THE EFFECT OF REMOVING TARIFFS AND DOMESTIC TAXES ON INSECTICIDE TREATED NETS (ITNs), NETTING MATERIALS AND INSECTICIDES IN ZIMBABWE

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A research report presented to the School of Economics/ Health Economics Unit at the University of Cape Town, in partial fulfillment of the requirements for the Masters of Social Science Degree in Health Economics.

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DEDICATIONS

This Dissertation is dedicated to my wife Monica, and my kids Tatenda, Tanaka and Tinotenda Shamu.

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TERMS OF REFERENCE

The Research paper was prepared for the School of Economics and the Health Economics Unit at the University of Cape Town in partial fulfillment of the Masters of Social Science Degree in Health Economics.

The main objective of the research was to study the effect of removing tariffs and domestic taxes on ITNs and their inputs and the resultant effect on consumer demand and ITN utilization.

I certify that this research report is my own original work.

Signed by candidate

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Supervisor

ABSTRACT

The use of Insecticide Treated Nets (ITNs) has already proved to be a cost effective way of malaria vector control. The important emphasis now should therefore be on how to increase the accessibility and utilization of the mosquito nets through devising viable financing and promotional mechanisms that are sustainable and equitable in the long run. One way of financing ITNs that has been propounded by the Roll Back Malaria (RBM) has been the issue of the reduction or elimination of tariffs and domestic taxes on ITNs and their inputs.

The purpose of this study was to look at how and in what way this RBM financing policy on eliminating tariffs and domestic taxes on ITNs and their inputs would benefit the consumer given the complex nature of ITN industry operations and the consumer behaviour.

The study concentrated on information gathered from net manufacturers and insecticide providers, wholesalers and retailers and some key personnel in the overall ITN industry to gather information on production, sales and marketing trends.

The analysis revealed that there are indeed gains to be realized by both the consumer and the private sector if tariffs and taxes are removed, in terms of the increase in demand and supply of the product. The elimination of the 15% tariff on ITN input prices in Zimbabwe, *ceteris paribus*, would lead to the retail price of ITNs falling by between 4% and 12%. This would result in consumer purchases increasing by between 2% and 11%. The elimination of both taxes, other things constant, would lead to the price falling by between 4% and 23%, leading to retail purchases increasing by between 2% and 21%. Depending on the price elasticities of demand and supply, the fall in retail prices and the consequent increase in retail purchases are quite substantial in a developing country context where incomes are very low.

Sensitivity analysis using different demand and supply elasticities also showed that the elimination of tariffs and taxes on ITNs and their inputs would lead to a substantial fall in retail purchases resulting in retail purchases increasing.

Conceptually the study was able to show that manufacturers benefit from the fall in input prices and increase in demand while the consumers would benefit from the fall in retail prices, however, the benefits are more in a constant marginal cost industry than in an

increasing marginal cost industry. Although theoretically possible, the study could not *guarantee* practically that the fall in input prices would indeed eventually translate into a fall in the retail price of ITNs on account of the complex distribution chain and market failures. Prices are also generally known to be 'sticky' in adjusting downwards.

The analysis also showed that even with different elasticity values and with different estimates of other parameters like returns to scale, a removal of a 15% tariff and 15% sales tax (absolute sum of 30%) would not automatically mean an equal fall in the retail price of the ITN on account of the different mark ups and supply responses that are met by the agents involved in the distribution of ITNs.

In conclusion, the issue of eliminating tariffs and taxes was found to be a noble idea, although its effectiveness in Zimbabwe did not warrant placing a lot of emphasis on it. The study noted that coupled with idea of commercial pricing, demand creation and social marketing to make this policy work, other ways to finance ITNs should also be looked at so as to ensure sustainability of the ITN industry and supply of ITNs as well as equitable distribution of ITNs in the long run. These financing mechanisms included targeted subsidization for example by use of voucher systems and the promotion of community projects and programmes in the country.

The study also noted that there is a need to do further research in Zimbabwe to find out more ITN industry cost of production information especially the supply elasticity. This study was a partial equilibrium analysis that only looked at the relationship between price and quantity, therefore there is also need to carry out a general equilibrium analysis that would incorporate all factors that affect consumers purchasing decisions. More information and specific data are needed to verify whether ITNs are price elastic or income elastic.

ACRONYMS

ADB	AFRICAN DEVELOPMENT BANK
AN.	ANOPHELES
CCZ	CONSUMER COUNCIL OF ZIMBABWE
CIF	COST INSURANCE AND FREIGHT
DALY	DISABILITY ADJUSTED LIFE YEAR
DDT	DICLORO-DIPHENYL-TRICHLOROETHANE
DFID	DEPARTMENT FOR INTERNATIONAL DEVELOPMENT
DSA	DISTRICT SERVICES ASSOCIATION
GDP	GROSS DOMESTIC PRODUCT
ITNS	INSECTICIDE TREATED NETS
ITNSC	INSECTICIDE TREATED NETS SUB-COMMITTEE
JICA	JAPANESE INTERNATIONAL CO-OPERATION AGENCY
KAP	KNOWLEDGE, ATTITUDE AND PRACTICE
MAE	MARKETING ASSESSMENT EXERCISE
MOHCW	MINISTRY OF HEALTH AND CHILD WELFARE
NGO	NON-GOVERNMENTAL ORGANISATION
OPD	OUT PATIENTS DEPARTMENT
PIB	PERMETHRIN IMPREGNATED BED-NETS
PSI	POPULATION SERVICES INTERNATIONAL
RBM	ROLL BACK MALARIA
RHS	RESIDUAL HOUSE SPRAYING
SAPs	STRUCTURAL ADJUSTMENT PROGRAMMES
SSA	SUB-SAHARAN AFRICA
SAMC	SOUTHERN AFRICA MALARIA CONTROL
SS	SENTINEL SITES
US$	UNITED STATES DOLLAR
VCSC	VECTOR CONTROL SUB-COMMITTEE
VIDCO	VILLAGE DEVELOPMENT COMMITTEE
WB	WORLD BANK
WHO	WORLD HEALTH ORGANISATION
WTP	WILLINGNESS TO PAY
Z$	ZIMBABWEAN DOLLAR

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: BACKGROUND TO THE STUDY

1 . 1 INTRODUCTION

The introduction of a wave of economic Structural Adjustment Programmes (SAPs) in the developing world saw the heralding and emphasis of cost recovery measures as one of the basis for broader macro-economic policies and fundamentals. This also coincided with the publication of the famous World Bank document on Financing Health Care: an agenda for reform (1987), which gave an added impetus to this wave of macro-adjustment policies (Kutzin1995). However, cost recovery was not seen as a policy per se, but as an instrument to address welfare issues. Taking it as a policy would have entailed changing the whole philosophy of cost recovery to that of ultra-profit maximization that would have become a great disadvantage to the poor. The cost recovery instrument is now essentially the idea behind The Roll Back Malaria (RBM) initiative to see the reduction or removal of domestic taxes and tariffs on ITNs and their inputs as a way to increase accessibility and utilization.

The rationale of this instrument has its basis on the idea that it would entice the private sector into producing more affordable mosquito nets by reducing input prices through the reduction or elimination of tariffs and by promising non-interference in the pricing of ITNs. Further, the reduced ITN retail prices on account of tariff and domestic tax elimination would attract more consumers into purchasing more mosquito nets resulting in greater utilization.

Market pricing of ITNs just like the idea of user fees (Creese 1991), has generally two functions, [1] to generate revenue from the consumers who are willing and able to pay for the services offered at the particular going price and [2] to act as a rationing and market segmenting mechanism.

However, just like user fees, market pricing of ITNs would have some drastic impact on equity especially since Zimbabwe has 61% of the population classified as being poor. Out-of pocket payments are generally known to be very regressive. The above observation, however, did not stop proponents of the market pricing of ITNs from supporting this form of pricing as technically efficient and non-distortionary. Deliberations by Path Canada, a major player in

malaria control initiatives and advocate of the extensive use of ITNs, with net manufacturers and distributors in Tanzania and Kenya revealed that sales tax, and import duties on nets, netting materials and insecticides imported through proper commercial channels formed a major component of retail price for ITNs (Davies 1998). Hence it was only economically sound to either remove or lower these taxes in order to lower the retail price for ITNs. This is basically why the study is concentrating on the issue of removing tariffs and domestic taxes on ITNs, just like user fees, as a good way of 'financing' as they are a viable cost recovery measure.

Although in a marketing study done in the four countries of Tanzania, Ghana, Gambia and Burkina Faso it was revealed that the reduction of tariffs and the removal of domestic taxes on ITNs in Tanzania did not lead to significant reduction in retail prices relative to the ITN prices in other Sub-Saharan countries. However, the study showed that it improved the quality and availability of ITNs instead. In Ghana, a 25% tariff and a 15% sales tax pushed the cost of an untreated net above US$10 (Macdonald in Just the Basics Number 1-June 2001). In Nigeria the cost data revealed that the elimination of these taxes would lead to a fall in prices of 22% and an increase of retail sales of 11%, other things constant (Simon et al 2001).

Before the study looks at the issue of tariffs and domestic ITN taxes in detail, it will first give a background analysis of the malaria challenge in both Africa and Zimbabwe as a way to justify why we need different action policies to combat malaria. Quoting from a speech by Dr GH. Brundtland in 2001, the study justifies why the extensive use of ITNs has seen so much literature and time devoted on it: "I am pleased to note that since the Abuja Summit, 21 countries have developed plans for multi-sectoral action to Roll Back Malaria based on these strategic elements [vector control strategies]. Out of those four, Roll Back Malaria placed particular emphasis on preventing malaria, and concentrated on encouraging the widespread use of insecticide-treated mosquito nets".

1.2 PROBLEM STATEMENT

This section defines the malaria problem in Africa and Zimbabwe respectively, spelling out the effects malaria has on socio-economic issues, and how malaria has impacted negatively

on the economies and social behaviours of affected countries, in particular Zimbabwe. Figures on morbidity and mortality will be given to highlight the magnitude of the impact. Further more, this section also looks at the rationale and justification of carrying out this research given the background scenario of escalating morbidity and mortality due to malaria and the less than expected success rate of the existing malaria vector control measures.

1.21 MALARIA CHALLENGE IN AFRICA

Malaria is a problem that has always presented a mammoth challenge to the developing countries that have high malaria endemicity. Past studies (Gallup et al, 1998, Mills 1998, Goodman et al, 1999, Shepard et al, 1991) on the economics of malaria have shown that the important principle behind the studies of malaria has been necessitated by the revelation that expenditure on malaria control measures is not consumption per se but a form of investment since a healthy nation is a wealthy nation. In some cross-country regressions done previously covering the period 1965 to 1990s on the link between malaria and poverty, it was confirmed that there was a correlation between malaria and poverty (Gallup et al, 1998). They showed that countries with severe malaria had income levels data that was 33% less than those countries without malaria in the year 1995. The GDP per capita in 1995 for the countries with malaria was US$1.526 while for those without severe malaria it was US8.268, which was quite a substantial difference.

Malaria is one of the most common diseases affecting tropical populations and the temperate regions. It is estimated that 90% (estimates reflect that the region has 100 million malaria cases) of the global episodes of clinical malaria are found in Africa alone (Report: WHO Technical Consultation 2001).

Malaria is caused by an infection from a protozoa. The common parasite known as plasmodium[1] falciparum causes the most incapacitating and unbearable burden, which eventually results in severe complications to affected individuals. Although other parasites

[1] Plasmodium is a germ protozoan parasite that lives within the red blood cells of Humans. Its asexual development takes place in humans and then it completes its sexual development in the stomach and glands of anopheline mosquitoes. There are three species of anopheles mosquitoes: An. Arabiensis, an. Gambie and an. Funestus. The anopheles mosquito transmits four species of plasimodium: which are plasmodium: P. vivax, P. ovale, P. malarie and P. falciparum.

are non-debilitating and these include plasmodium ovale, plasmodium malariae and the plasmodium vivax, they still pose a threat to human social and economic development. The transmission of malaria, its geographic distribution and its prevalence is influenced by factors such as topography, season, species and the habits of the vector (ITN Draft Policy Document 2001). It is, however, the infective anopheline mosquito that transmits malaria to humans.

Although malaria may be a problem to other regions outside Africa, the burden of malaria is mostly severe in Africa where more than a million deaths per year are estimated to occur as a result of the disease. In highly endemic malaria areas and where the disease presents in stable form children below the age of 5 years are the most affected, while in the highly endemic and unstable areas, all age groups are affected. The effect of malaria on the productive age group mostly results in the withdrawal from labour causing huge economic losses (Hammer 1993). Since the 1990s, Africa's GDP per capita estimated at US$300 billion has declined due to malaria while economic growth has slowed down by 1.3% per year *(ibid)*. Combating malaria therefore would account for estimated savings of between US$3 billion to US$12 billion per year. One such study has shown that the benefits of malaria control may be one health life year gained per US$1 to US$8 invested in the malaria intervention (Mills 1998), which is just as cost effective as investment in measles vaccination.

