Relative poverty is defined as a condition where the household income is a certain percentage below median income. For instance, the threshold for relative poverty can be set at 50.0% of median income. In Malaysia, we do not use relative poverty but absolute poverty whereby poverty is defined as a condition in which the gross monthly income of the household is less than PLI. Hardcore poverty is defined as a condition in which the gross monthly income of the household is less than half of the PLI (EPU, 1999, 2002, 2004).

Using the appropriate poverty measurement is crucial to identify the poor and the hardcore poor in the country in order to assist policymakers in designing the appropriate interventions to reduce the incidence of poverty. On top of that, its measurement will enable objective comparison between countries as well as regions within a country. After appropriate intervention, the measurement of poverty can be used to gauge the effectiveness of the

intervention for further improvement. In a nutshell, poverty measurement is essential in improving the population well-being and quality of life in the country.

6.2.2.2 Poverty line income and its development

The official Malaysian poverty line was introduced by the Economic Planning Unit (EPU), Malaysia in 1977 (EPU, 1999, 2002, 2004). The initial PLI introduced in 1977 was based on the estimated minimum household monthly income required to purchase food and certain non-food items sufficient for the basic needs of a five-persons reference household of two adults and three children. The food components included the monthly cost required to purchase a basket of food items necessary for the nutritional needs of all 5 household members. The non-food component included the estimated minimum monthly expenses required for clothing, footwear, housing rental amount, fuel and power, furniture and household equipment, transportation and communication, recreation, education, cultural services and healthcare services.

Since 1977, the poverty line aforementioned had been adjusted annually for inflation using annual consumer price index (CPI) and for the changing average household sizes. The use of the 1977 poverty line income certainly has some drawbacks. One of the main drawbacks was that the PLI was uniformly applied to households in all regions in Malaysia, namely Peninsular Malaysia, Sabah and Sarawak regardless of their household size as well as their adult-to-child ratio. Using the 1977 PLI formula, any household regardless of their household size and composition would be classified as poor if their monthly income fell below the PLI. An important example would be a large household composed of more than five members with household income just above the PLI would be classified as non-poor,

yet, average household resources would probably not be sufficient to cater to the basic needs for each of the household members. In a similar condition, a household with two household members with household income just below PLI would be classified as poor, however, the available resources for the two household members were certainly more than the aforementioned non-poor household. In addition, the PLI also does not account for differences in prices of goods and services between urban and rural areas in the country.

In 2005, the EPU has revised the methodology to estimate household PLI. The revised methodology accounts for household size, household composition by age and gender as well as household location by state and strata. On similar basis, the revised poverty lines are also based on food and non-food components but the new poverty lines are customized to each household based on the needs of its members and the spatial pricing differences. On top of that, the nutritional need under the new poverty line was based on advice from nutritionists and the calories requirement differed by sex. In short, the new poverty line aims to provide accurate estimate of poverty rate in Malaysia.

6.2.2.3 Comparison of PLI

The PLI constructed in 1977 was based on the estimated minimum household monthly income required to purchase food and certain non-food items sufficient for the basic needs of a five-persons reference household of two adults and three children. The PLI constructed in 2005 was also based on food and non-food components but the new PLI are customized to each household based on the needs of its members accounting for its household size, composition by age and gender as well as household location by state and strata.

Both of the PLIs accounted for food components as aforementioned. The PLI in 1977 included the monthly cost required to purchase a basket of food items necessary for the nutritional needs of all five household members. On the other hand, the PLI in 2005 was based on the nutritional need recommended and advised by the nutritionists and the calories requirement differed by sex. On the contrary, the nutritional requirement under the PLI 1977 was not sex specific which lacked precision in its estimation. Another evident difference between the PLI 1977 and 2005 is the latter PLI accounted for spatial price difference due to differential pricing in different regions and states within Malaysia.

6.2.2.4 Description of Variables

In this chapter, the main variable of interest is the poverty headcount. The poverty headcount is a measure of incidence of poverty. There are two main poverty headcounts in this chapter, namely poverty headcount before tobacco expenditure (pre-expenditures) and after tobacco expenditure (post-expenditures). The pre-expenditures poverty headcount is the poverty headcount using the per capita household consumption expenditures. As for the post-expenditure poverty headcount, it is the poverty headcount after deducting the per capita household consumption expenditures with per capita tobacco expenditure. The difference between post-expenditures poverty headcount and the pre-expenditures poverty headcount is the increases in estimate attributed to tobacco expenditure.

We utilised poverty line income officially released by the Economic Planning Unit, Malaysian Government to estimate the increases in estimate of impoverishment attributed to direct tobacco expenditure. To further improve the results, the PLI is converted into individual PLI to accommodate our per capita household consumption expenditures. To

obtain individual PLI, the pre-determined PLI for every state was adjusted with the mean of household members. Using the adjusted PLI, we determined whether the individual in the household was impoverished or not. The household and individual PLIs are summarized in Table 7.1.

A person in the household is considered poor if his or her per capita consumption expenditures falls below the individual PLI. Household and individual PLIs are distinct between different regions in Malaysia, namely Peninsular Malaysia, Sabah and Labuan and lastly Sarawak. Using the individual PLI, we determined the poverty headcount which is the total number of persons with adult equivalent per capita consumption expenditures falling below the individual PLI.

Table 6.1 Household PLI in Malaysia, in 1993, 1998, 2004, 2009 and 2014.

Regions / Year	1993	1999	2004	2009	2014
Peninsular Malaysia	405	510	661	763	930
Sabah and Labuan	582	685	888	1048	1170
Sarawak	495	584	765	912	990

Note: All values are nominal value in MYR.

Source: Information obtained from Economic Planning Unit, Malaysia.

Table 6.2 Individual PLI in Malaysia, at 1993, 1998, 2004, 2009 and 2014.

Regions / Year	1993	1999	2004	2009	2014
Peninsular Malaysia	84.38	107.17	150.23	187.86	224.30
Sabah and Labuan	114.12	136.12	170.77	211.72	234.00
Sarawak	96.47	119.17	166.30	207.27	225.00

Note: All values are nominal value in MYR.

Taking into account the variability of ethnicity, all major ethnicities in Malaysia, namely Malay *Bumiputra*, non-Malay *Bumiputra*, Chinese, Indian and others were included. Nonetheless, the analysis was done in aggregate of *Bumiputra* and non-*Bumiputra* in HES 2009/10 and 2014/15 because the data provided by HES was an aggregate of both *Bumiputra* and non-*Bumiputra*. Urban-rural stratum include either urban or rural stratum. The definition of urban and rural stratum was mentioned in Section 4.2.1 of Chapter 4.

Malaysia is an upper middle-income country made up of 13 states and three Federal Territories. The states include Perlis, Kedah. Perak, Selangor, Negeri Seremban, Melaka, Johor, Pahang, Kelantan and Terengganu located in Peninsular Malaysia while Sabah and Sarawak are located in the Borneo Island. The 3 Federal Territories include Kuala Lumpur and Putrajaya in Peninsular Malaysia and Labuan in the Borneo Island. In this analysis, Malaysia is divided into three main regions, namely the Peninsular Malaysia, Sabah and Labuan, and Sarawak.

6.2.3 Statistical analysis

STATA version 14 was used for statistical analysis in this chapter. In the analysis, we employed survey setting using individual weight as the analysis is at the individual level. Firstly, the pre-tobacco per capita consumption expenditures would be assessed using individual PLI stratified by region, urban-rural stratum and ethnicity in Malaysia to yield number of individuals impoverished prior to tobacco expenditure. Then, the post-tobacco expenditure per capita consumption expenditures were assessed with the individual PLI to yield the number of individuals impoverished after tobacco expenditure. The increases in

estimate of impoverishment due to tobacco expenditure were yielded by deducting the pre-tobacco expenditure poverty headcount from the post-tobacco expenditure headcount.

6.3 Results

6.3.1 Impoverishment attributed to tobacco expenditure in Malaysia, 1993 to 2014

Poverty is one of the important indicators for the well-being of household members. In Malaysia, the overall poverty rate had gradually declined from 49.30% in 1970 to 0.40% in 2016(EPU, 2016). In this chapter, poverty is investigated with respect to tobacco expenditure. Table 6.3 shows the increase in estimate of poverty attributed to direct tobacco expenditure in Malaysia at 5 points of time, 1993, 1998, 2004, 2009 and 2014. Overall, the impoverishment from direct tobacco expenditure is persistently present at five points of time in Malaysia, however, the increases in estimate of impoverishment had reduced from 1.08% in 1993 to 0.01% in 2014. From the number of individuals impoverished by tobacco expenditure, there were 184,240 persons affected in 1993 which gradually reduced to 3,443 persons in 2014. In short, the number of individuals impoverished by tobacco expenditure has decreased enormously in Malaysia although the burden of tobacco-smoking is still huge.

6.3.2 Impoverishment attributed to tobacco expenditure by region in Malaysia, 1993 to 2014

There are 3 main regions in Malaysia, namely Peninsular Malaysia, Sabah and Labuan and lastly Sarawak, whereby each region utilises different PLI in view of distinct cost of living in the three regions. In the analysis of impoverishment due to tobacco expenditure, we also analysed by three regions in Malaysia to specifically examine the impoverishment due to tobacco expenditure in every region.

In Peninsular Malaysia, the increases in estimate of impoverishment due to tobacco expenditure is relatively small, ranging from 0% to 1.05%. In addition, the increases in

estimate of impoverishment had been declining from 1.05% in 1993 to 0% in 2014. On top of that, the number of individuals impoverished by tobacco expenditure had also been diminishing from 147,382 in 1993 to an almost negligible level in 2014. In Sarawak, the increases in estimate of impoverishment due to tobacco expenditure had also been small, whereby the increases in estimate was 1.28%, 0.37% and 1.06% in 1993, 1998 and 2004 respectively. The increases in estimate of impoverishment due to tobacco expenditure further fell to a negligible level in 2009 and 2014 for Sarawak. As compared to Peninsular Malaysia and Sarawak, the impoverishment due to tobacco expenditure in Sabah was slightly higher, ranging from 0.12% to 1.35%, though, it had been reducing from 1.35% in 1993 to 0.12% in 2014. At any point of time, the impoverishment due to tobacco expenditure had been higher in Sabah compared to Peninsular Malaysia and Sarawak.

In summary, the impoverishment due to direct tobacco expenditure is declining in every region of Malaysia.

Table 6.3 Increases in estimate of impoverishment attributed to tobacco expenditure in Malaysia, 1993 to 2014

Poverty headcount	1993		1998		2004		2009		2014	
	%	No. of individual	%	No. of individual	%	No. of individual	%	No. of individual	%	No. of individual
Pre-consumption headcount, H^{gross}	12.37	2,105,551	4.84	850,588	3.15	799,901	1.99	536,834	0.16	48,089
Post-consumption headcount, H^{net}	13.45	2,289,791	5.08	892,277	3.38	856,248	2.15	580,324	0.17	51,532
Increased in estimate, H^{net}-H^{gross}	1.08	184,240	0.24	41,689	0.23	56,347	0.16	43,490	0.01	3,443

Table 6.4 Increases in estimate of impoverishment attributed to tobacco expenditure by regions in Malaysia, 1993 to 2014

Poverty headcount	1993		1998		2004		2009		2014	
	%	No. of individual	%	No. of individual	%	No. of individual	%	No. of individual	%	No. of individual
PENINSULAR MALAYSIA										
Pre-consumption headcount, H^{gross}	9.91	1,397,495	2.59	375,038	0.68	137,118	0.22	46,162	0.00	-
Post-consumption headcount, H^{net}	10.96	1,544,877	2.81	406,415	0.76	153,657	0.27	57,705	0.00	-
Increases in estimate, H^{net}-H^{gross}	1.05	147,382	0.22	31,377	0.08	16,539	0.05	11,543	0.00	-
SABAH AND LABUAN*										
Pre-consumption headcount, H^{gross}	40.44	598,113	28.11	436,300	21.64	620,732	14.51	469,030	1.58	48,071
Post-consumption headcount, H^{net}	41.79	618,113	28.49	442,150	22.25	638,146	15.51	501,341	1.70	51,532
Increases in estimate, H^{net}-H^{gross}	1.35	20,000	0.38	5,850	0.61	17,414	1.00	32,311	0.12	3,461
SARAWAK										
Pre-consumption headcount, H^{gross}	7.67	110,826	2.54	38,645	1.99	44,322	0.99	23,730	0.00	-
Post-consumption headcount, H^{net}	8.95	129,393	2.91	44,220	3.05	68,012	0.99	23,730	0.00	-
Increases in estimate, H^{net}-H^{gross}	1.28	18,567	0.37	5,575	1.06	23,690	0.00	-	0.00	-

6.3.3 Increases in estimate of impoverishment attributed to tobacco expenditure by regions and urban-rural strata in Malaysia, 1993 to 2014

In Malaysia, the prevalence of tobacco-smoking differs between urban-rural stratum(H. K. Lim et al., 2013), hence, it would be important to examine the impoverishment due to tobacco expenditure between urban and rural stratum. Table 7.4 indicates the increases in estimate of impoverishment attributed to tobacco expenditure by urban-rural stratum in every region in Malaysia. In Peninsular Malaysia, the increases in estimate of impoverishment in rural stratum are bigger than the urban stratum. Additionally, the increases in estimate of impoverishment due to tobacco expenditure had gradually been reducing between 1993 and 2014 both in urban and rural strata. In 2014, none of the tobacco smokers was impoverished by tobacco expenditure in both urban and rural strata.

In Sabah, the increases in estimate of impoverishment due to tobacco expenditure also has similar trend whereby the impoverishment due to tobacco expenditure has been larger in rural stratum. On top of that, the impoverishment due to tobacco expenditure has also been reducing since 1993. In addition, the persons impoverished by tobacco expenditure in the rural stratum of Sabah had also decreased from 14,491 in 1993 to 3,472 in 2014. In Sarawak, the increases in estimate of impoverishment due to tobacco expenditure in urban stratum are less than in Peninsular Malaysia as well as Sabah and Labuan. The increases in estimate of impoverishment ranged between 0 and 0.40% in the urban stratum of Sarawak. Despite the fact that the increases in estimate of impoverishment attributed to tobacco expenditure of rural stratum in Sarawak were higher, the magnitude of impoverishment was still lower than in Peninsular Malaysia and Sarawak. By the number of persons impoverished, the impoverishment due to tobacco expenditure had been lower in Sarawak and the magnitude was almost negligible in 2009 and 2014 for both urban and rural strata.

In summary, the increases in estimate of impoverishment attributed to tobacco expenditure in rural stratum were generally higher than the urban stratum. Nonetheless, the increases in estimate of impoverishment attributed to tobacco expenditure had been reducing in both urban and rural strata.

Table 6.5 Increases in estimate of impoverishment attributed to tobacco expenditure by regions and urban-rural strata in Malaysia, 1993 to 2014.

Poverty headcount	1993		1998		2004		2009		2014	
	%	No. of individual	%	No. of individual	%	No. of individual	%	No. of individual	%	No. of individual
Peninsular Malaysia (Urban)										
Pre-consumption headcount, H^{gross}	3.54	280,096	0.77	59,005	0.27	37,424	0.17	24,877	0	-
Post-consumption headcount, H^{net}	4.19	331,682	0.83	63,909	0.27	37,430	0.17	24,877	0	-
Increases in estimate, H^{net}-H^{gross}	0.65	51,586	0.06	4,904	0.00	6	0	-	0	-
Peninsular Malaysia (Rural)										
Pre-consumption headcount, H^{gross}	18.13	1,119,385	4.67	316,479	1.56	99,789	0.33	21,301	0	-
Post-consumption headcount, H^{net}	19.68	1,215,255	5.05	342,779	1.82	116,353	0.51	32,836	0	-
Increases in estimate, H^{net}-H^{gross}	1.55	95,870	0.38	26,300	0.26	16,564	0.18	11,535	0	-
Sabah and Labuan (Urban)										
Pre-consumption headcount, H^{gross}	31.09	154,720	13.81	70,194	14.09	208,684	11.74	205,816	1.35	24,567
Post-consumption headcount, H^{net}	32.26	160,540	14.12	71,766	14.19	210,142	12.64	221,541	1.35	24,567
Increases in estimate, H^{net}-H^{gross}	1.17	5,820	0.31	1,572	0.10	1,458	0.90	15,725	0	-
Sabah and Labuan (Rural)										
Pre-consumption headcount, H^{gross}	45.19	443,861	35.07	366,133	29.65	411,378	17.78	263,211	1.95	23,520
Post-consumption headcount, H^{net}	46.67	458,352	35.43	369,883	30.81	427,424	18.92	280,093	2.23	26,992

Increases in estimate, H^{net}-H^{gross}	1.48	14,491	0.36	3,750	1.16	16,046	1.14	16,882	0.28	3,472
Sarawak (Urban)										
Pre-consumption headcount, H^{gross}	2.08	12,975	1.17	7,981	0	-	0.23	2,892	0	-
Post-consumption headcount, H^{net}	2.48	15,451	1.17	7,981	0	-	0.23	2,892	0	-
Increases in estimate H^{net}-H^{gross}	0.40	2,476	0	-	0	-	0	-	0	-
Sarawak (Rural)										
Pre-consumption headcount, H^{gross}	11.92	97,991	3.66	30,657	4.02	44,324	1.82	20,850	0	-
Post-consumption headcount, H^{net}	13.87	113,981	4.33	36,231	6.17	68,014	1.82	20,850	0	-
Increases in estimate, H^{net}-H^{gross}	1.95	15,990	0.67	5,574	2.15	23,690	0	-	0	-

6.3.4 Increases in estimate of impoverishment attributed to tobacco expenditure by ethnicity in Malaysia, 1993 to 2014

Besides urban-rural strata, the prevalence of tobacco-smoking also differs by ethnicity in Malaysia (H. K. Lim et al., 2013; NHMS, 2015). Consequently, it is crucial to explore the increases in impoverishment due to direct tobacco expenditure by ethnicity to assist policymakers in formulating a tobacco control policy. Table 7.5 indicates the increases in estimate of impoverishment attributed to tobacco expenditure by urban-rural stratum in every ethnicity in Malaysia. In 1993, 1998 and 2004, the impoverishment due to tobacco expenditure was analysed by specific ethnicity, namely *Bumiputera* Malay, *Bumiputera* non-Malay, Chinese, Indian and others. However, the grouping of ethnicity was distinct in 2009 whereby both the *Bumiputera* Malay and *Bumiputera* non-Malay were collectively combined in a group classified as *Bumiputera*. In 2014, the ethnicity also differed as there were only two main groups, namely *Bumiputera* and non-*Bumiputera*, whereby the latter was inclusive of Chinese, Indian and others.

In 1993, 1998 and 2004, the increase in estimate of impoverishment due to tobacco expenditure had been persistently higher in *Bumiputera* non-Malays compared to *Bumiputera* Malays, Chinese and Indians. Another interesting finding is the increases in estimate of impoverishment due to the fact that tobacco expenditure was very small in Chinese ethnicity and the increase was almost negligible in 1998, 2004 and 2009, and this finding is in line with the lowest prevalence of tobacco-smoking in Chinese (H. K. Lim et al., 2013). In 2014, the increases in estimate of impoverishment due to direct tobacco expenditure was almost negligible both for *Bumiputera* and non-*Bumiputera*.

In summary, the increase in estimates of impoverishment attributed to direct tobacco expenditure in *Bumiputera* Malays were generally higher than the other ethnicities in 1993, 1998 and 2004. Nonetheless, the poverty impact attributed to tobacco expenditure reduced to a negligible level in 2009 and 2014.

Table 6.6 Increases in estimate attributed to tobacco expenditure by ethnicity in Malaysia, 1993 to 2014

Poverty headcount	1993		1998		2004		2009		2014	
	%	No. of individual	%	No. of individual	%	No. of individual	%	No. of individual	%	No. of individual
Bumiputera Malay										
Pre-consumption headcount, H^{gross}	14.50	1,268,411	3.62	340,598	1.07	100,926	1.75*	164,358*	0.15*	35,433*
Post-consumption headcount, H^{net}	15.84	1,385,515	3.94	370,759	1.19	111,925	1.87*	176,130*	0.15*	35,433*
Increases in estimate, H^{net}-H^{gross}	1.34	117,104	0.32	30,161	0.12	10,999	0.12	11,772	0.00	-
Bumiputera non-Malay										
Pre-consumption headcount, H^{gross}	30.48	422,198	20.79	311,750	13.97	209,478	-	-	-	-
Post-consumption headcount, H^{net}	32.08	444,420	21.37	320,484	15.06	225,851	-	-	-	-
Increases in estimate, H^{net}-H^{gross}	1.60	22,222	0.58	8,734	1.09	16,373				
Chinese										
Pre-consumption headcount, H^{gross}	1.35	62,395	0.28	12,355	0.15	6,634	0.02	1,316	0.17**	12,194**

Post-consumption headcount, H^{net}	1.45	67,273	0.28	12,355	0.15	6,634	0.02	1,316	0.20**	14,540**
Increases in estimate, H^{net}-H^{gross}	0.10	4,878	0.00	-	0.00	-	0.00	-	0.03	2,346
Indian										
Pre-consumption headcount, H^{gross}	5.34	73,805	1.55	21,360	0.13	1,763	0.24	4,993	-	-
Post-consumption headcount, H^{net}	6.37	87,932	1.55	21,360	0.13	1,763	0.24	4,993	-	-
Increases in estimate, H^{net}-H^{gross}	1.03	14,127	0.00	-	0.00	-	0.00	-		
Others										
Pre-consumption headcount, H^{gross}	32.31	281,939	19.43	164,211	23.41	197,823	13.08	229,504	-	-
Post-consumption headcount, H^{net}	35.36	309,492	19.85	167,742	24.36	205,853	14.33	251,464	-	-
Increases in estimate, H^{net}-H^{gross}	3.05	27,553	0.42	3,531	0.95	8,030	1.25	21,960		

Notes: *Refers to ethnicities of *Bumiputera*, inclusive of Malays and non-Malays.

**Refers to ethnicities of non-*Bumiputera*, inclusive of Chinese, Indians and other ethnicities.

6.4 Summary

Although tobacco-smoking has been well-known for its adverse health impact leading to higher medical expenditures, the non-health financial and welfare impact from direct tobacco expenditure should not be underestimated. Impoverishment attributed to direct tobacco expenditure is an immediate financial impact from tobacco expenditure. Under a constrained household budget or a near PLI household income, tobacco expenditure could easily push the household into the classification of poverty.

At large, the increases in estimation of impoverishment due to tobacco expenditure in Malaysia were larger in 1993 and gradually declined in subsequent years. By region, a similar trend was also observed in the three regions whereby the poverty impact was gradually reducing since 1993. Among the three regions, the increases in estimate of impoverishment attributed to tobacco-smoking were generally larger in Sabah and Labuan. Comparing between urban and rural strata, the increases in estimation of impoverishment due to tobacco expenditure were less in urban than rural stratum, yet, both urban and rural strata had reduction in the increases in estimation of impoverishment due to tobacco expenditure. By ethnicity, the *Bumiputra* non-Malays were found to have larger poverty impact than *Bumiputr*a Malays, Chinese and Indian. On the other hand, the increases in estimation of impoverishment due to tobacco expenditure had been the lowest in Chinese ethnicity compared to the rest.

In conclusion, the increases in estimation of impoverishment due to tobacco expenditure have been paradoxically low compared to the actual burden of tobacco-smoking under the circumstances of increasing tobacco taxes in Malaysia. Hence, this

finding deserves a thorough discussion complemented with the findings from Chapter 5 and 7 later.

CHAPTER 7: CROWDING OUT EFFECT OF ESSENTIAL GOODS AND SERVICES

7.1 Introduction

This chapter examines the financial and welfare impact attributed to household tobacco expenditure. The financial and welfare impact explored in this thesis is reduction of expenditures on essential goods and services after household tobacco expenditure. The chapter essentially compares every category of essential goods and service between household with and without tobacco expenditure. In the Malaysian setting, this information is relatively scarce; yet, it is crucial for highlighting the financial and welfare impact attributed to tobacco expenditure among households in the country. Reduction of essential goods and services is referred to as the crowding out effect in the chapter and the thesis.

The Malaysian adult male population has been the main group of tobacco consumers. To top it up, most of these adult males are the heads of households in Malaysia (DOS, 2004, 2009, 2014). Hence, the financial and welfare impact from household tobacco expenditure should not be underestimated as the heads of households will act as the main decisionmakers on goods consumption in the household. Under a constrained household budget, the household members might have to give up some essential goods and services to fulfil the addiction need for tobacco products. In addition, reduction of essential goods and services was also observed in other countries with a high burden of tobacco-smoking such as China, India and Cambodia (R. M. John, 2008; R. M. John et al., 2012; Wang et al., 2006).