1.22 MALARIA SITUATION IN ZIMBABWE

Malaria is one of the leading causes of morbidity and mortality in Zimbabwe. Scientific evidence on what causes malaria in Zimbabwe states that the malaria vectors belonging to the *An. Gambie*[2] and *an. Funestus*[3] transmit malaria in Zimbabwe. However, the principle vector in Zimbabwe is the *an. Arabiensis*[4] that is in the same group of species as the *an.gambie*. Of all malaria cases, 97% of these cases are due to *Plasmodium falciparum* considered the most virulent of all human malaria parasites.

[2] Anopheles gambie is an athropophilic (rests mostly outside in water bodies) anopheles mosquito that prefers to bite humans to animals.
[3] Anopheles funestus is another anthropophilic mosquito that prefers to bite animals to humans.
[4] Anopheles arabiensis is an endophilic (rests mostly indoors) anopheles mosquito that prefers to bite humans to animals.

With a population of slightly above 13 million people (CSO 1999 figures) and a nominal per capita gross national income of Z$670, the effect of malaria on the economy and the demographic picture of the country is very sad. Although the MOHCW has increased access to health facilities, with 85% of the population now living within 8 km of a health facility, the broader picture of the welfare of the Zimbabweans, especially with regards to life expectancy has not been positive over the years. The gains in the health sector of the two last decades after independence in 1980 have been eroded. For example, in 1980 life expectancy at birth was 56 years, and this rose to 61 years in 1990. This figure went down to 54 years for males and 57 years for females in 1995.The figure has now fallen down dramatically to an average life expectancy of 39 years due to the Aids pandemic. The fall in life expectancy although not attributed singly to malaria and HIV Aids, reveals a very grim picture of the general well being of the populace. However, a positive element that can be taken advantage of in our battle to eradicate malaria is the integration of the curative and the preventive health services in the country. This was achieved by a radical change from the 1960s-70s vertical programs and the current package on the market now combines curative, promotive, preventive and rehabilitative care, which is more effective in combating preventable diseases like malaria.

Approximately one person in three in the country lives in a malaria risk area. In 1995 alone 720 000 clinical malaria OPD cases were recorded in the whole country. This figure rose rapidly in 1996 by over 130% to about 1.7 million cases. In 1999 the clinical malaria OPD cases rose further to 1.8 million *(Zimbabwe National Health Profile 1999)*. Higher figures of malaria OPD attendances are normally recorded in the rainy season that starts in November and ends in April.

Of the total 40 districts[5] that are malaria prone in the country, 16 of them reported malaria incidence rate of higher than 100 per 1000 population in 1996, with the most affected district of Hwange reporting an incidence rate of 900 per 1000 population in the same year. This figure rose in 1999, where about 20 districts in the country recorded an incidence rate of above 160 per 1000 population, with the district of Mudzi recording the highest incidence rate of 885.29 per 1000 population.

[5] There are a total of 59 districts in the country.

Table 1 below gives a break down of some figures of the population at risk from malaria and figures for the most vulnerable groups (children under 5 years and the pregnant women) in Zimbabwean.

Table 1: Population at Malaria Risk, 1998

Percentage of population in malarious areas	*Total population living in malarious areas*	*Number of pregnant women at risk of malaria*	*Number of under 5s at risk of malaria*	*Number of households in malarious areas*
50	5962000	219000	987500	1 268 000
As a percentage of Total Population at risk to malaria		3%	15%	

Extracted from WHO-SAMC Bulletin

Out of an estimated 2.5 million households[6] in the country, more than one million of these are located in the malarious areas, representing about 50% of all households in the country. This figure tallies well with the 50% estimated for the population living in malarious areas as shown in table 1. Pregnant women and children, who happen to be more vulnerable to malaria, constitute a combined sum of 18% of the total of those at risk to malaria. This is quite a substantial percentage figure and should one also add the poor sections of the society, then this figure is set to rise considerably. However, malaria control efforts have so far managed to confine the transmission of the disease to the north, northeastern and southeastern parts of the country (ITN Draft Policy Document 2001).

For the period 1995-1999, reported annual malaria deaths ranged between 305 and 1392 while the estimated figures ranged between 9 000 and 13 600 deaths. The estimated figures are quite substantial possibly pointing out to the fact of under reporting of malaria mortality within the system.

[6] Family size is 4.76 and the estimated families in the country are 2.5million.

Economically, the country loses about 0.8% to 1.9% productivity as a percentage share of GDP due to malaria *(SAMC 1997-2000)*. While residual household spraying in Zimbabwe remains the major preventive measure, the cost of pyrethroids insecticides has increased to US$1.4 million per year and hence has impacted negatively on the effective use of residual house spraying to control malaria. Residual house spraying also requires a well skilled and trained workforce coupled with better supervision and adequate equipment The high cost of residual house spraying has caused the shifting of the emphasis and high dependence of control measures on spraying to the involvement of the integration of mosquito larviciding, the use of mosquito nets and other personal protection measures in the fight to prevent malaria. This has necessitated the need to look at better ways of financing the acquisition of ITNs.

In terms of available data on gross domestic product in the health sector, in 1990 3.1% of real GDP (US$22 per person) was spent. This amount decreased to 2.1% of real GDP (US$11 per person) in 1996 and a marginal rise in 1997 to 2.4% of GDP (US$13 per person). Over the period from 1980 /81 to 1996/97, the Government of Zimbabwe's health expenditure as a percentage share of real GDP, however, remained stable, oscillating between 2% and 3.5%. On the other hand Health expenditure per capita increased from 2% in 1980/81 to 7% 1996/97 *(Zimbabwe National Health Profile 1999)*. The increase in per capita health expenditure did not, however, match the growth in population (1.7% population growth rate from 1990-1999) due to factors such as inflation and depreciation of the Zimbabwe dollar against currencies of major trading partners, and the general political instability currently prevailing in the country.

The lack of resources in the health sector particularly the low health expenditure per capita have taken place under the background of a resurgence of malaria in the country. Coupled with the negativity described above, a household survey on poverty alleviation in Zimbabwe that was undertaken in 1995, revealed that about 45% of the population were categorized as very poor, with 16% classified as poor, implying that about 61% of the population are classified as generally poor. In that same study a total of 71% of communal land households were classified as very poor, while 31% were classified as non-poor. It should be noted that most malaria endemic places and malaria victims are in the rural areas and are also regarded

as some of the poorest people in the country. Any cost recovery measures would need strenuous efforts so that these vulnerable members of the society can be catered for.

1 . 3 PURPOSE AND OBJECTIVES OF THE STUDY

The malaria epidemic does impact negatively on the economic growth of the malaria countries (Gallup et al, 1998) hence Policy makers should strive hard to come up with an integrated set of vector control measures that fully combat this scourge. This particular research targeted one of the components of vector control, the use of ITNs, with a *Country-Specific* emphasis on the impact of the removal of tariffs and domestic taxes on ITN inputs and on the price of the final product respectively: The hypothesis being that the elimination of the tariffs and the domestic tax would lead to a substantial increase in demand and supply of ITNs in Zimbabwe since they would have become cheaper and affordable. This policy instrument was well spelt out and supported by the Ministry of Health and Child Welfare (MOHCW) when it announced that "... MOHCW will support the removal of taxes and tariffs as long as this arrangement translates to significant price reductions, benefiting the intended ultimate consumers" (National ITN Draft Policy Document 2001 pp11).

The main aim of the study therefore is to give a well thought out analysis of what is being suggested and advocated by MOHCW and Roll Back Malaria (RBM) as a viable option of financing ITNs in Zimbabwe. Documented evidence is necessary for easier selling to the policy makers especially since this policy instrument requires the working closely of MOHCW and the Ministries of Industry and Trade, and Finance. Below we summarize the main and specific objectives of the study.

1.31 OBJECTIVES OF THE STUDY

- The overall objective of the study would be to investigate the effect on ITN demand and accessibility [and supply] by households in the malaria endemic areas after eliminating tariffs and domestic taxes on ITNs and their inputs.

1.32 SPECIFIC OBJECTIVES:

1. Study the effect of tariff and taxes on ITNs, netting materials and insecticides prices procurement, production, supply and demand.
2. To calculate the supply elasticity[7] using cost data.
3. Inputting into the malaria policy on use of ITNs by providing empirical evidence from own country setting.
4. To provide information that may be useful in creating an environment for potential long- term market development.

1.33 HYPOTHESIS

1. Consumers must respond to the lower prices by purchasing more mosquito nets.
2. Commercial pricing of ITNs will cause an increase in supply of mosquito nets.

1 . 4 JUSTIFICATION AND SIGNIFICANCE OF THE STUDY

In this section the study looks at the importance of emphasizing the use of ITNs in the country juxtaposed with other existing vector control measures to bring out the essence of why one would be interested in the elimination of tariffs and taxes on ITNs and their inputs as a viable way to finance their acqusition.

1.41 VECTOR CONTROL

It is basically the effectiveness of the different vector control methods in Zimbabwe within the context of the resurgence of the most virulent malaria vector (plasmodium falciparum) in the country that have led us to believe that this study on ITNs, and in particular on the issue

[7] Elasticity measures responsiveness, where price elasticity of demand measures how much of the quantity demanded of particular good changes when its own price changes, other things constant. If a one percent change in price causes a more than one percent change in quantity demanded, then it is said to be price-elastic demand. If on the other hand a one percent change in price causes a less than one percent change in quantity demanded, then it is said to be price-inelastic demand.

Price elasticity of supply, on the other hand measures the responsiveness of quantity supplied of a particular good due to a change in its market price. Just like in the case of price elasticity of demand, if a one percent change in price of a good causes a more than one percent change in quantity supplied, then it is said to be price-elastic supply. If on the other hand a one percent change in price causes a less than one percent change in quantity supplied, then it is said to be price-inelastic supply.

of the elimination of the tariffs and domestic taxes on ITNs is very important. In the earlier section we noted that about half of the population in the country is at risk from malaria hence there is a need to critically look at the benefits of other forms of vector control such as the case of ITNs.

In this section the study gives a descriptive view of the vector control methods in Zimbabwe. It also gives a tabulated list of some of the studies that have so far been done concerning the cost effectiveness of the different preventive methods. About six studies on the cost effectiveness of ITNs have so far shown that mosquito nets are highly cost effective (Goodman et al, 1999). Promoting extensive use of mosquito nets therefore would warrant us to look at a viable financing mechanism hence the issue of the removal of tariffs and taxes on ITNs their inputs.

Table 2 below lists the four ways in which vectors are controlled in Zimbabwe. As mentioned earlier, the most common vector in the country is the anopheles arabiensis. The other vectors shown in the table, anopheles funestus and anopheles merus are classified as minor vectors. Vector control in Zimbabwe involves the annual spraying of households that are mostly located in the rural areas using residual insecticides. However, the anopheles arabiensis vector has started to show some resistance to the deildrin insecticide used for residual household spraying (RHS) posing a difficult in spraying efforts in the country. Since 1949 up until 1991 DDT (dicloro-diphenyl-trichloroethane) was used as an acceptable form of vector control within the malaria vertical vector control management of the 1960s and 1970s. DDT was also used in the integrated vector control management of the 1980s. Although DDT was regarded as most effective insecticide, it was discontinued in 1991 after tobacco farmers complained of contamination of their export tobacco crop.

Table 2: Vector control

Vectors		**Vector control and personal protection methods on use**	**Insecticide resistance**	**Sentinel sites (SS) for susceptibility and bioassay**	**VCSC and/ITNSC**	**National entomologist**
Major	***Minor***					
Arabeinsis	Funestus merus	RHS***[8] Larviciding* Bednets* Repellents*	An. Arabiensis for deildrin	SS exist Few bioassay tests	Exist, partially active	Exist

Source WHO-SAMC Bulletin. VCSC- vector control sub-committees, RHS – residual house spraying. Insecticides Treated Nets Sub-committee

Residual house spraying using pyrethroid insecticide is considered environmentally safer if compared to DDT. However, these insecticides are expensive hence unable to be used in all areas that need them due to lack of resources. Also as highlighted above, some of the malaria vectors have began to show resistance strains to some of the insecticide chemicals used in spraying. As highlighted in the table 2, alternative malaria prevention methods brought up within the framework of MOHCW's integrated primary health care were put forward. These include the use of personal protection methods (mosquito repellents and insecticide treated nets) and anti-malarials (chemoprophylaxis[9] tablets/liquid which in Zimbabwe are a combination of pyrimethamine and dapsone).

It is, however, difficult for one to say which malaria intervention method is more cost effective and hence better than the other because of limited cross comparison data on cost effectiveness of different interventions. The available studies are not comparable because of different settings: "… most studies produce what is called a single point estimate of cost effectiveness, and undertake only limited analysis of plausible range for the cost effectiveness ratio" (Mills 1999 pp97). Table 3 below gives the number of cost effectiveness analyses studies that have been undertaken so far on existing malaria interventions.

[8] The stars (*) are showing the intensity in use of each vector control measures in malaria control.
[9] Not recommended, however, in Zimbabwe for use in rural areas and individuals in malarious areas for longer periods due to the fear that they would develop resistance stains.

Table 3: Cost effectiveness studies

Type of Intervention	Number of Cost effective studies
ITNS	6
Residual Spraying	1
Prophylaxis for children	1
Ante-natal prophylaxis	3
Improving treatment	2
Environmental management	0
Control of epidemics	0

Source: Mills 1999

The study will discuss some these studies in the literature review section.