UNICEF Malaysia has also recently highlighted malnutrition among children in Kuala Lumpur, Malaysia whereby malnutrition could act as a surrogate indicator for long-term social impact in a rapidly urbanising region in Malaysia (Abdul Khalid et al., 2018). The prevalent malnutrition among children has evidently raised suspicion on the reduction of nutritious food supply in the household as the household allocates less importance as well as monetary resource on food. Hence, it would be interesting to explore the possibility of reduction of essential goods and services due to household tobacco expenditure as tobacco-smoking has always been associated with poor socioeconomic status (H. K. Lim et al., 2013).

The chapter begins with Section 6.2, which will describe the data sources and specifications used in the analysis. This section will also explain the statistical methods utilised in the chapter, namely QUAIDS model and a seemingly unrelated regression (SUR) method. The subsequent section contains the results of the crowding out effect of essential goods and services between tobacco-smoking and non-tobacco consuming households as well as the crowding out effects among tobacco-smoking households as the tobacco expenditure increases. In the chapter, the crowding out effects were explored at the national level, then stratified by socioeconomic quintile and lastly by smoking intensity. Lastly, the chapter concludes with Section 6.4 which provides a summary of the findings.

7.2 Data sources and methods

7.2.1 Source of data and specifications

The data for the analysis in this chapter were obtained from the HES 2014/15. The details on the designs, conduct and extent of the data captured in HES have been elaborated in Section 3.2 of Chapter 3. HES 2014/15 is the only HES utilised in this chapter on the crowding out effect of essential goods and services where HES is a nationally representative household survey in Malaysia conducted to collect information on the level and pattern of consumption expenditures. Geographically, HES 2014/15 covered both urban and rural areas of 13 states and three federal territories in Malaysia. As mentioned earlier in Chapter 3, the dataset obtained for HES 2014/15 was indeed one third of the whole dataset of the HES (49862 households), however, the dataset generated for this study was done randomly to ensure the representativeness of the Malaysian population in 2014.

This chapter will mainly compare the difference in the proportion of expenditures in essential goods and services at the household level between tobacco and non-tobacco-smoking households. In this chapter, goods and services considered essential are food and non-alcoholic beverages, tobacco products, education, clothing and footwear and housing. The household is considered tobacco-smoking if there was recorded tobacco expenditure in the household; otherwise, the household is categorised as a non-tobacco-smoking household.

7.2.2 Consumer Demand System

This study used the quadratic almost ideal system (QUAIDS) as the econometric model to assess the households' expenditures on various goods in response to household tobacco expenditure. The following section describes evolution of various consumer demand systems and their related characteristics.

7.2.2.1 Engel curve

The Engel curve is a function describing how a consumer's purchase of any good varies with the consumer's total resources such as income or total expenditures (Lewbel, 2008). To be specific, the Engel curve is a function describing how a consumer's expenditures on some good or service relates to the consumer's total resources holding prices as fixed. It can also be written as $q_i = g_i(y,z), \ q_i$ whereby q_i is the quantity consumed of goods *i*, *y* is income, wealth or total expenditures on goods and services, and *z* is a vector of other consumer characteristics such as age and household composition. The shape of the Engel curve may also be affected by various demographic variables and other consumer characteristics. For instance, food expenditures will increase with increasing household income and family size, yet, food budget shares will decrease with decreasing household income.

A household's Engel curve will indicate its income elasticity and show whether it is an inferior, normal or luxury merchandise item. In another words, the Engel curve will essentially indicate the percent change in q_i that results from one percent change in *y*. The Engel curve for a normal goods item will have a positive gradient where, as the

income increases, the quantity demanded will also increase. As for luxury goods, the curve will bend towards the X-axis in its upward sloping curve. On the contrary, the upward sloping curve will bend toward the Y-axis for necessities. For inferior goods, the Engel curve will have a negative gradient. For instance, the consumers will buy less of the products if their income increases as they are able to purchase better products.

In short, the shape of Engel curves evidently plays a crucial part in the determination of macroeconomic demand relationships. In relation to this, the Engel curve could be linear and non-linear. Hence, having an inclusive consumer demands model to represent the demand relationships is very important.

7.2.2.2 Linear expenditures system (LES)

The LES was originally developed by Richard Stone in early 1954 based on a utility function. Then, Stone-Geary showed that the demand system can also be derived from the Klein-Rubin utility index of cost of living. The LES is essentially a pure theory of consumer behaviour concerning individual demand functions. It is believed that an individual's preferences are assumed to be representable by a well behaved utility function, $U(x_1, \ldots, x_n)$, where x_i denotes the rate of consumption of the ith goods item. The LES is showed in the equation below (Pollak & Wales, 1969):

$$\sum_{k=1}^{n} p_k x_k = \mu$$

where p_i is the price of the ith goods item and μ represent the total expenditures. The equation includes functions of all prices and total expenditures to ensure its utility maximizing quantities of various goods. In the equation, $x_i = h^i(P, \mu)$ where P denotes the price vector, $(p_1, \ldots\ldots p_n)$ and the functions $(h^1, \ldots\ldots, h^n)$ are the ordinary demand functions (Pollak & Wales, 1969).

The demand functions satisfy the budget constraint. On top of that, the functions are also homogenous of degree zero in all prices and total expenditures. Furthermore, the implied Slutsky substitution matrix for the LES is symmetric and semidefinite. On top of that, the LES can be made more flexible by allowing the parameters to vary systematically with the variables exogenous to the demand system. Nonetheless, the LES is not without its defects whereby with certain values of prices and income the predicted expenditures becomes negative (Parks, 1969). Theoretically, this defect is not satisfactory, yet, the system may still be useful for a wide range of price-income points.

7.2.2.3 Almost Ideal Demand System (AIDS)

Ever since Richard Stone estimated a system of demand equations based on consumer theory, there has been an abundance of investigation on various models such as the LES, the Rotterdam model and the translog model. LES is a demand system whereby the expenditure is linear in price and income. Rotterdam model is a demand equation system that allows the theory of utility-maximising in consumers found by Barten and Theil in 1964. Translog model is the model whereby the parameter is linear in transcendental logarithmic. Later in 1980, Deaton introduced another model primarily aimed at

studying consumer behaviour from a combination of translog and Rotterdam models. The AIDS was believed to have the best properties of the two.

In the AIDS model, the budget shares of the various commodities are linearly related to the logarithm of actual total expenditures and the logarithms of relative prices. The AIDS model also gives an arbitrary first-order approximation to any set of demand systems derived from utility -maximizing behaviour (Deaton & Muellbauer, 1980). This property is essential because it means that tests of homogeneity of symmetry are set within a maintained hypothesis.

The following is the AIDS equation (Deaton & Muellbauer, 1980):

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log\{x / P\}$$

where w_i is the budget share of goods item i, x is the total expenditures, p is the price vector, and P is a price index. The AIDS model satisfies a few important properties of a demand function, namely homogeneity of degree 0 in prices and total expenditures, sum of budget shares adds up to 1 and it satisfies the symmetry of the Slutsky matrix (Deaton & Muellbauer, 1980). In short, the AIDS model was shown to have most of the properties desirable in the conventional demand model.

7.2.2.4 Quadratic almost ideal system (QUAIDS)

Since the introduction of AIDS, the model has been inarguably the most commonly and frequently used system for modelling of consumption behaviour for various commodity groups. However, the AIDS model has one obvious weakness in that it has difficulty in capturing the effects of non-linear Engel curves. Unfortunately, numerous empirical demand studies had frequently been encountered with non-linear Engel curves. In order to ensure the AIDS model's properties while maintaining its consistency with Engel curve and relative price effects within a utility maximization framework, a quadratic term in log income is added to the AIDS model which yields the QUAIDS model.

In 1997, Banks et al conducted a study to explore the welfare analysis of shifts in relative prices using a long time series of expenditures surveys based on consumer demand (Banks, Blundell, & Lewbel, 1997). In the study, their nonparametric analysis of consumer expenditures pattern revealed more curvatures in the Engel curve relationship than is permitted by the previous consumer models. Hence, Banks et al strongly suggested that quadratic terms be used in the logarithm of expenditures in the Engel curves. In relation to this, the previous popular consumer demand models such as the AIDS only permitted Engel curves that were linear in logarithm of total expenditures.

In their study, the QUAIDS model was also found to produce a data-coherent and plausible description of consumer behaviour associated with price and tax changes. On top of that, nonparametric analyses of Engel curves and of residuals from the parametric

QUAIDS models showed that the model was adequate and hence, no additional semiparametric terms were added. On the contrary, Banks et al also indicated that studies based on AIDS or translog preferences would inaccurately identify the distribution of welfare losses in their study context due to failure in modelling the Engel curvature correctly. In short, Banks et al concluded that the QUAIDS model is essentially more superior than their latter consumer models.

The QUAIDS model was used in various studies related to consumer demands in different countries. In the Czech Republic, the QUAIDS model was utilized to study the behavioural response of consumers to price change after reforms of indirect taxes (Janský, 2014). The QUAIDS model is also frequently used in the study of the crowding out effect of essential goods and services. For instance, the QUAIDS model was used to explore household expenditures in various categories of goods between tobacco-smoking and non-tobacco-smoking households. The QUAIDS model was used to explore the aforementioned condition in India and Cambodia (R. M. John, 2008; R. M. John et al., 2012).

One of the most prominent advantages of using the QUAIDS model is that it allows the same goods item to be either a luxury or a necessity based on a household's income level as the model includes a quadratic term of logarithmic income based on the utility maximization theory (Banks et al., 1997; R. M. John, 2008; R. M. John et al., 2012). In relation to this, certain durable goods or certain types of branded clothing could be necessities for richer households but identical items could be considered a luxury for poorer households. On top of that, the QUAIDS model accounts for household

characteristics which will obviously affect allocation of available household resources among their household members. Due to its advantages, this study utilised QUAIDs as the primary consumer model to examine the crowding out effects of essential goods and items in response to tobacco expenditure.

7.2.3 Description of Variables

In this chapter, the outcome variables include the percentage of expenditures groups from the total household consumption expenditures for five essential expenditures categories, namely food and non-alcoholic beverages, education, medical care, housing, clothing and footwear (DOS, 2014). The main explanatory variable in the model was tobacco expenditure status of the household.

7.2.3.1 Outcome variables

Due to our main interest in the impact of tobacco expenditure on the purchase of other goods and services, we calculated the proportion of all expenditures spent on the five distinct expenditures categories. These five expenditures categories are shown in Table 7.2, as well as their overall mean expenditures in MYR and mean of the proportion from total household consumption for every expenditure category by the ascending living quintile. The detail on data collection as well as the recall period was comprehensively discussed in Section 4.2.1 in Chapter 4. Daily expenditures were

totalled up to yield monthly consumption with a one-day recall period. As for durable items, respondents would record purchases made 12 months prior to the survey

(DOS, 2014).

7.2.3.2 Explanatory variable

The explanatory variable of interest in this study is the household tobacco expenditure whereby we coded the variables in three ways. First, the household tobacco expenditure was coded as a continuous variable by summing up the total tobacco expenditure in a month. Secondly, we created a categorical variable to represent the status of household tobacco-smoking whereby 0 indicated zero expenditures on tobacco products whilst 1 indicated any level of expenditures on any form of tobacco products.

Thirdly, the household tobacco expenditure was also graded into low-, and high-tobacco expenditure referring to the mean of tobacco expenditure. For instance, if the household tobacco expenditure were lower than the mean of household tobacco expenditure, then it would be classified as low-tobacco expenditure. This categorical variable was used in the analysis of the crowding out effect among tobacco-smoking households to ascertain the dose-response relationship between crowding out and intensity of tobacco expenditure.

7.2.3.3 Control variables

Knowing that there are other factors that affect household expenditures; hence, we control for observable household and demographic variables. In the analysis of the crowding out effect for every expenditure category, we controlled for age, sex, marital status, highest formal education achievement and ethnicity of household head. As for household characteristics, we controlled for household size, presence of children below 14 years old, total household expenditures, locality and region in Malaysia. We used Pearson Chi-squared test and T-test to compare the household characteristics such as mean household income, household composition and urban-rural strata between tobacco-smoking and non-smoking households.

In regard to living standard, the similar quintile is also applied in this chapter whereby the total household consumption was divided into 5 main quintiles, namely from the poorest to the richest. Based on the 5 classes of living standard, we examined the crowding out effect by tobacco-smoking compared to non-smoking households. Furthermore, a similar living standard was also applied in subpopulation analysis among the tobacco-smoking households.

7.2.4 Statistical analysis

To analyse the crowding out effect, we employed the consumer demand model called Quadratic Almost Ideal Demand System (QUAIDS) which was discussed in the earlier section (Banks et al., 1997; R. M. John, 2012; R. M. John et al., 2012). To estimate the QUAIDS model, we employed the Seemingly Unrelated Regression (SUR) method.

In view of multiple household expenditures categories in a single household, the household budget allocation to one expenditures category is correlated with other expenditures categories which likely to cause the error terms in the equations. Hence, this leads to increased variance in the estimated coefficients. Nonetheless, the SUR method that generates efficient regression coefficients by estimating all regression equations simultaneously using the Feasible Generalized Least Square method (R. M. John et al., 2012; Zellner, 1962) would be able to address the aforementioned issues.

$$W_i = \alpha + \beta T + \mathfrak{z} X + \mathcal{E}$$ (R. M. John et al., 2012)

where W_i is the proportion of the ith expenditures category from total household expenditures (except tobacco), T is a binary variable with the value one if the household had tobacco expenditure while 0 represent the household without tobacco expenditure, X is a vector of the household's socioeconomic characteristics (log of total expenditures, log of total expenditures squared, household size, locality and region in Malaysia) and demographic characteristics of the household head (gender, marital status, ethnicity and education level). STATA version 14 was used for statistical analysis in the study. In the analysis, we employed a survey setting using individual weight.

7.3 Results

7.3.1 Household characteristic between tobacco-smoking and non-smoking households

Comparing between tobacco-smoking households and non-smoking households would be crucial to determine variables to be controlled during the subsequent multivariate analysis. Demographic characteristics are also important factors affecting tobacco-smoking initiation and status among tobacco smokers (Hanson & Chen, 2007; Hiscock, Bauld, Amos, Fidler, et al., 2012; Siahpush, Borland, Yong, Kin, & Sirirassamee, 2008). Hence, it would be appropriate to firstly compare the demographic characteristics between the main explanatory variables in the subsequent analysis to avoid possible confounding effects.

Table 7.1 summarizes the household characteristics and demographic characteristics between tobacco-smoking and non-tobacco-smoking households. From the comparison, mean household income, household composition and urban-rural strata were significantly different between tobacco and non-tobacco-smoking households. In summary, tobacco-smoking households had lower mean household income, higher proportion of household members below 14 years old, higher number of household members and a higher proportion were in the rural locality.

Besides that, demographic characteristics of household heads were also significantly different between tobacco-smoking and non-smoking households. Female heads of households were relatively more prominent among the non-smoking households. As for educational background of heads of households, the non-smoking households had a

higher percentage of secondary and tertiary education attainment compared to tobacco-smoking households. In short, the heads of tobacco-smoking households were mainly adult males with married status and more than 70.0% of them achieved at least a secondary education.

Table 7.1 Household characteristics between tobacco-smoking and non-smoking households

Variable	Total			Household tobacco spending status						P-value
				Tobacco consuming household			Non-tobacco consuming household			
	n	% or mean	(S.E)	n	% or mean	(S.E)	n	% or mean	(S.E)	
Sex of household head										
Male	12258	86.25	(0.35)	6169	79.18	(0.55)	6089	92.74	(0.38)	<0.001
Female	2187	14.75	(0.35)	1696	20.94	(0.55)	491	7.26	(0.38)	
Marital status										
Single	1718	12.47	(0.33)	925	12.70	(0.47)	793	12.19	(0.47)	<0.001
Married	11472	79.36	(0.40)	6055	76.82	(0.58)	5417	82.49	(0.55)	
Divorced/Separated	1255	8.18	(0.27)	885	10.49	(0.40)	370	5.32	(0.34)	
Education of household head										
No formal education	630	3.93	(0.21)	365	3.86	(0.26)	265	4.01	(0.35)	<0.001
Primary	2528	16.22	(0.47)	1273	14.53	(0.48)	1255	18.31	(0.61)	
Secondary	8188	55.60	(0.66)	4195	52.25	(0.67)	3993	59.73	(0.74)	
Tertiary	3099	24.25	(0.60)	2032	29.36	(0.61)	1067	17.95	(0.56)	
Mean of household income		6117.4	(57.40)		6286.5	(82.13)		5908.9	(83.20)	<0.001
Household composition										
Below 14 years old	8065	55.43	(0.49)	4244	53.65	(0.67)	3821	57.63	(0.72)	<0.001

Number of household member			4.29	(0.02)		4.12	(0.03)		4.50	(0.03)	<0.001
Locality											
	Urban	9986	77.10	(0.15)	5615	79.11	(0.35)	4371	74.63	(0.45)	<0.001
	Rural	4459	22.90	(0.15)	2250	20.89	(0.35)	2209	25.37	(0.45)	
Region											
	Peninsular Malaysia	10372	82.58	(0.17)	5698	83.44	(0.31)	4674	81.52	(0.42)	0.087
	Sabah and Labuan	1918	8.99	(0.16)	1002	8.19	(0.26)	916	9.97	(0.38)	
	Sarawak	2155	8.43	(0.06)	1165	8.37	(0.19)	990	8.51	(0.21)	

Source: Information obtained from HES 2014/15 datasets.

7.3.2 Crowding out effect of tobacco expenditure at national level

In general, the tobacco-smoking households spent a smaller portion of their available monetary resources for food, education, medical care, housing, clothing and footwear. The smoking households in richer quintiles had consistently devoted a smaller portion of their available household monetary resources for essential goods such as food, education, medical care, housing, clothing and footwear. The details of essential goods and services expenditures across household expenditures quintiles are summarized in Table 7.2. The reduction in major consumption expenditures categories such as food and non-alcoholic beverages, education, medical care and housing has also been rather persistent irrespective of poor or rich quintiles. The next section will explore the statistical significance of the crowding out effects of essential goods and services among tobacco-smoking households.

Table 7.2 Average household expenditures on all commodities between tobacco-smoking and non-smoking household by consumption expenditures quintiles

Consumption categories	Total				Poor quintile				Second quintile				Middle quintile				Fourth quintile				Rich quintile			
	Non-smoking HH		Smoking HH		Non-smoking HH		Smoking HH		Non-smoking HH		Smoking HH		Non-smoking HH		Smoking HH		Non-smoking HH		Smoking HH		Non-smoking HH		Smoking HH	
	MYR	%	MYR	%	MYR	%	MYR	%	MYR	%	MYR	%	MYR	%	MYR	%	MYR	%	MYR	%	MYR	%	MYR	%
Food & non-alcoholic beverages	686	26.45	672	25.59	456	34.70	449	32.72	610	30.45	597	29.32	680	26.49	661	25.43	765	23.42	775	23.17	908	17.77	872	17.25
Education	50	1.31	32	0.89	9	0.63	8	0.48	21	1.01	18	0.79	37	1.30	24	0.85	59	1.65	36	0.97	116	1.92	74	1.33
Medical care	65	2.03	53	1.59	28	1.96	30	1.45	41	1.96	29	1.39	51	1.94	41	1.51	69	1.96	66	1.78	130	2.29	105	1.83
Housing	212	29.20	790	25.74	432	32.34	382	27.76	571	28.31	503	24.81	751	27.65	675	25.03	928	27.71	83	24.19	1777	29.58	1612	27.44
Clothing and footwear	127	4.26	123	4.17	55	4.06	56	3.97	86	4.25	90	4.31	111	4.36	117	4.36	145	4.36	143	4.19	227	4.31	209	3.96

Table 7.3 Crowding out effect of tobacco expenditure between tobacco-smoking and non-smoking households by consumption expenditures quintile

Consumption categories	Overall			Poor			Second			Middle			Fourth			Rich		
	Coeffici ent	S.E	Sig.	Coeffic ient	S.E	Sig.	Coeffic ient	S.E	Sig.	Coeffic ient	S.E	Sig.	Coeffic ient	S.E	Sig.	Coeffic ient	S.E	Sig.
Food	-1.6400	0.1603	***	-2.3072	0.4127	***	-1.8218	0.3642	***	-2.0577	0.3401	***	-0.9746	0.3443	***	-1.1960	0.2969	***
Education	-0.4686	0.0510	***	-0.2179	0.0730	***	-0.2130	0.0966	**	-0.5090	0.1044	***	-0.6508	0.1256	***	-0.6747	0.1614	***
Medical care	-0.3493	0.0684	***	-0.4365	0.1753	**	-0.3262	0.1399	**	-0.3081	0.1369	**	-0.2252	0.1480		-0.4862	0.1615	***
Housing and rent	-1.8751	0.1839	***	-2.1432	0.4344	***	-2.2918	0.3528	***	-1.3157	0.3882	***	-2.1661	0.3889	***	-0.7263	0.4829	
Clothing	-0.2009	0.0484	***	-0.0766	0.1071		-0.0529	0.0998		-0.1906	0.1098	*	-0.2940	0.1089	***	-0.4475	0.1176	***

Notes:* Significant at 10%, ** Significant at 5% and *** Significant at 1%

Table 7.3 shows the results of seemingly unrelated regression for the differences in household budget allocation among households with and without tobacco expenditure for the five expenditures categories. The null hypothesis is that the difference in the household budget allocation between smoking and non-smoking households is zero.

The tobacco-smoking households were found to significantly reduce expenditures on food, education, medical care, housing and clothing. Table 7.3 reports the coefficients of the binary variable tobacco expenditure from the regression equation for every expenditure category. A negative coefficient indicates a lower budget allocation in the particular expenditure category among tobacco-smoking households compared to non-tobacco-smoking households. On average, the tobacco-smoking households significantly devoted 1.64% less for food, 0.47% less for education, 0.35% less for medical care. 1.88% less for housing and 0.20% less for clothing than the non-smoking households, respectively from their total household consumption expenditures.

7.3.3 Crowding out effect of tobacco expenditure stratified by socioeconomic status among tobacco-smoking households

From the crowding out of essential goods and services, we explored the crowding out of essential goods and services by consumption expenditures quintile. Table 7.3 also details the crowding out effect among tobacco-smoking households by consumption expenditures quintiles to examine the crowding out effect in different groups of living standards.

Tobacco-smoking households from the poorest quintile experienced significant crowding out in food (2.31% less), education (0.22% less), medical care (0.44% less), housing (2.14% less), and clothing (0.20%) compared to non-smoking households from the same consumption expenditures quintile. As for the second poorest quintile, the tobacco-smoking households had significantly reduced their household budget allocation in food (1.82% less), housing (2.29% less), education (0.21% less) and medical care (0.33% less). The middle quintile was also not exempted from experiencing significant crowding effect in food (2.06% less), housing (1.32% less), education (0.51% less) and medical care (0.31% less).

In spite of higher income and better living standard, the richest quintile and the fourth quintile were also not spared from the effect of crowding out from tobacco-smoking at the household level. The fourth quintile household experienced significant crowding out in food (0.97% less), education (0.65% less), housing (2.17% less) and clothing (0.29% less). Among the richest household, the tobacco-smoking households were found to significantly reduce their budget allocation in food (1.20% less), education (0.67% less),

medical care (0.48% less) and clothing (0.45% less) compared to their non-smoking counterparts.

Overall, the crowding out effect of essential goods and services especially food and education, were consistently present in all consumption expenditures quintiles. Other essential goods and services that were crowded out included medical care, clothing and housing. Nonetheless, the magnitude of the crowding out effects varies in different consumption expenditures quintiles.

7.3.4 Crowding out effect among tobacco-smoking household by smoking intensity

Overall, our subpopulation analysis showed that the crowding out effect among tobacco-smoking households by their smoking intensity was common as shown in Table 7.4. On average, the crowding out effect was significantly observed in food, medical care and housing when comparing high tobacco expenditure households against low tobacco expenditure households. High tobacco expenditure households significantly reduced 2.43% of their budget allocation on food compared to those with low tobacco expenditure households. As for medical care, the high tobacco expenditure households also reduced 0.61% of their budget allocation compared to low tobacco expenditure households. In housing, the high tobacco expenditure households also significantly reduced 3.65% of their budget allocation compared to low tobacco expenditure households.