Although the country lacks a malaria unit, it has a decentralized provincial structure that oversees malaria control. Malaria task-forces/technical committees are also well established in the country showing the commitment of the country towards preventing malaria. As shown in table 2 the vector control and ITN subcommittees are in existence, although they are not very active. Complimenting the efforts of these sub-committees is the national malaria entomologist who is also assisted by entomologists from research institute such as the Blair Research. Major Partners in malaria control such as Japanese International Cooperation Agency (JICA), African Development Bank (ADB) and World Health Organization (WHO) are all complimenting the efforts of MOHCW to combat malaria. For example with the inception of the Roll Back Malaria programme on ITNs in the country in 1999, the country implemented ITN projects in 10 frontrunner districts of Binga, Gokwe, Muzarabani, Centenery, Hwange, Kariba, Mudzi, Mutasa, UMP and Nyanga.

1.5 SCOPE AND LIMITATIONS OF THE STUDY

The study had a simple framework of calculating the price elasticities of demand and supply for ITNs in Zimbabwe and then employ these estimates to assess the impact of removing tariffs and domestic taxes on ITNs and their inputs. The idea, given price elasticity of demand

and supply, was to see the effect on consumer purchases and producer supply response. The study had also the other objective of describing the market structure of the ITN industry with a view to visualize how the elimination of the tariff and domestic taxes would filter through the distribution chain to the final consumer. Data had to be gathered on market conditions in the country. A market assessment analysis was undertaken as part of shedding light on the potential market for ITNs. The research had also a simple framework of analyzing cost of production data from ITN manufacturers in order to understand company mark up pricing and supply elasticity. Supply elasticity was necessary, since Zimbabwe has a domestic manufacturer of nets, and the idea was to also assess the response of the manufacturers to lower input prices and how this would affect their eventual pricing policy on ITNs.

For all this effort the study made extensive use of formal and informal interviews to obtain data from industrialists in the ITN business and experts in the Ministry of Trade and Finance as well as malaria entomologists from the Health Sector.

The study had wanted to estimate the price elasticity of demand for ITNs using company sales data. Unfortunately the only company the study could rely on, Emnet, was unable to provide sufficient data for Time series analysis. The study was forced therefore to use elasticity values from empirical studies. Sensitivity analyses were done to check for the robustness of the results.

Problems were, however, encountered in the data collection period. For example during the period of data collection rocking political problems due to an impending election in the country made it hard for traveling to parts of the country that were highly malaria endemic to assess the retail sales and ancillary costs such as distribution costs of ITNs.

Also, the companies that manufacture ITNs and insecticides were not willing to divulge specific information on production costs. On account of these problems, data analysis relied to a large extent on the 'raw' modeling techniques to estimate the changes in prices and purchases. A lot of consistency was, however, followed in the analysis so as to restrict the deviation of the estimated figures to marginal variation.

CHAPTER 2: LITERATURE REVIEW

2.1 THE CASE FOR INSECTICIDE TREATED NETS

An Insecticide Treated Net (ITN) is simply a physical barrier (net) and a chemical barrier in a form of a synthetic pyrethroid (Reed et al, 1999). ITNs or treated mosquito nets are an essential component of the preventive malaria control programme in Zimbabwe. Malaria preventive control programme as highlighted in the previous chapters, incorporates case management (hospital treatment), personal protection (for example ITNs and mosquito repellents), epidemic forecasting and early detection, monitoring, evaluation and operational research and the integration of these activities within the primary health care system.

It should be noted that ITNs alone are not the only solution to malaria control initiatives, but they form a core component of the malaria control strategy that involves an integrated approach of curative and preventive services. With the use of pyrethroids insecticides becoming more and more expensive, and their failure to sustain the spraying coverage that was once enjoyed with the use of DDT, the emphasis has now shifted to the use of ITNs. Also the use of chemoprophlaxis in Zimbabwe is not recommended in rural areas and to individuals staying for longer periods in areas of high indemicity due to the fear that resistant stains would develop.

The main goal of RBM under the banner of the WHO has been to see the use of ITNs increase to 60% in the world's malarious regions and to make sure that every person who is at risk of malaria is protected with a mosquito net within the next 5 years (Jowett et al 2000). ITNs have the potential of reducing malaria death among children in the world by a third *(ibid)*. So far only 10% of women and children living in the malarious areas in Africa are covered by mosquito nets. Although they are used mainly at night, ITNs are an effective way of protecting families from mosquitoes. Quoting from a Report of an Informal Consultation of WHO, " The use of ITNs has been shown to be very cost-effective and resulted in a 20%

reduction in overall child mortality in Africa, equivalent to six deaths averted per year per 1000 children protected, at a cost of about US$5 per child".

Mosquito nets are not a new phenomenon in the world since they have been used thousands of years ago. However, the use of insecticides only started in the Second World War. By the late 1970, pyrethroids, safe for home use had become readily available and made it possible for its widespread use in treated nets (Lengeler 2001). The efficacy and durability of mosquito nets were proved in the trials carried out in the 1980s in Gambia (only country in Africa in which trials were done on a wider scale while for others it was only pilot or small programs), Burkina Faso, Ghana and Kenya. The trials were on the impact of ITNs on all cases of childhood mortality. The research from these countries revealed that ITNs reduce the risk of severe disease and death in under fives by 25% in malaria endemic countries (Lengeler et al 1996). They also reduced clinical cases by almost half *(ibid)*.

In other trials carried out in Kenya and Ghana on the effectiveness of ITNs, the results revealed that death in children aged six months to four years declined by 17% in Ghana and 33% in Kenya (Reed et al, 1997) due to the use of ITNs. Macmillan (1995 pp1) noted that: "Studies have shown a 20% to 63% reduction in malaria disease rates following the introduction of insecticide treated nets".

In another study carried out by Lengeler in 1997, it was also found out that ITNs reduce the intensity of uncomplicated malaria episodes associated with fever in under fives and that they also improved the haematological and growth of kids in high transmission areas. However, as pointed out in their document, results from a scientific study cannot be generalized and be comparable to results from programmes, hence the efficacy of ITN use in scientific trials cannot justify extensive use of ITNs especially in high transmission (EIR[10] > 100) areas on account of delayed immunity. However, the use of ITNs in highly endemic areas should not be discouraged.

Yet in another study carried out by Goodman in 1999, use of insecticide treated nets proved to be effective in malaria intervention by showing that there are gains per dollar spent. The study analyzed different interventions to prevent childhood mortality. These interventions

[10] EIR refers to the endemicity intensity rate.

included insecticide treated nets, residual spraying of houses and the use of chemoprophylaxis. Dalys were calculated for each intervention and the result was that in a very low income country, for the treatment of existing mosquito nets, cost effectiveness range was US$4-10 per DALY averted; for provision of nets and insecticide treatment US$19-85; for residual spraying (two rounds per year) US$32-58; and for chemoprophylaxis for children US$3-12. This would imply therefore that the initial provision of ITNs, although costly, would level off during the periods of net re-treatments which have proved to more cost effective than residual house spraying and use of chemoprophylaxis.

Table 4 below summarizes studies that have so far looked at the cost effectiveness of different malaria interventions. The results are not strictly comparable because of differences in the methodologies used. Some of the studies are based entirely on trials while some are based on operational settings. The different epidemiological and socio-economic settings in the different country settings also made it difficult to compare across results (Goodman et al 1999). However, according to WHO guidelines, in Low Income countries (GNP per Capita under US$1000), interventions are considered to be 'highly attractive if the cost per DALY falls below $25-$30, and 'attractive' if the cost falls below $150 *(ibid, WHO 1996).*

The results in the table show that the Insecticide treated bed-nets are a highly cost effective way of protection against malaria with most of them having a cost per DALY averted within the $9-$30 range. The only problem being that a country without resources like Zimbabwe will not cover the entire population at risk because it is too expensive. It is only by looking at innovative financing mechanisms like the case of tariffs and domestic taxes that the country can increase the use of ITNs.

Table 4: Review of Cost Effectiveness studies: Costs are expressed in 1995 US$

Intervention	**Area Studied**	**Costs per death averted**	**Cost per DALY Averted or DYLG**	**Reference**
Insecticide treatment of bed-nets	Gambia	$219 ($167-$243)	$9 ($9-$14)	Picard et al, 1993.
		Net CER* $494 ($326-$805)	Net CER* $21 ($14-$35)	Aikins et al, 1998.
		$829 ($447-$2117)	-	Graves 1998
	Sub-Saharan Africa	-	$4-$10	Goodman et al, 1998
Provision of insecticide treatment of bed-nets	Ghana	$2112 ($992-$2289)	$77 ($37-$84)	Binka et al, 1997.
	Kenya	$2958 ($2838-$3120)	-	Some, 1999
	Africa	-	$10-$118	Evans et al, 1997.
	Sub-Saharan Africa	-	$19-$85	Goodman et al, 1999.
Residual Spraying	Sub-Saharan Africa	-	$16-$58	Goodman et al, 1999.
Chemoprophylaxis	The Gambia	$167	-	Picard et al, 1992.
Ante-natal chloroquine chemoprophylaxis	Malawi (drug costs only).	$950 ($317-$951)	-	Schultz et al, 1995.
	Sub-Saharan Africa	-	$14-$93	Goodman et al 1999.
Antenatal SP intermittent treatment.	Malawi (drug costs only).	$81 ($79-$352)	-	Schultz et al, 1995.
	Sub-Saharan Africa	-	$4-$29	Goodman et al 1999.
Combined Preventative interventions.				
Insecticide treatment of bed-nets and chemoprophylaxis	The Gambia	$300 ($246-$333)	$13 ($13-$20)	Picard et al 1993.
Residual Spraying, fogging and source reduction	Brazil	$5 072 ($785-$10 427)	$132	Akhavan et al 1999.

Combined preventative and treatment programme				
Residual spraying, fogging and source reduction, and a package of measures placing greater emphasis on early diagnosis and prompt treatment.	Brazil	$2 596 ($1 093-$5 193)	$67	Akhavan et al 1999.
Case Detection and treatment and residual spraying	Nepal	Net CER* $1309-$17650	Net CER* $12-$1803	Mills 1993.

Source: Goodman et al, 1999. Net CER incorporates potential cost savings to the government and households from reducing malaria incidence.

DYLG: Discounted Life Year Gained.

CER: Cost effectiveness Ratio.

SP: Sulphadoxine-pyrimethamine.

The other means of malaria control are also attractive, but as the study noted before, ITNs are not replacing these vector control measures, but are a complimentary means since in Zimbabwe mosquito vectors are now showing resistant stains to insecticides and more so these insecticides are also expensive. The incremental effectiveness of combined methods as shown in the table, reflects a situation of attractive cost effectiveness, hence the argument that all methods of vector control should be encouraged.

A study in Benin on the determinants of the permethrin impregnated bed-nets (PIBs) and the role of women in the acquisition and utilization of PIBs revealed that bed-nets are not considered a good option in a context where there is a quasi shortage of financial resources. The price for bed-nets was found to be a very important determinant in the acquisition and utilization of bed-nets as noted in the following quotation; "The price of the PIB appeared to be the principle obstacle to its use", [(Aitkins et al, 1993; Stephens et al, 1995, Malemba et al, 1995; Njunwa et al, 1991) in Rashed et al 1999 page 3]. It is not clearly known, however, whether it is the price of the bed-nets or the availability of funds that make up the true problem.

On the issue of ITN demand, a household study undertaken in Tigray, Ethiopia, found out that the demand for untreated nets was inelastic (-0.5) with respect to price (Cropper et al, 2001). Fairly well was their observation that the demand for nets was heavily weighed in favour of non-price factors. In another similar study, but this time focusing on net re-treatment, it was found out that on average the price elasticity of re-treatment was also inelastic (–0.75) with respect to price changes (Cham et al, 1997). All these studies confirmed that the ownership of nets was indeed a necessity, but was hindered by access and availability.

Although the willingness to pay (WTP) studies do not measure elasticity per se, they are also believed to highlight the gap between what people are prepared to pay and the ITN retail price: Another study that also focused on consumer demand noted that, "Although data are scarce, the evidence we have suggests that ITN demand is relatively price inelastic if other determinants of demand (e.g. household understanding of malaria prevention, bed-net quality, cost of malaria treatment) remain constant" (Simon et al, 2001 pp23). From a purely economic point of view this implies that people view ITNs as a necessity and would continue buying it even if prices were raised. The important point to take note of is that since ITNs bring health benefits it should follow that their demand be price inelastic, however, the non-extensive use of this product may be due to a number of constraints.

The effective use of ITNs at the household level requires knowledge of a set of parameters that encompass the ownership of the net by the household, access to the appropriate insecticides for routine re-treatment, and the appropriate information on safe use of the net and the insecticides (Viswanathan et al, 1998). All of the above parameters would not be successful in the absence of government support through various initiatives that may involve public education and donor support and also if resources are not made available to the poor sections of the community to afford to purchase a net. Poor people, pregnant women and children under five years happen to be the most vulnerable to malaria.