A subpopulation analysis was carried out on the crowding out effect among tobacco-smoking households by their smoking intensity stratified by consumption expenditures quintile. Stratified by the consumption expenditures quintile, the high tobacco expenditure households significantly reduced expenditures in food (3.66% less), medical care (1.35% less), housing (5.41% less) and clothing (0.45% less) when compared with low tobacco expenditure in the poorest quintile. In the second quintile, the high tobacco expenditure households were found to significantly reduce expenditures on food (4.43% less), medical care (0.48% less) and housing (2.05% less) than their counterpart who had lower tobacco expenditure.

The middle quintile was also not spared from the crowding out effect as tobacco expenditure increased, namely on food (2.43% less), education (0.24% less), medical care (0.78% less) and housing (4.09% less) between the high tobacco expenditure households and the low tobacco expenditure households. The tobacco-smoking households in the fourth quintile also experienced significant crowding out in food (1.54% less) and housing (2.71% less) as the tobacco expenditure increased. The crowding effect among the rich household was rather minimal as tobacco expenditure increased whereby there was only crowding out in housing (4.21% less). Otherwise, there was no crowding out on food, medical care and education in the rich households as tobacco expenditure increased.

In summary, the magnitude of tobacco expenditure was found to be associated with the severity of the crowding out effect of essential goods and services. The higher the tobacco expenditure, the greater the crowding out effect of essential goods and services.

From the overall analysis, the dose-response relationship between household tobacco expenditure with food, medical care and housing was established respectively.

Table 7.4 Crowding out effects among tobacco-smoking households by smoking intensity

Consumption categories	Overall			Smoking intensity[1]						Coefficient	Sig.
				Low			High				
	MYR	Budget share	S.E	MYR	Budget share	S.E	MYR	Budget share	S.E		
Food	666.00	25.44	0.15	636.41	27.96	(0.21)	716.41	21.14	(0.22)	-2.4276	***
Education	31.17	0.88	0.03	25.59	0.82	(0.04)	40.79	0.97	(0.06)	-0.0764	
Medical care	52.39	1.56	0.07	47.88	1.62	(0.10)	60.07	1.47	(0.07)	-0.6091	***
Housing and rent	787.73	25.82	0.16	715.90	27.31	(0.22)	910.07	23.29	(0.23)	-3.6504	***
Clothing	121.73	4.16	0.04	103.87	4.16	(0.05)	152.14	4.16	(0.07)	0.0913	

Notes: [1] Household tobacco expenditure was graded into low-, and high-tobacco expenditure referring to the mean of tobacco expenditure.

* Significant at 10%, ** Significant at 5% and *** Significant at 1%

Table 7.5 Crowding out effect of tobacco expenditure among tobacco-smoking households by consumption expenditures quintiles

Consumption categories	Overall			Poor			Second			Middle			Fourth			Rich		
	Coefficient	S.E	Sig.	Coefficient	S.E	Sig.	Coefficient	S.E	Sig.	Coefficient	S.E	Sig.	Coefficient	S.E	Sig.	Coefficient	S.E	Sig.
Food	-2.4276	0.2458	***	-3.6552	0.9176	***	-4.4307	0.5727	***	-2.4322	0.4843	***	-1.5442	0.4726	***	-0.6814	0.4173	
Education	-0.0764	0.0672		-0.0608	0.1307		-0.0238	0.1374		-0.2358	0.1331	**	0.0321	0.1514		-0.1496	0.2001	
Medical care	-0.6091	0.1002	***	-1.3479	0.4047	***	-0.4780	0.1844	***	-0.7841	0.1814	***	-0.2952	0.2112		-0.3599	0.1978	*
Housing and rent	-3.6504	0.2683	***	-5.4124	0.9128	***	-2.0527	0.5194	***	-4.0928	0.5199	***	-2.7074	0.5013	***	-4.2143	0.7089	***
Clothing	0.0913	0.0741		-0.4531	0.2218	**	-0.1936	0.1639		0.1750	0.1641		0.1324	0.1542		0.2936	0.1578	

Notes: * Significant at 10%, ** Significant at 5% and *** Significant at 1%

7.4 Summary

Other than the adverse health impact caused by it, tobacco-smoking will also bring adverse financial impact to the tobacco smokers as well as their household members. Nonetheless, prior to the onset of long-term adverse social and health impact, financial and welfare impact would surface earlier. Crowding out of essential goods and services is one of the welfares impact of tobacco expenditure. Under a constrained household budget, the household would have to forgo other goods or services to make way for tobacco purchase. However, the choice to forgo other essential goods and services will directly affect the household members welfare. Hence, exploring the crowding out effect among tobacco-smoking households is crucial in studying the spectrum of financial and welfare impact attributed to tobacco-smoking.

Overall, the crowding out effect of essential goods and services is present in tobacco-smoking households in Malaysia. Tobacco-smoking households significantly crowded out on food, education, medical care, housing and clothing compared to non-smoking households. We have to bear in mind that the tobacco-smoking households would frequently reduce allocation on essential items whereby the reduced consumption would potentially affect the households in the long run. For instance, the reduction of expenditures on education affects the opportunity of quality education among the children which in turn affects investment on human capital at large.

The crowding out effect was present in all consumption quintiles although the expenditures category varied and the magnitude of crowding out varied as well. The crowding out of essential goods and services such as food, medical care, education and housing was rather consistent in all consumption expenditures quintiles although higher income and better living were among the richest quintile. In short, the evidence of crowding out on essentials goods and services attributed to tobacco-smoking is relatively

common irrespective of the income status and living standard. This has obviously highlighted to us the enormous financial impact contributed by tobacco-smoking to the households.

The analysis also showed a dose-response relationship between the magnitude of tobacco expenditure and crowding out effects. First and foremost, the crowding out effects significantly worsened as the tobacco expenditure increased in the households. In relation to this, the crowding out effects were observed in food, medical care and housing when comparing high tobacco expenditure against the low tobacco expenditure households. When stratified by consumption expenditures, the dose-response relationship between crowding out effects and the magnitude of tobacco expenditure gradually reduced from the poorest to the richest quintile. This could possibly be explained by the better financial capacity in the richest quintile which would be able to mitigate for the increasing tobacco expenditure.

In conclusion, household tobacco expenditure has welfare impact on Malaysia tobacco-smoking households such as crowding out effect on food, education, medical care, housing, and clothing but small. On top of that, there is a dose-response relationship between the crowding out effects and the magnitude of tobacco expenditure whereby higher tobacco expenditure is also found to further crowd out food, medical care and housing in the households. Moreover, the crowding out effect was evident irrespective of their consumption quintiles.

CHAPTER 8: CONCLUSION

8.1 Introduction

The following is a summary of all key findings presented in chapters 5, 6 and 7:

- The proportion of households that purchase tobacco remained at more than 40.0% in Malaysia in 1993, 1998, 2004, 2009 and 2014. While the richest quintile had the lowest proportion, the third and the second quintiles gradually emerged as groups with the highest proportion of household with tobacco expenditure between 2004 and 2014.
- Household tobacco expenditure was more concentrated among the higher income population in Malaysia irrespective of region, urban-rural stratum and ethnicity.
- The poorest quintile had the highest tobacco expenditure shares as a proportion of total household expenditures, whereas the richest quintile had the lowest. Nonetheless, among the tobacco-smoking households, the tobacco expenditure share has been falling in the overall population and in the tobacco-smoking households from 1993 to 2014.
- Overall trend in the increase in the estimate of impoverishment due to tobacco expenditure in Malaysia was small and gradually declined from 1993 to 2014 irrespective of regions, urban-rural stratum and ethnicity Nonetheless, the increase in the estimate of impoverishment due to tobacco expenditure was slightly higher in Sabah and Labuan, in the rural stratum and among non-Malay *Bumiputra* compared to their respective counterparts.
- Overall, the crowding out of essential goods and services is present but small among tobacco-smoking households in Malaysia and this finding was rather consistent across all consumption expenditures quintiles.

- In the subpopulation analysis among the tobacco-smoking households, a dose response relationship between crowding out effect and the magnitude of tobacco expenditure was established for food, medical care and housing. However, the magnitude of the crowding out effect gradually reduced from the poorest to the richest quintile.

The remainder of this chapter starts with Section 8.2 which discusses on the burden of tobacco consumption in Malaysian households and its changing trend. The subsequent section, Section 8.3, specifically discusses on whether the rich or the poor has been spending more in tobacco products in Malaysia. Section 8.4 discusses the overall non-health financial and welfare impact of household tobacco expenditure in Malaysia. This is followed by Section 8.5, which zooms into non-health financial and welfare impact of household tobacco expenditure by living standards. Section 8.6 highlights the significance of the study in terms of specific lessons that could inform policymaking in Malaysia and which could also have implications for other countries. Finally, Section 8.7 concludes the thesis by suggesting some future directions for research.

8.2 The burden of tobacco consumption in Malaysian households and its changing trend

Overall, tobacco-smoking in Malaysia is still a burden as the prevalence of tobacco-smoking among the adult male population is relatively high compared to a few South-east Asian countries such as Brunei, Singapore and Thailand (SEATCA, 2012). In this study, the proportion of tobacco-smoking at the household level is similar with the proportion of tobacco-smoking at the individual level among the adult male population, as shown in chapter 5. The finding that 40.0% of households in the country had tobacco expenditure in Malaysia suggests that 40.0% of the households in the country have the potential to be negatively affected by non-health financial and welfare impact from direct tobacco expenditure. In this context, not only does tobacco smoking in the household affect the tobacco smokers; the other household members are also not spared from the adverse financial and welfare effects, added to which, the other household members are also at higher risk of adverse health impact from passive smoking (Coultas, 1998; Glantz & Parmley, 1991; He et al., 1999; Hirayama, 1983; Janson, 2004; Taylor, Gumming, Woodward, & Black, 2001).

Globally, it is well known that tobacco-smoking is relatively higher in the low socioeconomic group in both LMICs and high-income countries. With regards to higher proportion of tobacco-smoking among the low socioeconomic group, the morbidity and mortality related to tobacco-related illnesses such as cardiovascular diseases has also been found to have a persistent socioeconomic gradients in many countries (Brown-Johnson, England, Glantz, & Ling, 2014; M. Marmot, 2005, 2006; Nagelhout et al., 2012; Stringhini et al., 2010). Hence, tobacco control measures have been targeted at the low socioeconomic group to reduce the proportion of tobacco-smoking in this group. In relation to this, in this study, it was revealed that while the poorest quintile had the highest

proportion of tobacco-smoking households in 1993 and 1998, the second and middle quintiles gradually emerged to have the highest proportion in 2004, 2009 and 2014.

The changing trend of tobacco-smoking in Malaysia could possibly be explained by the progress of tobacco control policy in Malaysia. In this respect, tobacco control in Malaysia has heavily relied on increasing tobacco taxes to reduce the demand for tobacco products since 1990 (My Health Portal, 2018). This is in line with the widely held view that tobacco taxation is one of the most cost-effective public health approaches to reduce tobacco-smoking, especially in LMICs (Chaloupka et al., 2012; Van Baal et al., 2007). In addition, tobacco taxation has also been included in the measures recommended by the WHO to tackle the tobacco epidemic in all countries (WHO-FCTC, 2015).

From 1990 to 2009, the excise tax was increased approximately 1630% from MYR0.013 per cigarette to MYR0.225 per cigarette (Malaysian Government, 2016). In response to the tax increase, the shares of household with tobacco expenditure was actually reducing for all consumption quintiles but the reduction was highest in the poorest and second quintiles compared to the rest. This differential reduction eventually closed the gap between the households in the poorest two consumption quintiles with the middle quintile. This finding has suggested that the gradual increase in tobacco tax from 1990 to 2009 had successfully reduced tobacco-smoking especially among the poor in Malaysia.

In 2014, the proportion of household with tobacco expenditure rebounded in households across all consumption quintiles with the highest proportion in the second quintile followed by the poorest and the middle quintiles. Kiddie-pack of 10 and 14 cigarettes was banned in 2006 and the MPL was implemented in January 2010 in Malaysia. The introduction of MPL as well as the banning of kiddie-packs, may have caused smokers, especially the poorer ones, to switch from licit to illicit cigarettes. This

phenomenon is verified by a study by Liber and colleagues in Malaysia whereby introduction of the MPL had led to the increase in purchase of illicit cigarettes from 13.4% to 16.5%, accompanied by a reduction of licit cigarette purchases from 3.9% to 1.8%. The mitigation strategy of resorting to cheaper illicit cigarettes that was adopted by the smokers possibly explains the increase in the proportion of household with tobacco expenditure.