ITN programmes and projects are deemed to be expensive in treating large populations hence better financing options for ITNs are needed so that use of ITNs is increased. Sub-Saharan African (SSA) governments do not have the capacity to provide ITNs to large populations and cannot ensure regular re-treatments of the bed-nets hence they must strengthen the public/private partnership. Proponents for the extensive use of ITNs have advocated for

commercial markets for nets to be established and let to function sustainably on their own. This would involve social marketing and the promotion of an honest public-private partnership. On the other hand the government would help this initiative by providing:

- A conducive environment for the development of commercial markets by initiating large-scale promotional activities.
- By removing or lowering domestic taxes and tariffs.
- By leveling the platform of trade for both international and domestic firms.

2.2 ITN USE IN ZIMBABWE

Net usage in Zimbabwe has remained very minimal due to inadequate information on the use and benefits of ITNs. It is estimated that 7% (Freeman 1996) of the households in Zimbabwe that are at risk to malaria use ITNs with only 2% of these households having more than one net per household (SAMC 2000). A Report of the District Situation analysis for RBM in Zimbabwe carried out by Dr Charimari and his team stated that, "During the DSA, communities were found to have good knowledge of what causes malaria but this was not complemented by corresponding high usage of ITNs..." (Charimari et al, 2000 ppviii). The report also highlighted the observation that even shopkeepers preferred to stock and sell painkillers and chloroquine but did not act likewise when it came to ITNs, although some people were willing to buy them.

It was also interesting to note that the price factor was also common concern in their study as reflected by the following quotation; "The high cost of nets is the main reason why people said they did not have nets in their homes" (Charimari 2000 pp5). The nominal price for a standard net in the year 2000 was between Z$100 and Z$300. Currently (2001/2002) the standard net is selling at a nominal retail price of between Z$1300 and Z$1600.

A study conducted in Chirisa Village Development Committee (VIDCO) by Skovbolling in 1998/99 revealed that about 97% of the people interviewed in that study had heard of ITNs, but that only 9% had nets in their homes. Reasons for the low usage of the nets were due to various constraints such as 36% of the people saying the ITNs were too expensive, 28% attributing the low usage to problems in accessing them, 36% saying they had simply not

thought of using the nets, 5% believed that ITNs did not work and 15% saying that they did not know how to use the nets. What was interesting in the study was the fact that a larger percentage (64%) attributed low net usage to the problem of money and accessibility, although they considered nets to be, "durable, effective and widely practicable".

Another study carried out prior to the above studies also highlighted the same reasons for low utilization of ITNs in Zimbabwe. "A Knowledge, Attitude and Practice (KAP) survey carried in Binga District (which is one of the highly endemic districts in Zimbabwe) in 1995 showed a correlation between net utilization and education level and income level [*refer to table 5 and 6 respectively* (Freeman 1996)].

Table 5: Mosquito net usage by Educational Level

Level of Education	***Number/% with nets***	***Total Interviewed***
Primary	116(7.1)	1623
Secondary	287(16.3)	1680
Tertiary	165(36.2)	456
Total	***568(15.1)***	***3552***

Source; T.Freeman 1996

Figures in table 5 reveal that high levels of net usage are associated with a person's level of education, which would also explain why those with high incomes are also associated with high percentage of net usage (assumption being that we associate high incomes with higher education). The most important point is that these figures show that, given that malaria is highly correlated with poverty of which poverty is phenomenon that is also associated with low literacy levels, poor people and vulnerable children are at a greater risk and disadvantage to malaria. The figures also imply that without adequate 'user friendly' mechanisms of information dissemination net usage cannot be increased. Messages and advertisements within the Social Marketing Package should be simplistic and wholistic in nature to reach every level of the education divide specifically the illiterate and poor people.

The following table 6 shows the mosquito net usage by occupation. The results were obtained from the same KAP study carried out by Tim Freeman in the Binga District in 1995.

Table 6: Mosquito net usage by occupation

Occupation	***Number and % with nets.***	***Total Interviewed***	***Estimated income/month Z$***
Unemployed	205 (10.3)	1999	
Self-employed	7 (10.0)	63	< $1 000
General	96 (13.0)	741	< $1 000
Farmer	35 (12.2)	287	< $1 000
Office	32 (17.8)	179	$1 000 - $2 000
Security Services	25 (45.5)	55	> $2 000
Teacher	92 (36.5)	252	> $2 000
Technical	65 (30.4)	149	> $2 000
Administrative	11 (32.4)	34	> $2 000
Totals	***568 (15.1)***	***3759***	

Source T. Freeman 1996.

In that study ITNs were considered highly income elastic implying that beyond a certain price level they are considered a luxury item. If the above data on estimated monthly incomes could be interpreted and be extrapolated for the whole country then the notion of income elasticity would be important to consider in future research. However, one cannot conclude factually given the study setting and small difference in monthly income bands.

Ownership of nets grows with the level of income the people are getting; Unemployed 10.3%, general hands and office employees with an average of 13% and those with nominal incomes of above Z$2000 averaging 36% ownership. Technically, the above facts and figures justify the need to look at [1] the price of nets with a particular aim of lowering it and making nets affordable and accessible, [2] information dissemination, with the emphasis being to educate the people on the use and importance of using ITNs and [3] the issue of demand creation by employing the so called 'social marketing techniques'.

In summary it should be noted that in areas of no malaria or low malaria transmission, case management coupled with health education and the use of chemoprophylaxis should be encouraged, while in areas of high malaria incidence and visible seasonal peaks as is the case with seasonal malaria in Zimbabwe, the use of residual house spraying, the use of ITNs,

larviciding and other methods of personal protection must be highly recommended (Worrall et al, 1997).

2.3 MARKETING DISTRIBUTION OF ITNS IN ZIMBABWE

There are only two companies in Zimbabwe that are involved in the manufacturing of mosquito nets, and several public and private organizations involved in the distribution of the nets. The single biggest manufacturer of nets in the country is a domestic company known as Emnet (which became operational in 1986), and manufactures a whole range of nets from the luxury jumbo nets for hotels and exotic places to the ordinary standard nets that are affordable by ordinary people. Emnet manufactures on average about 3000 nets per day, but when in full capacity it is able to manufacture about 5000 nets per day. The bulk though of Emnet net sales are for the export market to Europe, USA, Mozambique, Angola, Swaziland, Malawi, South Africa, Namibia, Botswana and the Democratic republic of the Congo. The other sizeable chunk of sales goes to programmes under the banners of World Health organization (WHO), JICA, Ministry of Health and Child Welfare, DFID, Malaria self-help projects, Ecomark (a private company that is involved in the manufacturing of insecticides), while a small proportion of nets that remain is then sold to consumers through various wholesalers, retailers and hawkers' organizations around the country.

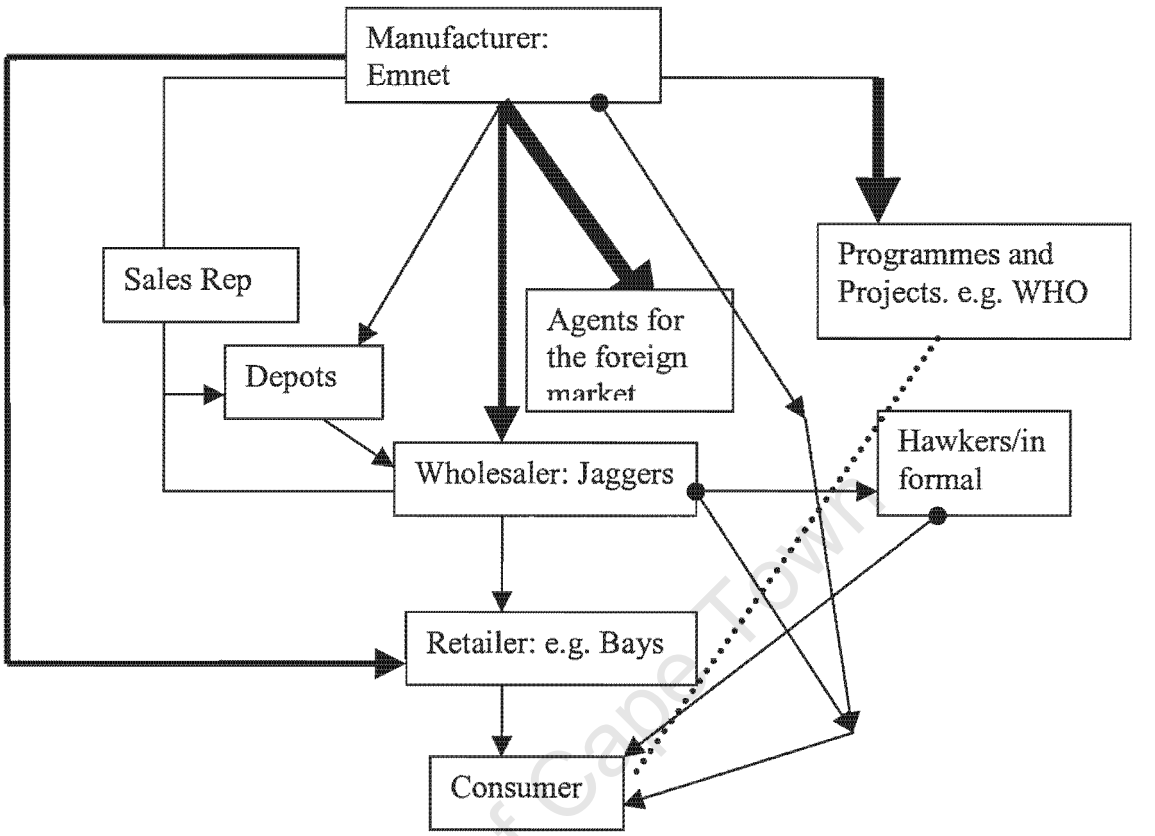
The other second ITN company, Protex Clothing Limited in Kadoma (first manufacturer of Nets in Zimbabwe), is not so much involved in the production of ITNs since it is not their core business. It only produces ITNs on special demand and specific orders. This places it in a position of a virtual non-competitor in the ITN industry since their ITNs are programme specific and not market oriented. However, one cannot conclude with certainty that Emnet has a 100% share of the market hence a monopoly. The ITN industry is not regulated and has competition, but the only problem is that the ITN business is not attractive to many a- would be competitors on account of low demand and low turnover rate of the product. On account of its special minimal production of ITN the study did not incorporate Protex Clothing Company into the study but concentrated on the ITN production by Emnet alone.

The ITN marketing distribution chain follows closely that found in the developed world and other African countries, only deviating when it comes to the inclusion of the Hawker. Rather than the simple traditional marketing chain, the complex nature of the distribution chain as illustrated in figure 1 below shows a complex interplay of agents involved in the distribution and selling of ITNs in Zimbabwe. However, from the manufacturer, the distribution chain follows three (3) critical paths, which have led Emnet to operate what in literature is referred to as a three tier pricing system for its ITN sales in Zimbabwe and outside. These tiers are classified as follows:

1. Sales to the wholesalers, NGOs, Ministry of Health and Child Welfare and Foreign Agents.
2. Smaller orders to retailers and,
3. Sales directly to the consumers.

Figure 1 shows the sales paths and the volume of sales that pass through the links as reflected by the thickness of the arrows.

Figure 1: ITN Marketing distribution in Zimbabwe: Adapted from T.Penhallrick



Key: 1.The thickness of the arrow shows the volume of ITN sales to the different agents in the ITN industry. For example, most sales are foreign sales to SADC region and Europe.

2.The continuous arrows show the paths where ITN commercial pricing is present while the dotted line shows the paths where ITNs are either sold at subsidized prices or are given freely.

Sales made to NGOs, WHO and other private organization end up as programmes and projects in various communities in Zimbabwe and in the SADC Region where nets are either re-sold at subsidized prices or given freely to communities that cannot afford to buy them at the going price. These organizations, just like the wholesalers, purchase the nets at factory prices and get huge discounts for buying in bulk. Direct sales between the manufacturer and the final consumer are generally more expensive. This was a deliberate initiative by the company to discourage consumers from purchasing nets directly from the company. The pricing was enacted after some private organizations in the netting business had complained of poor sales due to being undercut by some unscrupulous consumers who would informally re-trade these nets as Hawkers.

Emnet manufactures a whole range of goods from netting, lace, embroidery and mosquito nets. It sells standard nets at a nominal price of slightly over Z$1800 (The average retail price for a standard ITN is a nominal price of Z$1600) when it sells directly to the consumer. For the export market, the three quarter standard net is priced at US$7 while the most expensive net, the Jumbo king size is priced at US$39. About 80% to 90% of its manufactured nets are the basic standard nets. These nets are available in either green or white colour and for the export market; net impregnation is done on request, which incidentally calls for the price to be re-adjusted.

The material used to manufacture the nets is 100% texturised polyester[11] with a denier[12] of 75 by 55. 100 denier can be supplied if requested. The mesh[13] size for the nets is normally 196 by 156. The company gets processed yarn from a sister company known as Nets and Ropes, and also gets treatment kits such as solfac insecticide from Bayer Zimbabwe, K-othrine insecticide from Ecomark and Icon Insecticide from Zeneca. These companies import and prepare the insecticides for Emnet. The company only imports dyes and machine equipment and parts directly from outside.

[11] Polyester is more durable, cheaper and easily obtainable than cotton. Cotton is another alternative that can be used to manufacture nets.
[12] Denier refers to the weight in grams of the yarn used. 100 denier is equivalent to 40 grams per square metre.
[13] Mesh size refers to the number of holes per square inch. 156 mesh corresponds to 25 holes per square centimeter.

There are a number of wholesalers and retailers in Zimbabwe that are involved in the business of selling nets. These include Jaggers and Macro wholesalers, OK, Bays, Power Sales, Edgars, Topics and numerous Malaria Information Centers in Bulawayo, Harare and Victoria Falls.

Population Services International (PSI), Ecomark and Bayer Zimbabwe have had success stories of ITN projects using the nets from Emnet. JICA, the WHO and the Ministry of Health and Child Welfare have projects in hand using the nets from Emnet. The company also supplies to the army, the department of National Parks and the Air-force of Zimbabwe at huge discounts for bulk buying. However, wholesale and retail sales have been pathetic since most of the distribution agents consider the ITN product as a slow moving product with an unattractive stock turnover rate. Vigorous marketing and demand creation options have to be pursued to motivate these agents, hence the call by ITN advocates for a strong social marketing of the product which includes motivating these agents by way of advocating for the removal of tariffs and taxes on ITNs and their inputs.

In the following chapter the study looks at the economics behind tariffs, taxes and mark ups and its application to the ITN Industry. The chapter discusses the theoretical conceptual framework behind RMB initiative of reduction or elimination of tariffs and domestic taxes on ITNs and their inputs.

CHAPTER 3: CONCEPTUAL FRAMEWORK

3.1 THEORY OF TARIFFS AND TAXATION

In this chapter the document looks at the basic economics of tariffs and taxes and why there have been so important to the governments. Firstly the document highlights why tariffs and taxes on a single commodity like ITNs are a policy measure that does not distort the country's micro-economic fundamentals. In the latter parts of the chapter, the document discusses the theoretical framework, which forms the basis of the argument on why tariffs and domestic taxes on ITNs should be removed.

There are different ways of classifying policy instruments that are used for specific situations. These can be distinguished between quantitative, qualitative and reform policies (Tinbergen 1956 in Acocella 2000). A quantitative policy instrument changes the value of an existing policy instrument for example changing government expenditure. A qualitative policy on the other hand introduces a new instrument or involves eliminating an existing instrument without significantly changing the prevailing economic system, for example introducing a ceiling on bank lending or eliminating a tariff on insecticide treated bed-nets and netting materials. The final policy instrument, a reform policy involves the introduction of a new policy or the removal of an old one and in the process causing significant changes to the prevailing economic system, for example the privatization of state assets (Acocella, 2000).

Policy instruments can also be direct or indirect depending on the effect they have on the behaviour of agents. A policy is defined as direct if its ultimate objective is to impose a specific behaviour norm on particular agents. The imposition of import quotas to reduce the trade deficit may be classified as a direct policy instrument. On the other hand, indirect control measures do not specifically seek to change the behaviour of agents directly but do so via the influence of variables and other factors that influence the decision making of agents. One example would be the argument that to reduce the trade deficit a country should impose tariffs on certain imported products to discourage the flood of foreign goods.

The removal of tariffs and domestic taxes on mosquito nets and ITN materials should therefore be perceived as a qualitative and indirect policy instrument that will not seek to

change any micro-economic fundamentals in the country and that will neither seek to impose any specific behaviours on agents in the ITN industry. Policy makers should therefore not be scared about enacting such a policy instrument.

But what is a tariff?

- ***A tariff is*** *defined as a fixed percentage tax on the value of imported commodities that is levied at the point of entry by the importing country. It is applied Ad Valorem*[14] *on the cost, insurance and freight value (CIF) of the item. A tariff comes in various forms and can be used for different purposes. Naturally it is used for revenue purposes especially in developing countries, however, the norm is that it is generally used to protect domestic producers from foreign competition (Samuelson 1992).*

The fundamental economic reasoning behind a tariff imposition is the long propounded infant industry argument that states that a tariff is essential to allow the higher priced-domestic producers enough time to learn and probably achieve economies of scale in production. A tariff also leads to external economies of learning by doing, which is necessary in order to increase productivity (Todaro 1997). The argument seems to purport that the imposition of a tariff is temporary until such a time when the infant industry is weaned off and left to fend for itself. Experience, however, points to the contrary *(ibid)*.

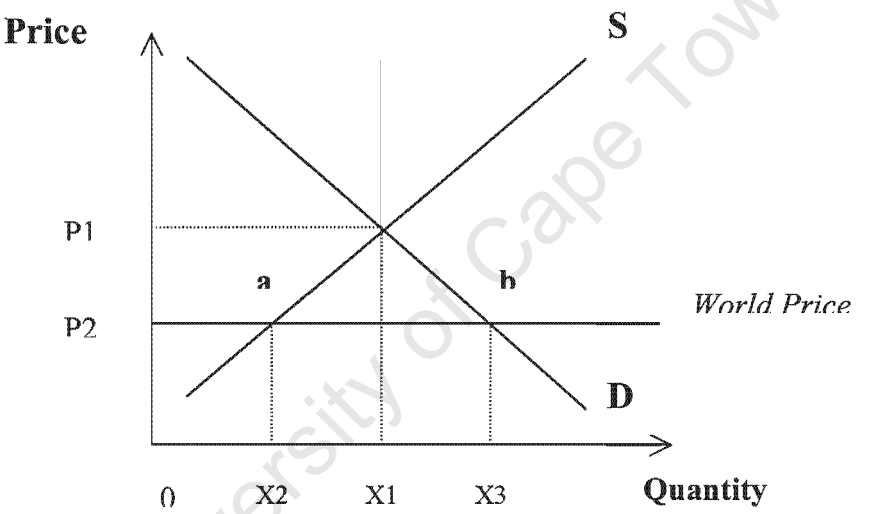
Other reasons for the tariff imposition are, the desire to reduce dependence on other country exports and attain greater self-reliance, the desire to build a strong domestic industrial base and the fact that most developing governments have also derived a lot of substantially easy revenue from tariff collections that eventually feed into the fiscus: for example in Sub-Saharan Africa countries, tariffs contribute on average 22% of total government revenue (Viswanatham 1998). Therefore it should, however, be noted that the idea of protectionism is an old story that has proved as controversial in as much way as many other barriers of international trade (Todaro 1997).

[14] An ad Valorem tax is a tax whose amount depends on the value of the transaction being taxed.

3.2 FREE TRADE WITHOUT TARIFFS

Figure 2 below shows a standard demand (D) and supply (S) interaction in a 'closed Zimbabwean economy' for the ITN market whose equilibrium price is P1 and quantity X1 of ITNs. Assuming Zimbabwe opens up to trade with other countries in ITN trade, it would face a perfectly elastic demand curve that depicts the world price for ITNs given below as P2. Since P2 is less than P1, the country therefore benefits from a lower price for ITN imports hence larger quantities (X1-X3) of ITNs are purchased.

Figure 2: Free Trade

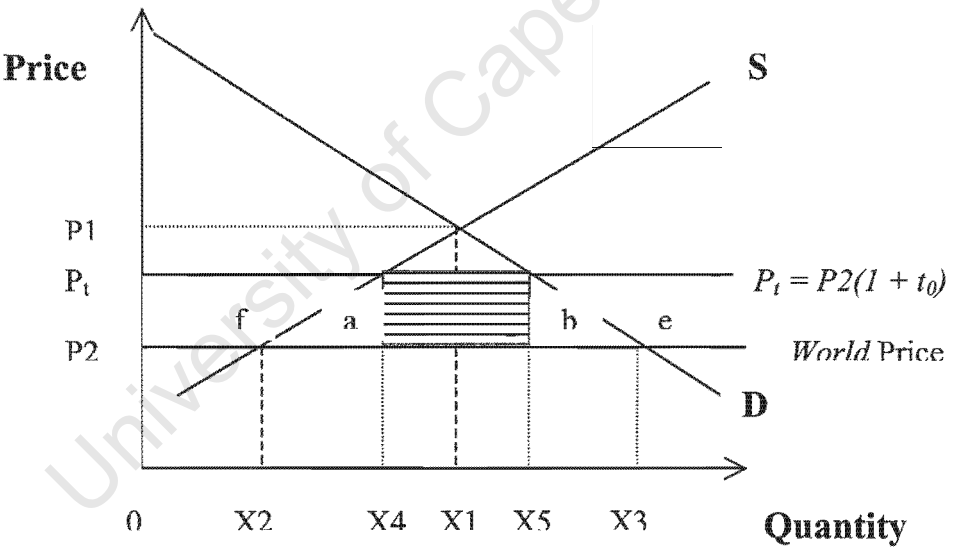


This scenario would then entail a loss to the domestic ITN producer since the quantity supplied falls from X1 ITNs to X2 ITNs. One would also anticipate a consequent shedding of staff and loss of business to the lower- cost foreign suppliers. Using the original demand and supply schedules one would notice that the distance ***ab*** on the graph represents the imported quantity of ITNs that would compensate for the excess demand in the domestic supply due to the lower world price (P2) for the commodity.

3.3 ECONOMIC COSTS OF A TARIFF

Having analyzed the effects of open trade in the ITN market, the next analysis looks at the economic costs of imposing a tariff. Figure 3 illustrates the new situation when a tariff (t_0) is imposed to protect the domestic ITN producers from the 'unfair' competition with foreign ITN suppliers. Economic theory suggests that a tariff has basically three effects on agents: Firstly, the domestic producers are able to expand production, secondly, consumers are then faced with a higher price and therefore consequently reduce their consumption and thirdly, the government gains substantial revenue depending on the nature of the commodity and its demand and supply elasticities. However, tariffs are generally considered to create economic inefficiency since they entail economic losses to the consumers as the revenue gained by the government and the extra profits earned by the producers are less than the consumer loss.

Figure 3: Trade with a Tariff



When a government imposes a tariff (t_0) on the ITN commodity the domestic ITN price rises from P2 (*note that P2 is the world ITN price as illustrated in Figure 1*) to P_t [P2 $(1 + t_0)$] and quantity demanded is reduced from X3 ITNs to X5 ITNs. But domestic producers have the advantage of increasing production from X2 ITNs to X4 ITNs and possibly increase employment. The shaded area measures the amount of tariff revenue that accrues to the government on the imported ITNs, which represents a transfer from the consumer to the government but is not necessarily a loss of efficiency. In essence, a tariff that raises the prices above P1 imposes a total subsidy on the ITN consumer who may then be aiding the domestic

producers and its employees at the expense of their social welfare (McConnell et al, 2002). The redistribution of income, in this case will be highly skewed in favour of producers. Triangle a[1] gives the cost of the inefficiency in production caused by a higher domestic price. Triangle b[2] shows the economic loss in consumer surplus due to the inefficiency caused by the high price. It should be noted also that the imposition of a tariff has a smaller effect on economic efficiency than on re-distributive effects[3].

3.4 NEGATIVE EFFECTS OF TARIFFS

Apart from the economic costs for a tariff analyzed above, following are some of the arguments that have been put forward by anti-protectionism advocates and do apply to the Zimbabwean situation of advocating for the removal of tariffs on ITNs, insecticides and netting materials. Empirical evidence shows that many industries that have been behind the protection walls of tariffs have largely remained inefficient and costly to operate (Dinwiddy and Teal 1996).

Secondly, it is often argued that the beneficiaries of the tariff protection in developed countries are the foreign firms that have managed to hide behind these tariff barriers by taking advantage of the usual tax and investment incentives.

Thirdly, tariff protectionism has been made easier in most cases by governments' importation of subsidized capital goods and the procurement of intermediate products from foreign and domestic companies.

Fourthly, exchange rates are artificially over-valued[4] in the quest to encourage local manufacturers to acquire cheap capital and intermediate goods. Fifthly, tariffs have worsened the local distribution of income by favouring the urban sector and higher income groups at the expense of the supposed beneficiaries the rural sector and the lower income groups.

[1] Area a represents the sum of the marginal costs of domestic producers as represented by the domestic supply curve, less the marginal costs of foreign producers.
[2] Note that the demand curve represents the marginal utilities for the consumers hence triangle b measures the loss in consumer satisfaction due to a cut in consumption.
[3] Triangles a and b represent efficiency loss and the redistribution effect is shown by the shaded area: Clearly it can be seen that the shaded area is greater than the combined triangle a and b.
[4] Overvaluation is the difference between the official exchange rate and the free-market/parallel exchange rates.

Finally, many infant industries have failed to take up hence have never been weaned causing industrialization to be inhibited (Todaro 1997).

3.5 ITN TARIFF CLASSIFICATION

Zimbabwe is classified as a low tariff country in ITN tariff charges, that is the 5%-25% group of countries. High tariff countries' range from 42% upwards while the medium tariff countries have tariffs ranging from 30% to 42%. There is a great deal of confusion on determination of the appropriate tariff classification of mosquito nets, netting materials and insecticides in Sub-Saharan Africa countries including Zimbabwe. The Harmonized System of Classification used by the WHO in SSA remains, however, the de-facto classification even though it is highly ambiguous.