Other than the changing trend in proportion, the prevalence of tobacco-smoking at individual level especially among the male adult population is high whereby it was around 41.9% in 2015 (NHMS, 2015). At the household level, the proportion of tobacco-smoking has also been persistently more than 38.0% and the proportion of household tobacco expenditure was 44.8% in 2014. Hence, it can be concluded that the burden of tobacco-smoking is still notable not only at the individual level, but also at the household level. On top of that, the changing trend in the proportion of household with tobacco expenditure by different living standards also provides a good insight into the state of tobacco control in Malaysia.

8.3 Who has been spending more in tobacco expenditure in Malaysia?

Socioeconomic inequalities have been blamed for the universal widening of the mortality rate between the rich and the poor (M. Marmot, 2005, 2006; M. G. Marmot & McDowall, 1986). Additionally, inequalities in negative health behaviours are also identified as one of the social determinants explaining disparities in mortality (Lantz et al., 1998). In this respect, a review of literature in tobacco-smoking revealed that tobacco-smoking was higher among the lower socioeconomic group compared to the richer socioeconomic group (Gospodinov & Irvine, 2009; Hiscock, Bauld, Amos, Fidler, et al., 2012). As the poor have been identified as major consumers of tobacco, concern has been expressed on whether the tobacco taxation is regressive and that it tends to negatively jeopardise the poor more than the rich. Hence, it is crucial to have accurate information before making further efforts to increase tobacco taxes.

This study found that, by actual quantum, tobacco expenditure was higher in the richer quintile compared to the poorer quintile in both the overall population and subpopulation analysis. This indicates that the richer group tends to spend a larger amount of their monetary resources on cigarettes compared to the poorer quintile. One of the possible explanations for this result could be that the rich tend to purchase branded cigarettes that are highly taxed rather than resort to illicit cigarettes. Conversely, the poor and middle quintiles could possibly be opting for illicit cigarettes to mitigate increments in the price of cigarettes. Hence, all of the concentration indices were positive n this study indicating that tobacco expenditure were more concentrated in the richer groups. In addition, this finding indicates that the rich were probably paying a higher proportion of the tobacco taxes in Malaysia.

Although the rich were found to spend more on tobacco products, their tobacco expenditure constituted a small portion of their total household consumption expenditure

due to their higher household income. In contrast, the middle-income group and the poor had lower amount of tobacco expenditure but a larger portion of their available monetary resources on tobacco products. Hence, this showed that the poor and the middle quintiles could actually spend less on tobacco products but their expenditure still constitutes a larger portion of their total household consumption expenditure. The low tobacco expenditure among the poor could possibly be due to usage of cheaper cigarettes or the poor could be smoking less. However, the higher proportion of household with tobacco expenditure in the poor would certainly be suggestive of usage of illicit cigarettes. On top of that, the NHMS shows that approximately 77.6% of the tobacco smokers in Malaysia smoked more than 10 cigarettes per day which indicates that almost 8 out of 10 tobacco smokers would have smoked at least 10 cigarettes every day. As such, the low tobacco expenditure among the poor hints at the possibility of illicit cigarettes usage.

By region, the richest quintile was also higher in term of household tobacco expenditure irrespective of region (Peninsular Malaysia, Sabah and Labuan, and Sarawak). The underlying reason for this finding may be that the richest quintiles in these three regions have been consuming more licit cigarettes, which also implies that this quintile was the major contributor of tobacco tax revenues in Malaysia during the period of this study. A similar observation was also noted for the urban-rural stratum where the actual quantum of household tobacco expenditure was more concentrated in the richest quintile in both strata. Nonetheless, the unequal distribution among the richest quintile was slightly more prominent in the rural population. Tobacco expenditure has also been found to differ between rural and urban strata in other countries, namely Cambodia and China (Hu et al., 2005; R. M. John et al., 2012). In the present study, household tobacco expenditure was not only more concentrated in the richest quintile by region and urban-rural stratum, but also by ethnicity. Overall, the rich were the main contributor of tobacco

taxes in Malaysia at the five time points and the increase in their tobacco expenditure was in accordance with the rise in tobacco taxes.

This study demonstrated that the poorest and middle quintiles were not the main contributors to the tobacco tax revenue, amidst the increasing tobacco taxation in Malaysia, It seems that the lower income households may have possibly resorted to illicit cigarettes (which are obviously cheaper than licit cigarettes) to avoid paying the high taxes for tobacco (Liber et al., 2015). As such, reducing the availability of illicit cigarettes in the market would be one of the key steps to ensure the effectiveness of tobacco taxation in Malaysia. Moreover, recent evidence has revealed that tobacco taxation can be a pro-poor policy instrument to reduce tobacco consumption, provided that illicit cigarette smuggling and trade is curbed. It is noteworthy that both tobacco taxes and illicit cigarettes are intrinsically linked and should be tackled simultaneously to reduce the burden of tobacco smoking (Verguet et al., 2015).

Despite the financial impact among the poorest and middle-quintiles being relatively small due to low tobacco expenditure, the health impact should not be underestimated. Tobacco-smoking leads to numerous adverse health conditions, ranging from airway irritation to a long list of malignancies (CDC, 2016b). Furthermore, in view of the wide range of illnesses, that result from smoking tobacco, the medical costs attributed to tobacco-related illnesses is essentially enormous (Aljunid, 2006; Radjiman, Adawiyah, Sarnantio, & Thabrany; Xu et al., 2015). For instance, in the United States, approximately 8.7% (95% CI: 6.8%, 11.2%) of annual medical expenditure can be attributed to tobacco-smoking, amounting to approximately USD 170 billion per year (Xu et al., 2015). As for Malaysia, a cost analysis has revealed that the direct and indirect medical costs of tobacco-related illnesses, namely chronic pulmonary airway disease, ischaemic heart disease and cancer amounted to USD 790 million in 2004 and this was projected to

increase to one billion USD in 2010 (Aljunid, 2006). Taken together, the above findings indicate that the rationale of raising tobacco taxes is not solely attributed to concerns on financial and welfare impact but also due to health impacts of tobacco smoking.

8.4 Overall non-health financial and welfare impact of household tobacco expenditure in Malaysia

In an effort to control the tobacco epidemic in Malaysia, the authorities have been committed to implementing tobacco control measures, which include increasing the rate of tobacco tax. However, although tobacco taxes have been increasing in Malaysia, the non-health financial impact of direct tobacco expenditure are small. In this respect, in Malaysia, the monthly per capita adult equivalent tobacco expenditure are relatively low at approximately MYR12.03 to MYR23.45. The per capita adult equivalent tobacco expenditure was expected to increase as the tobacco taxes increased because the burden of tobacco-smoking was persistently high with evidence stating that 8 out of 10 smokers smoked more than 10 cigarettes per day; however, the reverse seems to have been the case, as according to the subpopulation analysis among tobacco-smoking households, the per capita adult equivalent tobacco expenditure declined from 1993 to 2014. From a comparison of the price of the most popular cigarette brands between countries, the Malaysian cigarette price for one pack of 20 cigarettes was far cheaper than in Singapore (MYR15.89 vs MYR41.22) and Brunei (MYR15.89 vs MYR27.78) in 2014 (SEATCA, 2015). Hence, suboptimally priced cigarettes could have contributed to the low tobacco expenditure in Malaysia.

Not only has the actual quantum of tobacco expenditure been relatively low, the tobacco expenditure shares were also relatively low, ranging from 2.06% to 3.33% at the five points of time. Additionally, the tobacco expenditure share had been reducing from 3.33% 1993 to 2.06% in 2014 which indicated that lesser proportion of monetary resource from the total household consumption expenditures was required to purchase cigarettes in Malaysia from 1993 to 2014. From a comparison of the tobacco expenditure share of Australia and Malaysia in 1998, the tobacco share in Malaysia was lower than that of Australia where the tobacco share was 7.70% in the poorest quintile and 2.40% in the

richest quintile in Australia as opposed to 3.33% and 1.95%, respectively, in Malaysia (Siahpush, 2003). In the same period of time, the prevalence of tobacco-smoking in Australia was lower than in Malaysia (26.0% vs 42.5%) (White, Hill, Siahpush, & Bobevski, 2003). This indicates that less monetary resources were required to purchase tobacco products in Malaysia compared to Australia. In addition, cigarette became progressively more affordable in Malaysia from 1993 to 2014 as the income status of the general population improved over that period of time. This phenomenon seems paradoxical in the light of the desired impact of raising tobacco taxes in Malaysia. This could be due to the increase in tobacco tax lagging behind the high-speed economic growth and increase in household income in the country whereby the increase in the cigarettes price was disproportionately low compared to the increase in household income.

To eliminate the averaging effect of the non-tobacco-smoking households, an analysis of per capita adult equivalent tobacco expenditure was also conducted among the tobacco-smoking households. In those households specifically, the per capita adult equivalent tobacco expenditure was slightly higher than the overall populational finding after eliminating the averaging effect of the non-smoking households. Nonetheless, there is a mismatch between the average number of cigarettes smoked by tobacco smokers and the per capita adult equivalent tobacco expenditure. For instance, a pack of 12 cigarettes cost at least MYR 12.00 in 2014 (BAT, 2014) and the NHMS in 2015 revealed that 77.6% of tobacco smokers in Malaysia smoked more than 10 cigarettes per day (NHMS, 2015). Logically then, 77.6% of tobacco smokers in Malaysia would smoke at least 15 packs of cigarettes every month which would cost approximately MYR 180.00 per month per smoker. However, in contrast to finding of this study, the household tobacco expenditure with at least one smoker was only MYR 148.00 in 2014. Consequently, this finding suggests the postulation that tobacco smokers in Malaysia resorted to cheaper sources of

cigarettes in the market to mitigate increases in tobacco taxation. In short, the non-health financial impact of tobacco consumption in Malaysia have not been in line with the tobacco tax rate and the financial impact on tobacco smokers have not been huge as they can access alternative sources of cheaper cigarettes.

With regards to welfare aspects, tobacco-smoking has been cited as a cause of poverty especially among the poor as they are the major consumers of tobacco products worldwide (Gospodinov & Irvine, 2009; Hiscock, Bauld, Amos, Fidler, & Munafò, 2012 (Shafey, Dolwick, & Guindon, 2003). Moreover, the WHO has emphasized the connection between tobacco and poverty as the poor tend to smoke more than the rich. The poor can be impoverished via direct tobacco expenditure, the medical costs incurred due to tobacco-related illnesses or the loss of productivity due to medical illnesses. Nonetheless, the financial impact due to tobacco-related illnesses usually appear rather late as tobacco-related illnesses usually surface years after tobacco-smoking (Gandini et al., 2008; Hirayama, 1983; Liang, Chen, & Giovannucci, 2009). As for the effect of the direct purchase of tobacco, impoverishment can either be immediate or emerge over the long-term. This is because the household may have adequate savings to use for the purchase of tobacco products or may be able to borrow the money from other parties. Hence it was also deemed crucial to examine the impoverishment due to direct tobacco expenditure as such impoverishment would affect the welfare of all household members.

In this study, the overall impoverishment due to direct tobacco expenditure was found to be fairly small and the increases in the estimate of impoverishment due to direct tobacco expenditure diminished over the five points in time. In a previous study conducted in China, the impoverishment from direct tobacco expenditure was higher where the poverty headcount increased by 6.40% in urban and 1.90% in rural strata after accounting for direct tobacco expenditure (Liu et al., 2006). In the case of Malaysia, the

impoverishment due to direct tobacco expenditure was not only small for the overall population, but also for both urban and rural strata. In India, the impoverishment due to direct tobacco purchase was also small, where 0.72% of the population in the urban stratum and 1.50% in the rural stratum were impoverished by direct tobacco expenditure. Hence, as compared to both China and India, the impoverishment due to direct tobacco expenditure in Malaysia was relatively small and the number of persons affected is also fewer than in China and India due to the huge population size of the latter two countries.