Zimbabwe is still identifying and trying to separate and apply different tariffs to insecticides used for public health and those used for agricultural purposes. Since Zimbabwe is an agriculturally based economy, certain specified insecticides for agricultural purposes were exempted from duty as a form of boosting productivity in agriculture. Some of the specified chemicals can be used for the treatment of mosquito nets. Netting materials are also still classified under textiles hence the tariff charges are just the same as any other textile.

Difficulties in tariff classification and coding and the unavailability of accurate data on ITNs in Sub-Saharan African countries have complicated analysis on the impact of lowering or elimination of tariffs and domestic taxes ITNs and their inputs (Fitzgerald et al, 1998). Tariff commissioners have argued that without proper tariff classification the private industry may benefit from an elimination of these taxes, since chemicals and ITN materials like yarn and cotton are not solely used for the manufacture and treatment of mosquito nets.

3.6 ECONOMICS OF TAXATION IN THE ITN MARKET.

Taxation is a cost and is therefore a determinant of the firm's supply curve. The type of tax involved in the ITN market in Zimbabwe is a form of excise tax known as the sales tax. There is a small technical difference, however, between sales tax and the other form of excise tax known as a specific excise tax. A sales tax falls on a wide range of products and is transparent to the consumer, whereas a specific excise tax is levied individually, normally on a small, select list of commodities. However, to understand the impact of sales tax on ITN, the study analyzes the incidence of a specific excise tax that could be easily extended and generalized to that of a sales tax (normally sales tax is entirely shifted from the producer to the consumer).

ITNs have an inelastic demand hence in Figure 4 the relatively steep demand curve depicts an inelastic demand curve (Simon et al, 2001). Assuming a specific supply curve (S), the pre-tax equilibrium situation shows quantity X1 of ITNs being supplied at Price P1. When the government imposes a tax on ITNs on the 'sellers' (tax is imposed on the sellers because it is easy to administer since the seller collects the money at the point of sale), it is viewed as an addition to the firm's marginal cost of ITNs. The effect of the tax would be to shift the supply curve to the left (S_t) as shown on the diagram below. Supply curve S_t now represents the after-tax supply curve and the resultant after-tax equilibrium price and quantity P2 and X2 respectively. The distance between the two supply curves shows the amount of tax levied per unit.

Having alluded earlier on that the demand curve is inelastic this scenario tries to ascertain where the burden of taxation falls, so that one is able to show the welfare loss to the society. With an inelastic demand, the price to the buyer of ITNs increases substantially from P1 to P2 and hence most of the tax is shifted to consumers.

Figure 4: Taxation and supply shifts

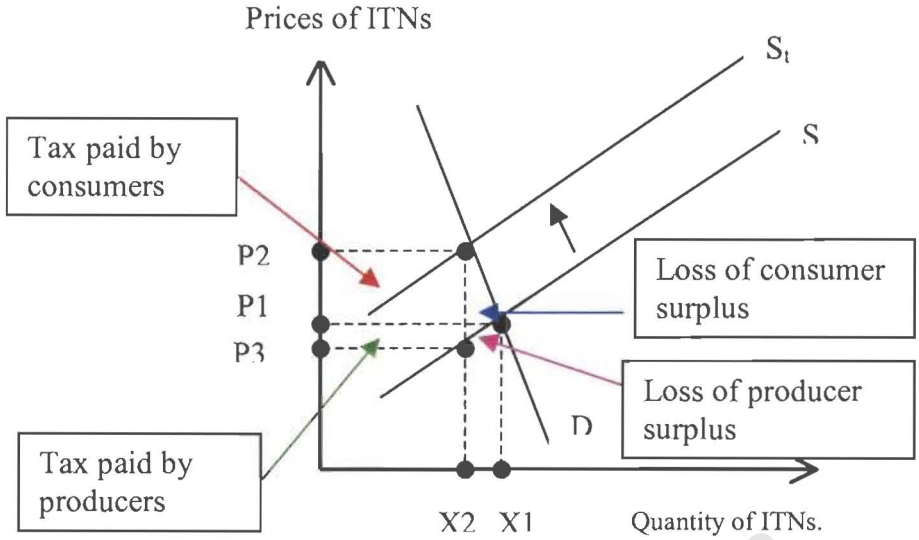


Figure 4 can also be used to show the welfare effect and the statutory[15] and economic incidence[16] of a tax on ITNs. Both producers and consumers bear part of an excise tax imposed on the ITN product. The red arrow points to the rectangle that shows part of the excise tax on ITNs that is paid by the consumer, while the green arrow points to the rectangle that depicts part of the excise tax that is borne by the producer. Summing up the areas of the se two rectangles gives us the government tax revenue. However, because the analysis has pointed out that the ITN market is characterized by inelastic demand, consumers bear most of the excise tax as evidenced by the bigger rectangle shown in the diagram. Generally, given a specific supply such as in the case above, the more inelastic the demand for a product, the larger the portion of tax shifted[17] to the consumer.

The implication of this excise tax to the society is shown by the two triangles, shown by the blue and purple arrows. Combining the two triangles gives the total efficiency loss or welfare loss (deadweight loss) to the society due to the imposition of an excise tax. However, the welfare loss is not equally divided between the producer and the consumer. The bigger triangle shown by the blue arrow shows the loss of consumer surplus and the smaller triangle shows the loss of producer surplus. The bigger triangle also reflects the point that an inelastic demand causes a greater welfare loss to the consumer. The main point to make is that sales taxes tend to be more regressive than tariffs and health care financing mechanisms such as

[15] Statutory incidence of a tax refers to the economic agent who is legally responsible for the payment of the tax.
[16] Economic incidence of a tax refers to the distribution of income brought about by the imposition of a tax.
[17] Tax shifting is the difference between statutory incidence and economic incidence.

social insurance and private insurance (Doorslaer and Wagstaff, 1993). They are regressive with income since a larger portion of a low-income person's income is exposed to the tax than that of a rich person.

3.7 WHY TARIFFS AND TAXES?

In the section on theory of tariffs and taxes the study looked at some of the reasons why governments introduce tariffs and taxes. These included such reasons as the need to raise revenue for government projects and programmes and the need to protect domestic industries from competition with foreign companies. In this section the study therefore discusses the reasons why the research has specifically targeted the removal of tariffs and domestic sales tax as a viable 'financing' option for ITNs.

As evidenced from the above analysis of the theory of tariffs and taxes, imposition of tariffs and sales taxes both cause welfare loss to the society. Although economists consider tariffs and sales taxes as re-distributive in nature through the higher revenues that are collected by the central government, they are regressive in that they affect the poor more than the rich (Samuelson 1992). There is a strong correlation between malaria and poverty, hence tariffs and sales taxes on ITNs will affect the poor most and this group happens to be the most vulnerable to the malaria epidemic (Gallup and Sachs 1998). Although it cannot be practically guaranteed, generally we believe that the removal of tariffs and taxes would lead to:

- Regaining of economic efficiency that was lost due to the imposition of a tariff on netting materials and insecticides in the case of Zimbabwe *(refer to triangle a and b in Figure3).*
- Increase in the consumption of ITNs since elimination of tariffs is assumed to lead to lower prices.
- The redistribution of income that was highly skewed in favour of the producers in a tariff situation *(refer to the shaded area in Figure 3).*
- The regaining of part of consumer and producer surplus that was lost because of sales tax on ITNs *(refer to triangles pointed out by the blue and purple arrows in Figure 4).*

- Since sale tax is regressive and hurts the poor most, the removal of sales tax on ITNs will benefit the poor sections of the communities that live in malaria endemic areas.
- Creation of a viable ITN market based entirely on the willingness and ability to pay for the product.
- Increase in the utilization of ITNs hence lead to effective malaria control with positive effects on morbidity and mortality caused by malaria.

Sian Fitzgerald of Path Canada also managed to estimate the price savings from the removal of tariffs in a number of Sub-Saharan African countries that included Zimbabwe.

Table 7 below shows a list of selected Sub-Saharan African countries together with their minimum and maximum savings that could be made if import duty(ies) are removed from imported ready-made ITNs, imported at US$2 and US$5 respectively.

Table 7: Customs Value of Imported Nets Estimated at $US2.00 to $US5.00

Country	**Mosquito Net**	
	Price reduction if import duty(ies) Removed	
	Minimum	**Maximum**
Botswana	$0.40	$1.00
Ghana	$0.50	$1.25
Malawi	$0.40	$1.00
Mozambique	$0.70	$1.75
Namibia	$0.40	$1.00
Tanzania	$0.10	$0.25
Zambia	$0.50	$1.25
Zimbabwe	$0.40	$1.00

Source: Sian Fitzgerald 1998.

Using a minimum-maximum band of estimated price savings when a tariff is completely removed, he found out that with an estimated price range of US$2 to US$5 for a net, the minimum saving that a person a net in Zimbabwe would save is US$0.40 per net valued at US$2 while the maximum savings would be US$1.00 for a net valued at US$5. This represents about 20% saving on ITN retail prices. The analysis excluded taxes and other non-tariff barriers, which would imply that if domestic taxes such as sales taxes were removed

then greater savings would be made. Such countries as Ghana, Zambia and Mozambique could also make substantial savings whilst the least savings could be made by Tanzania (ranges from US0.10 to US$0.25). The savings in the table highlight the important point why the removal tariffs and taxes must be viewed as a potential financing option for ITNs in order to fight malaria

3.8 THEORY OF MARK-UPS

Mark up pricing forms a major component of the pricing policy of the private sector and hence it is a gauge on the private sector profitability. Technically therefore, mark up constitutes a vital component of the ITN prices. This research does not advocate for the removal or lowering of the mark ups, but intends to show directly or indirectly how the mark pricing affects the final percentage reduction on consumer retail prices in the event of a tariff and sales tax removal. That the combined sum of 30% tariff and sales tax does not filter entirely to the consumer is an important observation that may be due to the different mark ups charged at different distribution nodes in the ITN industry. It should be noted that mark up levels are not regulated in the industry.

Mark up pricing is a form of average cost pricing whereby firms set a price that is equal to the total average cost, which in effect incorporates a net profit margin. In average cost pricing, prices are set to cover the average variable cost (AVC), average fixed costs (AFC) and some normal profit as shown in equation 1.

$$1. \quad P = AVC + AFC + net\ profit\ margin.$$

Average cost pricing is clearly different from the traditional marginalist principle of maximizing profits at the output level where marginal cost[18] (MC) is equal to marginal revenue[19] (MR). The mark up is therefore an off-shot of the average pricing rule that is given by the following equation 2:

[18] Marginal cost refers to the extra cost of producing one more unit of a product.
[19] Marginal revenue refers to the amount of money that an additional unit would add to total revenue.

2. $P = AVC + GPM$

It is assumed that the average variable cost (AVC) is known to the firm with some kind of absolute certainty since it involves such costs as the costs of inputs, such as yarn, chemicals, dyes, labour costs, rates and electricity charges. GPM which refers to the gross profit margin, is given in the following equation 3:

3. $GPM = AFC + NPM$, *where NPM refers to net profit margin.*

Which covers the fixed costs and yields a normal profit. The average fixed cost is calculated by dividing total fixed costs by the planned or budgeted or normal output. It is further assumed that the level of net profit is known or can be inferred from experience, otherwise if unknown, it should be a rate such that it yields a 'fair' return on capital invested. Average cost pricing mechanism implies implicitly the knowledge of the elasticity of demand by the firm (Koutsoyiannis 1984). The cost-plus pricing used in the setting of ITN prices in Zimbabwe is theoretically founded on the above concept of mark-up pricing. In the methodology section the study shows the different levels of mark up in the ITN industry in Zimbabwe.

In conclusion of the literature review, although the study showed different cost effective methods of vector control including the use of ITNs in the literature section, difficulties in comparisons across different settings and designs made it difficult to say which method is more cost effective than the other. However, it is the financing of ITNs that is more important in this analysis hence the study's emphasis on tariffs and domestic taxes on ITNs and their inputs.

CHAPTER 4: METHODOLOGY

4 METHODOLOGY

Theoretically, the document has so far shown that there are gains to be made by both the consumer and the producer if the tariffs and sales tax on ITNs are eliminated. Indirect taxes have been shown to be regressive when it comes to the poor and the vulnerable sections of the populations, and so are out-of-pocket payments. The combined effect of taxes and out-of-pocket payment would even be worse. However, with the elimination of sales tax and tariffs, the regressivity is lessened. Practically, however, the story may be different due to a lot of macro-economic fundamentals, market distribution in the ITN industry, and nature of the ITN industry and the perception of the role of nets by the consumers. Using a mathematical model devised by Simon et al 2001, the study tries to answer the question of the practicability and applicability of this policy instrument in the Zimbabwean context.

The models assist in tracing the filtering of this policy through the whole marketing chain from the manufacturer, distributor through to the final consumer. Starting with a very simple situation where ITNs are imported as a final product, with sales tax and a fixed percentage of profit per unit sold being added on.

4.1 MODEL 1: IMPORTING ITNs

This simple model assumes that the importer is selling directly to the consumer. Equation 1 shows how the retail price is arrived at.

$$1.\quad P_R(Tt) = p^w(1+r^T)(1+r^t)(1+r^I).\ \textit{Where ;}$$

$P_R(Tt)$ = the retail price with a tariff and sales tax.

p^w = the import price.
r^T = the tariff rate

r^t = *the sales tax imposed on the ITN.*

r^I = *profit(using cost-plus pricing)*[20].