In addition to the poverty impact, this study also assessed welfare impact of direct tobacco purchase by investigating the crowding out of essential goods and services. Overall, in the tobacco-smoking households the crowding out effects were significantly present in the four main expenditures categories, namely food, education, medical care and housing and rent, in comparison to the non-tobacco-smoking households. However, at approximately 2.00%, these crowding out effects were not large. In this context, this finding indicates that the tobacco-smoking households only reduced about 2.00% of their expenditures on any of the essential goods and services categories after accounting for their expenditures on tobacco cigarettes. The crowding out effects have also been found to be relatively small in Cambodia and India, although the crowding effects in those countries are persistently present in food, healthcare, clothing and education (R. M. John, 2008; R. M. John et al., 2012). The finding regarding a relatively small crowding out effect can be interpreted in a number of ways depending on the actual burden of tobacco consumption in a country. For instance, minimal crowding out effects constitutes a positive finding if the burden of tobacco smoking has gradually declined as this indicates that the threat of tobacco expenditure has been falling over the time. On the other hand, minimal crowding out effects could be a bad sign if the burden of tobacco-smoking is persistently high or rising because this indicates that the tobacco taxation system has an ineffective influence on tobacco expenditure. In other words, tobacco smokers could

possibly be mitigating the rising tobacco price by opting for cheap illicit cigarettes or the tax rises are suboptimal and thus have minimal impact on the cigarette price.

Overall, it can be concluded from this study that non-health financial and welfare impact of tobacco expenditure were present, but they were very minimal. If these findings are interpreted along with the high burden of tobacco-smoking in Malaysia, it is paradoxical. Consequently, it is postulated that the minimal financial and welfare impact could possibly be due to the rampant availability of illicit cigarettes and the suboptimal pricing of tobacco products whereby the tobacco products have remained relatively affordable and cheap to purchase (E. H. Blecher & Van Walbeek, 2009). In this respect, the tobacco taxes in Malaysia can be regarded as suboptimal whereby price elasticity is low in the current cigarette pricing regime (Norashidah, NikMustapha, & Mastura, 2013; Ross & Al-Sadat, 2007). In support of this argument, it has been reported that the tax rate burden of the tobacco price in Malaysia is lower than the optimal tax rate of 70.0% recommended by WHO (WHO, 2010, 2013). For instance, the tobacco tax rate was around 46.0% in Malaysia in 2014, even though the excise tax for tobacco/cigarette had actually risen (My Health Portal, 2018; SEATCA, 2013). This rate was lower than that in other countries in Southeast Asia in the same year, where; Singapore had the highest tobacco tax burden at 71.0%, followed by Thailand (70.0%), Brunei (62.0%), Indonesia (59.0%), the Philippines (53.0%) and Myanmar (50.0%) (SEATCA, 2013, 2015).

8.5 Non-health financial and welfare impact of household tobacco expenditure by living standards

Previous studies have shown that, by socioeconomic status, the poor in many countries have a higher prevalence of tobacco-smoking. However, this study found that household tobacco expenditure was the lowest among the poorest quintile in Malaysia over the five points in time. Moreover, it was also found that the richest quintile spent a higher amount of their monetary resources on tobacco than the rest of the quintiles. There was also an uprising gradient in the actual quantum of household tobacco expenditure in ascending socioeconomic status and this trend was persistently similar over the five points in time because the poor could possibly have been opting for cheaper cigarettes in the market. This finding is similar to that for China where it has been found that the low socioeconomic groups spend a lower amount of monetary resources on cigarettes and it was postulated that this is due to the lower socioeconomic group in that country opting for cheaper sources of cigarettes (Hu et al., 2005). In contrast, the low socioeconomic group in Australia has been found to have a higher amount of tobacco expenditure compared to the higher socioeconomic households (Siahpush, 2003). The difference in the findings from various countries could be strongly related to the availability of cheap cigarettes.

The subpopulation analysis of tobacco-smoking households in this study also identified similar trend, where the per capita adult equivalent tobacco expenditure among the poor was persistently the lowest at the five points in time compared to the other groups. Logically, one might expect to observe a higher amount of monetary resources being allocated to monthly tobacco expenditure among the poor in light of the increasing cigarettes taxes and the introduction of a minimum price for cigarettes in Malaysia. The minimum price law, which was introduced in 2010, mandated that a pack of 20 licit cigarettes must cost a minimum of MYR 6.40 and this price was subsequently raised to

MYR7.00 in 2011 (Food Act 1983, 2009, 2011). Then, in 2014, branded cigarettes were required to be cost a minimum of MYR 12.00 per pack of 20. Hence, it is rather illogical for a poor tobacco-smoking household to spend only MYR36.12 per month on cigarettes as 77.4% of tobacco smokers were smoking more than 10 cigarettes daily at that time (BAT, 2014; NHMS, 2015). Thus, it is strongly postulated that the poor spend their money on illicit cigarettes as the mean price of a pack 20 illicit cigarettes was MYR4.57 and MYR4.23 in 2009 and 2011, respectively.

In contrast to the socioeconomic gradient in the actual quantum of household tobacco expenditure, the tobacco expenditure share was higher among the poor, gradually reducing towards the richest quintile. This indicates that the poor were actually devoting a higher proportion of their overall household consumption expenditures to tobacco compared to the rich. This phenomenon has also been observed in LMICs where the poor tobacco-smoking households devote a higher amount of their available resources to the purchase of tobacco products (Efroymson et al., 2001; Husain et al., 2016; S. John et al., 2002). On the other hand, tobacco expenditure among the highest income households does not account for a significant portion of their total household expenditures as cigarettes are far more affordable for this group (E. Blecher & Van Walbeek, 2004). In relation to this, the richest quintile in Malaysia has been persistently spending the least portion of their monetary resources on tobacco expenditure at five points in times. The underlying reason for this is that the richest quintile has a higher amount of household income and hence the price of a pack of cigarettes would just consume a small portion of their available monetary resources. Not only that, subpopulation analysis reveals that the tobacco share was also gradually reducing from 1993 to 2014 in all quintiles. This indicates that cigarettes were gradually becoming more affordable in Malaysia and that less monetary resources were required from total household consumption expenditures for tobacco as the prevalence of tobacco-smoking was increasing in Malaysia. Overall,

both the overall population and subpopulation analyses showed that the tobacco expenditure share of total household expenditures for all quintiles was relatively small and thus cigarettes were still very affordable across all of the quintiles throughout the period under study.

In general, the findings in the study suggest that the burden of tobacco-smoking has been persistently high even though tobacco taxes have been increased over time. In addition, the amount of monetary resources required to purchase cigarettes in Malaysia has been small and the tobacco expenditure share of total household consumption expenditures has been relatively low across all of the quintiles. Possible reason for these findings could be the suboptimal pricing of cigarettes or the inadequacy of the tobacco tax rate. Additionally, the availability of other options that mitigate the increasing price of cigarettes such as resorting to the purchase of illicit cigarettes may be intrinsically linked to the effectiveness of tobacco taxes. In relation to this, the rampant marketing and availability of cheaper illicit cigarettes in Malaysia ensures that cigarettes are still highly affordable. For instance, illicit cigarettes constituted almost a quarter of the cigarette market throughout Malaysia in 2008 (Liber et al., 2015; The Star, 2009) Moreover, the price of a 12-pack of illicit cigarettes in Malaysia was merely MYR4.20 compared to MYR9.53 for licit cigarettes in 2011 (Liber et al., 2015). This enormous price disparity would certainly encourage tobacco smokers to opt for the cheaper illicit cigarettes in order to maximize their constrained household budget.

From the perspective of the welfare aspects, the crowding out of four main categories of expenditures, namely food, education, medical care and housing and rent, was persistent across the five consumption expenditures quintiles in Malaysia. As regards the crowding out of the above categories, there was no specific gradient in the ascending consumption expenditures quintiles. In India, a similar condition was also seen where

there was no specific difference by income status in both the urban and rural strata in term of the crowding out of essential items and services (R. M. John, 2008). In Cambodia, the crowding out of food was observed both in low- and high-income households (R. M. John et al., 2012). In short, the crowding out effect is relatively persistent irrespective of the income status or the consumption expenditures level. Hence, the welfare impact of tobacco-smoking should not be underestimated in all tobacco-smoking households as crowding out seems to be rather homogenous.

In relation to the crowding out of food, food has always been a basic necessity and accounts for a major portion of any household budget, whether rich or poor. In this study, food constituted, on average, about 26.0% of the household budget. A few studies in LMICs have reported lower food expenditures among tobacco-smoking households especially in low- and middle-income households (Efroymson et al., 2001; R. M. John, 2012; R. M. John et al., 2012). The current study obtained a similar finding where food expenditures was not only significantly reduced among tobacco-smoking households compared to non-smoking households at the national level; it was also reduced across the five consumption expenditures quintiles. Moreover, it was surprising that the richest households also experienced, to a certain extent, the crowding out of food. However, the magnitude of the crowding out effect was slightly lower than that the poorest and the second quintile but no specific socioeconomic gradient was observed. From the analysis, evidence was established that higher tobacco expenditure further reduced food expenditures among tobacco-smoking households especially among the poor and second quintiles. This is possibly due to already constrained household income being further reduced as tobacco expenditure increased. This finding is obviously worrying as a reduction in food expenditures may directly cause poor nourishment among the children in such households which in turn leads to increased morbidity and mortality among children especially in poorer households (Nonnemaker & Sur, 2007).

Expenditures on education and on medical care is a crucial capital investment intended to improve household well-being. Hence, the crowding out effect in both of these categories would negatively affect household members especially children. The results from this study indicate that tobacco-smoking households significantly sacrificed their investment in education compared to the non-smoking households. In addition, the crowding effect was not only observed in the poorer tobacco-smoking households, but also in the fourth and richest quintiles of these households. This particular finding could be attributed to the higher time preference among smokers where they could be less future-oriented and thus, place less weight on education (Peretti-Watel, L'Haridon, & Seror, 2013). This phenomenon could have a critical impact on their children's educational opportunities and jeopardize human capital investment and economic development at the national level in the long term. Although the magnitude of the crowding out is relatively low in education compared to food, its long-term effects on the next generation could be massive.

As compared to the crowding out effect on education, the negative association between medical care and tobacco-smoking households was relatively heterogeneous across ascending living standards whereby the tobacco-smoking households in the richest quintiles spent significantly less on medical care compared to their non-smoking counterparts. In addition, the higher tobacco expenditure households significantly crowded out medical care as compare to low tobacco expenditure households among tobacco-smoking households. In this context, medical care could be more discretionary among smokers whereby they might pay less attention to non-emergency and chronic medical conditions. Furthermore, their decision to continue smoking partially explains their low concern about health even though tobacco-smoking has been long proven to have disastrous medical consequences. The crowding out of medical care poses a risk to health and would possibly also affect the individual's future earning potential due to ill-

health and consequently their family's well-being. In contrast to this negative association, a previous study conducted in 40 LMICs reported higher medical care expenditures among tobacco-smoking households due to the higher medical expenditures associated with tobacco-related illnesses (Do & Bautista, 2015). Another possible reason for this finding in Malaysia could be due to the highly subsidised healthcare system in Malaysia where the public health care sector constituted of almost more than half (55.2%) of the total expenditures of health in Malaysia (WHO, 2016c). Hence, it would not be surprised the low medical expenditures among tobacco-smoking households could partially be contributed by the highly subsidised health care sector in Malaysia. In summary, the association between tobacco-smoking status and medical expenditures may be less straightforward than generally thought.

Another key finding of this study was the presence of the crowding out effect in housing expenditures among tobacco-smoking households from the poorest quintile to the fourth quintile. Moreover, housing expenditures declined as smoking intensity increased. It is undeniable that housing is another basic and important need of every household. In this regard, a previous study has stated that household consumption, wealth and income affect home ownership in Malaysia (Tan, 2008). Hence, a reduction in monetary resource due to tobacco-smoking would certainly reduce the opportunity to own or to rent a safe and secured house. Hence, tobacco-smoking households might resort to a cheaper and less well-equipped house. In this context, poor housing has been linked to environmental toxins and crowding which directly affect the health status of household members (Leventhal & Newman, 2010; Thomson & Petticrew, 2007). In addition, housing is a well-recognized social determinant, whereby it can directly increase the risk of a wide range of health conditions among household members such as respiratory infections, asthma, lead poisoning, injuries and mental illnesses (M. Marmot, 1999). In

contrast, having a secure and safe house can ensure the safety and health of household members especially children.