If the tariff and the sales tax is then removed on the imported ITN, equation 2 shows the resultant scenario, where the retail price is made up of the import price and the percentage profit rate.

$$2.\quad P_R(w) = p^w(1+r^I).\ \textit{Where ;}$$

$P_R(w)$ = *price without a tariff and sales tax.*

The percentage change in retail price due to the elimination of a tariff and sales tax can then be calculated using the simple algebra below ; that is, the new retail price without a tariff and sales tax less the original retail price with the tariff and sales tax divided by the original retail price with a tariff and sales tax as shown in equation 3.

$$3.\quad [P_R(w) - P_R(Tt)]/ P_R(Tt) = (- r^T r^t)/(1+r^T)(1+ r^t)$$

The final impact on consumer purchases is then found out by multiplying the elaciticity value of the demand for ITN product in the ITN market with the the percentage change in retail price after the tariff and sales tax have been eliminated. The right hand side shows the quantity purchased without a tariff and sales tax [$Q_R(w)$] less the quantity purchased with a tariff and sales tax [$Q_R(Tt)$] all divided by the quantity purchased with a tariff and tax incorporated in the retail price [$Q_R(Tt)$] as shown in equation 4.

$$4.\quad [Q_R(w) - Q_R(Tt)]/ Q_R(Tt) = - [(r^T r^t)/(1+r^T)(1+r^t]* E$$

Model 1 is the simple framework that forms the basic foundation of the models that the study uses to analyze the effect of removing tariffs and taxes in the ITN market in Zimbabwe. The ITN market in Zimbabwe is represented well by models 3 and 4 in which ITN materials are

[20] Cost pricing refers to the cost-plus percentage profit rate.

imported, assembled locally and then sold as a final product to the consumer. These two models clearly reflect the situation in Zimbabwe where there are only two net manufacturers (although the study noted earlier on that the analysis excludes the other 'non-visible producer') and a couple of distributors. The ITN market is however, dominated by one major manufacturer, Emnet which seems to enjoy a sizeable market power, as the other manufacturer only makes nets on request or on special orders. Classifying Emnet as monopoly supplier of ITNs would warrant one to use another extra model on monopoly. However, the absence of other firms in the industry does not mean a monopoly, and on the other hand, presence of many firms does not guarantee competition since firms can still collude and raise prices.

Model 2 was skipped because it is basically an extension of model 1 and looks at a situation where ITNs are imported rather than domestically produced. The pertinent models : model 3 looks at a situation where the marginal costs of production are constant[21], while the fourth model looks at a situation where the marginal costs are increasing for every extra net produced.

4.2 MODEL 3: CONSTANT MARGINAL COST INDUSTRY

Firstly the research needed to ascertain the variables that make up the marginal costs for a manufacturer of ITNs. Equation 5 below gives a simple summation of the marginal cost of the ITN manufacturer. Variable r^T is the tariff rate, variable *b* refers to the other local production costs that include labour, transport, rent and rates, etc and variable p^w refers to the CIF price of the imported materials needed to make an ITN. It is also important for one to give the marginal costs framework since it is pointed out earlier that model 3 and 4 depend on the marginal costs being constant and increasing respectively.

$$5.\quad \text{Marginal cost} = p^w (1 + r^T) + b$$

The initial retail price that incorporates the tariff rate and the sales tax is given in equation 6;

$$6.\quad P_R(Tt) = [p^w (1+r^T) + b + M1+M2] (1+r^t); \text{ where,}$$

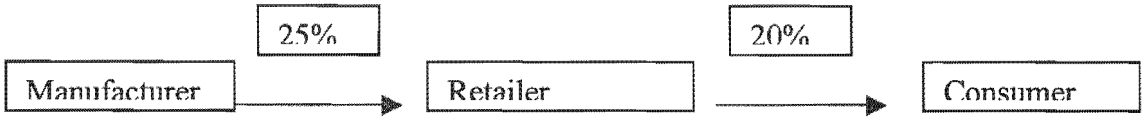
[21] Constant marginal cost means that an additional net costs as much as the net made before.

$M1 = r^J p^w (1 + r^T)$ *and*

M2 = % profit rate by the retailer.

This analysis assumes that the marketing chain is made up of the manufacturer, the retailer and the consumer as illustrated below.

Figure 5: Retail and Mark up Chain



The study lumped together the wholesalers and retailers, since there is basically no distinction between the big retailers and wholesalers involved in the distribution of ITNs in Zimbabwe. Retailers involved in the distribution of nets in Zimbabwe are big retail shops like OK and Bays and they enjoy the same status as wholesalers, for example discounts for bulky buying. This gave the study instead two levels of mark up. In Figure 5 above, M1 refers to the mark up charged by the manufacturer and is based on the cost-plus pricing policy, while M2 refers to the profit rate charged by the retailer and enters the equation additively since it is also based on the same cost plus-pricing principle.

If the tariff and the sales tax are eliminated the new retail price is therefore given in equation 7 as ;

$$7. \quad P_R(w) = [p^w + b + M1+M2]$$

In the same way the model calculated the percentage change in retail price in model 1 above, the model applies the same basic mechanics in the following equation 8.

$$8. \quad [P_R(w) - P_R(Tt)]/ P_R(Tt) = - r^T r^t/[(1+r^T)(1+r^t)+ (M1+M2+ b)/p^w]$$

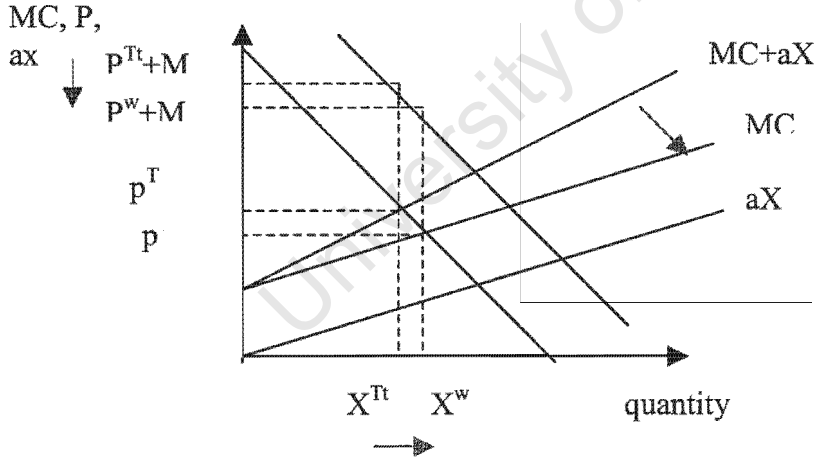
If the equation is multiplied by the elasticity value, one is able to calculate the final impact on consumer demand for ITNs as was done in Model 1.

Since model 3 is some kind of special case, the study looked again at model 4 which the study believesstrongly represents the ITN Industry in Zimbabwe.

4.3 MODEL 4: INCREASING MARGINAL COST INDUSTRY

Model 4 applies a slightly different philosophy to the third model in that instead of constant marginal production costs, it looks at a situation of increasing marginal production costs. We will look at a diagrammatic illustration behind the model.

Figure 6: Diagram showing the supply shifts due to change in tariff and tax structure.



Where:

1. *MC = Marginal cost without tariff.*
2. *MC+aX = marginal cost with tariff.*
3. *D = Domestic demand curve.*
4. *P^{w} = Producer prices without tariff.*
5. *P^{T} = Producer prices with tariff.*
6. *P^{Tt} + M = Consumer prices with tariff and tax.*
7. *P^{w} + M = Consumer price without tariff and tax.*

8. *M = Mark-up earned in the marketing chain.*

NB: Sales tax enters the analysis at the retail level/consumer price level hence it is not part of the producer price analysis.

Removal of tariff will lower input prices hence shift the original supply curve from MC+aX to MC leading to the fall of producer prices from P^T to P^w. The reduction of producer prices would 'prompt' retailers to lower their prices from P^T+M to P^w+M, however, with a further removal of the sales tax at the retail level, consumer prices will fall with a further percentage. The fall in consumer price will cause a larger quantity of the ITNs to be purchased (X^{Tt} to X^w).

The model notes that the important aspects to consider in this case of increasing marginal costs are the magnitude of the supply curve shift (which implicitly incorporates supply elasticity) and the effect of demand elasticity on the final retail price and retail purchases. And as the model notes again: that analysis is complex, but somehow using basic microeconomics analysis, ceteris paribus, they suggested that the shift can be calculated via the use of cross and own price supply elasticities as shown in the equation 9 *(ibid)*. In this research the study could not calculate the cross and input supply elasticities due to inadequate industry data and the reluctance of the Industry to release cost of production data.

$$9.\quad S_w = -(wX/pX) * S_p * N$$

S_w refers to the elasticity of supply with respect to the netting and insecticide input prices. Component -(wX/pX), refers to the negative of the netting and insecticide material costs as a share of the total revenue from the sales of bed-nets at the going price P. The component Sp refers to the supply elasticity with respect to output price, N refers to the returns to scale parameter, and as the model assumes, production levels can be expanded at reasonable cost when N is equal to 1, while an N value that is greater than 1, implies that an expansion in production levels is more costly. Variable X refers to the quantity of both netting materials and insecticides, and the final output, where wX refers to the total price of the netting and insecticide materials and pX refers to the total revenue from ITN sales.

The change in producer prices is effected by the interaction between the demand and supply curves, the magnitude of the change is reflected by the elasticities of these curves. Equation 10 estimates therefore the magnitude of the change in producer prices.

$$10.\ \%\Delta P = [S_w / (E - S_p)] * \%\ w$$

Parameter E refers to the elasticity of demand with respect to price. In equation 11 the model calculates the magnitude of the change in retail price of the ITNs at the consumer level.

$$11.\quad p^T/(p^{Tt} + M) = \%\ P * [p^T / (p^{Tt} + M)].$$

The document has described in-depth the models that were used in the analysis of data that was collected from various stakeholders that included manufacturers of nets and insecticides, retailers, Ministry of Health and Child Welfare, The World Health Organization and some NGOs that were/or are still involved in the promotion of extensive use of ITNs. While the original models looked only at a case of the removal of a tariff and a situation of one level of mark up, this analysis added on the issue of domestic sales taxes and an extra level of mark up pricing. As the models noted, the basic mechanics of analyzing the effect of these taxes would remain the same (Simon et al, 2001).

4.4 CRITIQUE/LIMITATIONS OF THE METHODOLOGY

The complex nature of the human behaviour cannot be entirely captured by a mere analysis of price responses. Intrinsic human values, cultures, preferences and perceptions that come into play when a consumer decides to buy the good are all missing in the analysis or they have been assumed to be constant.

As usually the case with economics, to simplify analysis many assumptions are made and these in some instances where these assumptions have watered down the models to mere utopian models that are far away from reality.

The models that the study employed draw a lot of strength from neo-classical economics hence assume that both distribution agents and the consumers are rational beings and would always exercise this rationality when purchasing ITNs. The models also assume that a tariff removal or reduction on inputs and a sales tax removal on the ITNs would automatically mean a reduction in the price of the consumer good, which would also result in the automatic adjustment of the market demand for ITNs. In practice there are so many factors that would hinder the free operation of such a mechanism, such as market imperfections due to fiscal distortions for example inflation and over-valued exchange rates, asymmetry of information between the producer and the consumer and the political status of the country as well as monopoly behaviour by some of the ITN industrialists. In reality the model would work better in pluralistic economies.

Most of the parameters in the model such as the returns to scale parameter, parameters used in the calculation of cross supply elasticities and even the simple price elasticities are difficult to estimate in Sub-Saharan African countries because of either lack of information or unsystematic recording systems of industry information. Hence most guess-estimated figures dilute the whole logic and argument of the whole exercise.

The model assumes that each party in the ITN industry knows exactly what would be happening, however, the consumers are always at a disadvantage since they do not know how the ITN industry really functions, for example, how ITN agents in the public sector and private sector arrive at their profit margins and how they finally set their prices. The model also disregards the market distribution in that it oversimplifies the nature and operation of the market by assuming a traditional marketing chain where goods move sequentially from the manufacturer to the wholesaler, and then to the retailer and finally to the consumer. The modern distribution chain is more complex than the traditional one hence one cannot easily trace how the benefit of tariff and sales tax removal moves from one node to the other.

However, the model still serves its purpose as a vehicle to initiate debate by providing justification to the policy instrument based fundamentally on basic micro-economic principles. Its simplicity makes it easier for the unsophisticated Policy maker to see the first line benefits of a tariff and sales tax removal on ITNs and their inputs.

CHAPTER 5: METHODS OF DATA COLLECTION

5.1 STUDY AREA

This is fundamentally a quantitative study although few qualitative data was also collected. The study was conducted mostly in Harare, the capital city. The choice was not deliberate, but the study took place in Harare because of the nature of the ITN industry, which is concentrated in Harare. The single largest manufacturer of bed-nets, Emnet is located in Harare and so are the companies that manufacture and prepare the insecticide chemicals. Most of the wholesalers and retailers that deal in ITNs have their company headquarters in Harare.