In short, this study found that crowding out effects were present in Malaysia across all tobacco-smoking quintiles irrespective of the consumption expenditures. Nonetheless, the crowding out effects in food, housing, medical care and education were relatively small compared to those among non-smoking household. In addition, there was no specific socioeconomic gradient in the magnitude of the crowding out effects. This could possibly be due to suboptimal pricing of cigarettes contributing to inadequate tobacco taxation as well as rampant availability of cheap cigarettes, both of which have made cigarettes highly affordable in Malaysia and hence the welfare impact was fairly small. Although the crowding out effects were minimal in Malaysian tobacco-smoking households, a dose-response relationship between household tobacco expenditure and the magnitude of crowding out in food, housing and rent and medical care was established for tobacco-smoking households. This is a crucial finding as it indicates that the higher the tobacco expenditure, the greater the crowding out effects. This is worrying as it raises concern as to whether increasing the price of tobacco would compromise the welfare of household members in tobacco-smoking households. Nonetheless, if tobacco cessation increased with the increasing cigarette price, then the adverse welfare impact caused by crowding out could be directly prevented. Consequently, in short, the ultimate aim of tobacco taxes of reducing tobacco-smoking would not be compromised as the reduction in adverse health impact would outweigh the possible increase in adverse welfare impact.

8.6 Significance of the findings

The findings of this study have implications for tobacco control in Malaysia. They also offer lessons for other countries in term of the non-health financial and welfare impact attributed to household tobacco expenditure as well as the distribution of tobacco expenditure across various living standards. This study has thus achieved its aim of providing insights into the importance of tobacco control in the form of tobacco taxation.

8.6.1 Policy lessons for Malaysia

The finding of low household tobacco expenditure and very low tobacco expenditure share in the present study are intriguing, given the high tobacco-smoking burden in Malaysia. Although tobacco expenditure share is not the best parameter by which to assess the affordability of cigarettes, it shows that cigarettes have remained very affordable in Malaysia. This in turn highlights that tobacco taxes are still suboptimal in the country and also hints of rampant availability of illicit cigarettes.

The Malaysian Government has employed tobacco taxation to reduce smoking and has gradually increased the tax rate to reduce cigarettes affordability (My Health Portal, 2018). However, the tobacco tax burden in Malaysia was only around 46.0% compared to the 70.0% recommended by the WHO-FCTC. Notably, the tax burden in Malaysia remains lower than that in Singapore, Thailand, Brunei, Indonesia, the Philippines, and Myanmar. There is a strong and urgent need to look into the current tobacco taxation; where tobacco taxes in Malaysia need to be closely monitored and adjusted on a regular basis to effectively reduce tobacco smoking. Previous studies by Ross et al (2007) and Norashidah et al (2013) have revealed that an increase in the price of cigarettes would be required to further reduce cigarette usage (Norashidah, NikMustapha, & Mastura, 2013; Norashidah, NikMustapha, Rampal, et al., 2013; Ross & Al-Sadat, 2007).Importantly, the

increase in tobacco taxes should be in line with income growth. This is corroborated by finding of a previous study which showed that a 1.0% increase in real income increased cigarette usage by 1.46% (Ross & Al-Sadat, 2007).

In addition to optimizing tobacco taxes, it is also very important to boost enforcement to control illicit cigarettes in Malaysia. Tobacco taxes are intrinsically linked to the rampant availability of illicit cigarettes because the tobacco taxation system is weakened by illicit cigarettes acting as the best tax avoidance option for tobacco smokers. Although the actual burden of illicit cigarettes in Malaysia remains unknown, data from certain sources suggest that illicit cigarettes may account for almost a quarter of the overall cigarettes market in 2008 (Liber et al., 2015; The Star, 2009). Also, in 2015, the illicit cigarettes shares soared to almost half of the total cigarettes market, to 45.6%, after the implementation of a 40.0% increase in the cigarette excise tax (FMTnews, 2016). In addition, in the same year, illicit cigarettes were sold at MYR 3.00 per pack compared to licit cigarettes that were being sold for at MYR 17.00 per pack (FMTnews, 2016). It therefore seems futile to expect tobacco taxation alone to be effective in reducing the burden of tobacco smoking. Inhibiting the youth from initiating smoking is almost impossible under the current circumstances in which cheap cigarettes are highly available. In short, it is of the utmost importance that there is effective and efficient enforcement to eradicate illicit cigarettes that is complemented by persistent and adequate increases in tobacco taxes in order to ensure that the tobacco taxation system benefits tobacco smokers across all living standards.

In relation to the above, the tobacco industry has suggested reintroducing kiddie-packs of cigarettes with the aim to reducing dependence on illicit cigarettes among tobacco smokers. Historically, kiddie-packs of seven and 10 cigarettes were initially banned by the Malaysian Government in 2006 to discourage youth from taking up tobacco-smoking.

Then, in 2010, the kiddie-pack of 14 cigarettes was also banned. Nonetheless, the debate about reintroducing kiddie-packs in Malaysia resurfaced recently in 2017 after a surge in illicit cigarettes in Malaysia (FMTnews, 2018; NST, 2018; The Star, 2017). The suggestion to reintroduce kiddie-packs was supported by most of the players in the tobacco industry, but the Ministry of Health Malaysia voiced strong objections stating that the reintroduction of kiddie-packs would be a "backward" step as kiddie-packs would not be able to resolve the issue of illicit cigarette consumption. Moreover, kiddie-packs may open up more opportunities for youth to initiate tobacco-smoking due to the cheaper price of these packs compared to the 20-packs cigarettes.

Rather, to effectively control illicit cigarettes, one of the best options to adopt is to strengthen enforcement. In this regard, implementing tracking and tracing systems from points of manufacture to all point of sales would enable the identification of points of diversion from the legal to the illicit market (Joossens et al., 2010). In addition, serious financial penalties should be applied for infringements. Also, internet sales of tobacco products to retail customers should be ended. Furthermore, there should be strict scrutiny procedures for selecting companies in the tobacco supply chain to ensure that they are all genuine companies (Joossens et al., 2010). In short, there are various mechanisms that can be employed to combat illicit cigarettes rather than following the path of reintroducing kiddie-packs which is obviously a backward move that contradicts the National Tobacco Policy of Malaysia and the WHO FCTC.

8.6.2 Implications for other countries

Other than the insights into tobacco taxation in the context of Malaysia that were comprehensively discussed earlier, this study also highlighted that there are non-health welfare and financial impact that can be attributed to tobacco-smoking. Although health impact has been the main concern in regards to tobacco-smoking, both active to passive, the non-health financial and welfare impact should not be underestimated. The current study has therefore also contributed towards the theoretical body of knowledge especially in relation to improving the understanding of the relationship between tobacco smoking and its adverse financial and welfare impact.

The situation in Malaysia does not go against the prevailing understanding of the relationship between tobacco smoking and adverse non-health financial and welfare impact published in other studies. Hence, the findings on the non-health adverse impact presented in this thesis are obviously not the first of their kind to be reported in the world, but they are the first for Malaysia. For instance, previous studies have shown that tobacco expenditure leads to significant crowding out effects in food, education and clothing in Cambodia and in India (R. M. John, 2008; R. M. John et al., 2012). Also, in a study undertaken in China by Wang et al (2006), it was revealed that tobacco expenditure crowded out investment in human capital, future farm productivity and financial security (Wang et al., 2006). In addition to the identified crowding out effects, this study also revealed the dose response relationship between tobacco expenditure and the magnitude of the crowding out effect in essential goods and services. The nature of this relationship indicates that the greater the tobacco expenditure the greater the impact of the crowding out effects. Consequently, tobacco-smoking not only adversely affects health, but also the welfare and financial aspects of household members.

This study found that, in Malaysia, the poverty impact of tobacco expenditure was relatively small and were gradually reduced as cigarettes became more affordable. There is no doubt that the eradication of poverty is important in any country and hence any possible contributor to poverty should be scrutinized. However, the small increase in the estimate of impoverishment due to tobacco expenditure and the high burden of tobacco smoking observed in the context of Malaysia is paradoxical. This is worrying as it indicates that cigarettes remained relatively affordable in Malaysia despite increases in tobacco taxes. Hence, this implies that it is important to ensure that cigarettes are truly unaffordable in order to reduce the burden of tobacco consumption in all countries.

Although it may be argued that an increase in tobacco taxes would lead to the further crowding out of essential goods and services among tobacco-smoking households, the basic public health intention of tobacco taxation should not be abandoned, especially where it is used to reduce tobacco smoking and eventually reduce the morbidity and mortality attributed to tobacco-smoking. As such, the evidence on the adverse financial and welfare impact of tobacco-smoking should be interpreted intelligently as this adverse impact will affect the next generation in the tobacco-smoking household if tobacco-smoking persists. Conversely, the adverse financial and welfare impact will diminish if tobacco-smoking ceases due to tobacco taxes. In short, the public health intention behind tobacco taxation should be upheld at all times to successfully combat the tobacco epidemic in all parts of the world.

8.7 Limitations of the study and future directions

This study explored the adverse non-health financial and welfare impact attributed to household tobacco expenditure and also established the dose response relationship between tobacco expenditure and the crowding out of essential goods and services. However, added value could have been achieved if data on the number of tobacco smokers in the household and the intensity of cigarette smoking had been available. In this study, it does not quantify on the tobacco taxes and illicit cigarettes. Therefore, a future study might wish to collect data on and explore the relationship between the number of cigarettes smoked and the actual quantum of tobacco expenditure. The results of such an inquiry would help to confirm whether illicit cigarette consumption was taking place in the market. Although the primary data collection was well-planned and reliable, the expenditure diary that was used for data collection could be filled up by any of the household members which could either overestimate or underestimate the actual household tobacco expenditure. Hence, it would the better that the tobacco smokers of the household who should fill up on the amount of money spent on tobacco products.

Another takeaway from this study is that research on illicit cigarettes in Malaysia is urgently needed in order to verify the actual burden of illicit cigarettes among tobacco smokers. For instance, a survey could be conducted among tobacco smokers to understand their daily choice of cigarettes as well as their expenditure on illicit cigarettes. The mapping out of the real burden of illicit and licit cigarettes would be helpful to the policymakers in their efforts to effectively combat the tobacco epidemic. In addition, a study to understand the tobacco tax avoidance strategies employed by the tobacco smokers in Malaysia could also be conducted. An understanding of the mitigation strategies used by tobacco smokers when faced with tobacco tax increases would enable policymakers to better evaluate the relative impact of all the possible tax avoidance option when increasing tobacco taxes. This is important because the effectiveness of tobacco

taxation is intrinsically linked to the taxation mitigation options available. In other words, the tobacco taxation system is weakened if there are plenty of other cheap cigarette options for tobacco smokers to choose from. In relation to the study of illicit cigarettes, various related agencies could collaborate in a joint effort to comprehensively study the real burden of illicit cigarettes and the possible sources of illicit cigarettes.

In a nutshell, this study essentially highlighted the non-health financial and welfare impact attributed to tobacco expenditure as well as the distribution of household tobacco expenditure in Malaysia. The presence of adverse financial and welfare impact in tobacco-smoking households should definitely be of concern to policymakers as these adverse effects affect all of the household members. In addition, the study findings raise concerns regarding whether a further increase in tobacco taxes would further constrain the financial resources of tobacco-smoking households and eventually lead to adverse financial and welfare effects. Consequently, a further assessment of the welfare and financial impact could be made after a significant increase in tobacco taxes has applied in conjunction with stringent enforcement activities to remove illicit cigarettes from the market. In short, the basic public health intention to reduce tobacco consumption by reducing affordability of cigarettes should not be forgotten. This is because the adverse health impact caused by tobacco-smoking are enormous and these adverse health impacts are interconnected with adverse financial and welfare impact. Hence, both the health and non-health impact should be treated equally with the main intention of reducing the morbidity and mortality attributed to tobacco-smoking.

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List of Publications and Papers Presented

1. "Distribution of household tobacco expenditure and household affordability of tobacco products in Malaysia" is accepted for publication in ASM Special Issue [APRU Global Health Conference 2018].
2. Trend and distribution of household tobacco expenditure in Malaysia from 1993 to 2014 was presented in the 9th Public Health Conference 2018, Seremban, Negeri Sembilan from 15/08/2018 to 18/08/2018.
3. Tobacco expenditure and its implications for household resource allocation in Malaysia was presented in the 12th annual APRU Global Health conference, Kuala Lumpur from 28/10/2018 to 30/10/2018.
4. The impoverishment due to direct tobacco expenditure in Malaysia was presented in 6th Asia Pacific Conference on Public Health in July 2019.