It was also imperative that study be undertaken in Harare because it houses the Ministries of Health and Child Welfare, Industry Trade and Finance and the Non-Governmental Organizations that deal with ITNs. However, this did not mean that the study was strictly confined to Harare, as company visits were also made to a textile company in Kadoma, which is a city about 180 kilometres outside Harare, which also manufactures ITNs on a small scale. There was also need to visit retail shops outside Harare to assess their transport costs.

5.2 SAMPLE SELECTION

Since this was basically a quantitative study based mainly on expert information from the ITN industry, Ministries of Industry, Trade and Finance, and the MOHCW and NGOs, the sample frame itself was very small on account of the few actors that are involved in issue of mosquito nets. There are only two companies (Emnet and Protex Clothing) that are involved in the manufacture of ITNs with one of the companies making the nets on a very small scale to the extent that it does not make any significant impact on overall net production in the country. There is also a single company (Nets and Ropes) that provides processed yarn to Emnet, which is the fabric used to manufacture nets. There are also about 6 companies that are involved the production, preparation and supply of insecticides. Added to this list are few retail and wholesale shops that are involved in the netting business.

There was therefore basically a kind of "Systematic Sampling" where companies and the ITN distributors were practically selected on the basis of their willingness to provide essential industry and retail information. For example the provision of cost of production data and profitability margins was regarded by some companies as very sensitive information and hence could not give that kind of data. In this regard such companies 'self-selected' themselves 'out' of the study by their unwillingness to provide the information required.

5.3 TECHNIQUES AND DATA COLLECTION

Structured interview schedules and guidelines for informal interviews were designed to collect data from the Manufacturers on cost of production, procurement procedures and sources as well as data on profitability. Data was collected using those methods mentioned above from ITN distributors on sales information, profitability and other ancillary costs. Using structured informal interviews information was sought from the Ministry of Industry, Trade and Finance on tariff rates and tariff classification, revenue generation capabilities, the impact of eliminating such tariffs on the consolidated revenue fund and the industry itself and information on alternative methods of revenue generation. From the MOHCW and the NGOs, information on malaria demographics, welfare issues, malaria policy and programmes and projects was sought by use of formal and informal interviews.

Expert meetings conducted mainly in the form of focus group discussions, were another important tool used to gather data on pertinent ITN issues. With the assistance of the WHO, such gatherings provided the opportunity to meet and interact with experts in different fields and policy environments. The WHO (RBM) local office on our behalf organized two such meetings.

Most of the information on company data was collected using an excel spreadsheet template that was easy to follow and hence could also be send by e-mail to the companies, where they would provide the information required and then send it back by e-mail. In some of the cases, telephone interviews were conducted especially with ITN distributors outside Harare.

Data on the Market assessment study was obtained mainly from secondary sources, but it was double checked with industry information so as to maintain consistency and improve the quality of data.

The other important factor was that since the study was fundamentally a quantitative analysis, it also relied to a large extent on secondary information. Most of the secondary data was collected from the Central Statistical Office Year Books, Company Reports, NGO annual reports and Ministries' annual reports. Some of the information could be obtained on the Internet by use of a technique called 'snowballing'[22]. This unique technique was also extensively used to search for relevant literature on ITNs.

5.4 QUALITY CONTROL AND DATA MANAGEMENT

The analysis of the data, which was described earlier as a quantitative study, was done based on two (2) of the four (4) models on Tariffs that were first developed, used and tested by Simon et al, 2001. The two models that were employed in the analysis were considered a relevant representation of the ITN industry in Zimbabwe.

Since companies, wholesalers and retailers gave different prices for ITNs, different prices for raw materials and different prices for insecticides, average figures were calculated and used in the analysis. Consistency was highly maintained in the calculations. It was only in the case cost of production data that information from one company Emnet was used in the analysis for reasons already alluded to in the earlier sections. Double and counter checks were made with other sources in the industry to verify the accuracy of information.

[22] Snowballing is a technique where the search process grows quickly in size, intensity and importance as one searches for particular information on the Internet.

5.5 TECHNIQUES OF DATA ANALYSIS

The quantitative data analysis was first done in Excel to calculate the average prices and total production figures. The application of these figures to the models and the further calculations were done manually because of the difficulties in programming the models. The calculations are shown in the appendix section of the word document.

Informal interviews were interpreted directly since they only involved a few interviewees and hence there was no need to use SPSS or any other statistical packages to interpret this qualitative part of the study.

Although the study could not find all the information that was necessary for a thorough analysis of the ITN financing policy alternative, such as information on price elasticity of demand, the quality information that was gathered in the field using instruments described above was enough to adequately address the study objectives.

CHAPTER 6: RESULTS

In this chapter the study analyzes and discusses the results from the estimation of models 3 and 4 separately. In the following sections it then compares the results from these two models in order to ascertain where one would derive more benefit. It also looks at a potential theoretical market for the private sector in the ITN business and tries to estimate some potential sales growth targets for the industry so as to give an outlook of the potential benefits the private sector would also obtain.

6.1 CONSTANT MARGINAL COST INDUSTRY[23]

Results from Model 3 (summarized in table 8 below), which is a constant cost industry show that the removal of a 15% tariff results in a 12% change in the retail price of ITNs. This is quite substantial and its effect on the retail purchases of ITNs with an inelastic demand value of -0.5, results in the retail purchases increasing by about 6%. With current production of nets in the country at 1.1 million for both the domestic market and the foreign market and using this figure as our current theoretical annual demand, estimated increase in retail purchases would be about 66 000 nets per year.

[23] See actual calculations in Appendix 1.

Table 8: Model 3 Summary table

Removal of 15% Tariff	
	Elasticity = -0.5
Percentage change in Retail Price after removal of tariff	12%
Percentage change in Retail Purchases.	6%
Estimated Annual demand quantity of ITNs.	1.1million nets per year
Estimated increase in Quantity Demanded.	66 000
Removal of 15% tax and 15% Tariff	
Percentage change in Retail Price after removal of both tariff and sales tax	23%
Percentage change in Retail Purchases	11.5%
Estimated increase in Quantity Demanded	126 500

The removal of both taxes, that is, tariffs and sales tax would result in a further fall in retail price from 12% to twofold fall of about 23%, which is highly substantial considering that the absolute sum of the two taxes is 30%. With a demand elasticity of -0.5 for the ITNs, the increase in retail purchases due to the 23% fall in retail prices would be 11.5%. And using our earlier estimated annual demand figure for ITNs, this would result in 126 500 more ITNs being purchased per year.

6.2 SENSITIVITY ANALYSIS: MODEL 3

For sensitivity purposes to verify whether we can still arrive at the same conclusion after altering one of the parameters, the study also analyzed the data using an elasticity of demand value of -0.9. Using this elasticity value and also still employing the same percentage change in retail price, the consumer purchases increase by about 10.8%. Using our annual theoretical demand this would result in an estimated increase in quantity demanded of ITNs by a margin of about 118 000 nets per annum. An elasticity of demand of -0.9 would result in a 20.7%

increase in retail purchases (that would be about 227 700 more nets being purchased per annum).

Table 9: Sensitivity analysis: Demand elasticity = -0.9

Removal of 15% Tariff	
	Elasticity =-0.9
Percentage change in Retail Price after removal of tariff	12%
Percentage Change in Retail Purchases	10.8%
Estimated Annual demand quantity of ITNs.	1.1 million nets per year
Estimated increase in Quantity Demanded	118 800
Removal of 15% tax and 15% Tariff	
Percentage change in Retail Price after removal of both tariff and tax	23%
Percentage change in Retail Purchases	20.7%
Estimated increase in Quantity Demanded	227 700

On average, the results show that a removal of 15% tariff on ITNs in Zimbabwe in a constant cost industry, *ceteris paribus*, would result in retail price falling by 12% and retail purchases increasing between 6% and 11%.

In essence, results from model 3 have shown that there are indeed substantial benefits if a tariff on ITN materials is removed and that the magnitude of the benefits to the consumer depends on the price elasticity of demand. The gains are even larger when both the tariff and sales tax are removed. Depending on the marketing distribution chain and the firms' and distributors' mark up pricing, the retail purchases increase markedly but not by the same magnitude as the total percentage fall in both taxes highlighting the intricacies in pricing policies and general price behaviour.

Discussions with ITN industry experts revealed that model 3 was a classical case and would therefore not best represent the ITN industry in Zimbabwe. Just like perfect competition in classical economics, Model 3 was viewed as a purely exceptional case. But considering the situation now prevailing in Zimbabwe, where prices of imports and the other commodities are just increasing almost on a monthly basis due to hyperinflation and the unstable exchange rate, one would also be justified in using another model that reflects an increasing marginal cost industry. Prices of raw materials and labour hence unit costs are bound to increase when new entrants get into the ITN industry because of competition for the scarce raw materials.

6.3 INCREASING MARGINAL COST INDUSTRY[24]

A couple of assumptions were made in this model: Firstly, it was difficult to estimate the supply elasticity of the ITN product in the industry, hence the model tried to infer for a realistic elasticity value using basic microeconomic analysis and evidence from empirical studies. ITNs in Zimbabwe are classified under textiles both on account of the fabric that they use in their production and also for purposes of tariff classification and charging. Generally from economic theory textiles are regarded as supply elastic. The model used a realistic supply elasticity value of 2 based on the fundamentals of microeconomics for such products as ITNs. An advantage of the inferred supply elasticity value, it could also be juxtaposed with the results found out by Simon et al, 2001 in some of their case studies. The model then used a supply elasticity value of 5 for sensitivity purposes. A value of 5 is plausible and justifiable than a supply elasticity of more than 10 that is considered too high and practically unrealistic[25].

The model also assumed returns to scale parameter of 1, both for comparison purpose with earlier studies and basically for the reason that interviews with industry experts revealed that they were not producing to capacity and hence had room to increase production if necessary. Returns to scale parameter of one (1) would ideally describe this kind of situation. The price

[24] For step-by-step calculations refer to Appendix 2.
[25] Simon et al, 2001.

elasticity of demand values are the same values that were used in Model 3.Table 10 below summarizes the results that were found using Model 4 equations.

Table 10: ***Model 4 Summary table***

15% Tariff eliminated	*1 % decrease in raw materials causes supply to increase by 1.04%*	
	Supply elasticity of 2 and Price Elasticity of demand = - 0.5	**Supply elasticity of 2 and Price Elasticity of demand = - 0.9**
Returns to scale Parameter	**1**	**1**
Percentage fall in producer prices	6.24%	5.38%
Percentage fall in consumer prices	4.5%	4.5%
Percentage increase in consumer purchases	2.25%	3.87%
Estimated annual quantity demanded for ITNs = 1 100 000		
Estimated increase in quantity demanded	24 750	42 570
Elimination of 15% sales tax and 15% tariff		
Percentage fall in consumer prices	5.18%	4.45%
Percentage increase in consumer purchases	2.58%	4%
Estimated increase in quantity demanded	28 380	44 000

When a 15 % tariff is removed and supply elasticity of 2 exists in the industry, this would result in a 1% change in the price of raw materials resulting in supply of ITN raw materials increasing by 1.04%. The increase in the supply of raw materials would have the effect of decreasing the producer price by 6.24%. Following the chain further, this fall in producer prices would then translate into a 4.5% fall in the consumer prices. As was pointed out in model assumptions that the model used the same price elasticity of demand values as in Model 3. Using -0.5 as the value for price elasticity of demand, therefore consumer purchases would increase by an estimated 2.25%. Having alluded earlier in Model 3 that the estimated

theoretical annual demand is 1.1 million nets, the model therefore estimated that the consumer ITN purchases would increase by 24 750 nets per year.

The model also estimated the increase in consumer purchasing by employing the price elasticity of demand of -0.9 to test for the robustness of results as we did with Model 3. With the same parameters that were assumed earlier on still remaining operational, producer prices are bound to fall by about 5.38% leading to a further fall in retail prices by 4.5%. The fall in retail prices therefore leads to consumer purchases increasing by 3.87% (an increase of approximately 42 570 nets per year using the estimated theoretical annual demand figure for ITNs).

In the first part of Model 4 the removal of a 15% tariff with supply elasticity of 2, and price elasticity of demand of between -0.5 and -0.9, consumer prices would fall by about 4.5% while the retail purchases would increase by between 2.25% and 3.87% (that is between 24 750 nets and 42 570 nets per year).

The second part of Model 4 looked at a situation where both tariff and sales tax are removed. In the case of where supply elasticity is 2 and the price elasticity of demand is estimated at -0.5, the removal of both taxes would lead to a 5.18% fall in consumer prices culminating in consumer purchases increasing by 2.58% (28 380 nets per year). And again with supply elasticity of 2 and price elasticity of demand of -0.9, results also show that the retail price for ITNs would fall by about 4.45% leading to consumer purchases increasing by 4% (44 000 nets per year).

6.4 SENSITIVITY ANALYSIS: MODEL 4

In this sensitivity analysis section, the model explored the impact of the removal of 15% tariff and 15% sales tax on ITNs and their inputs in a situation where a supply elasticity value of 5 prevails in the industry. This supply elasticity value of 5 was employed to test for the robustness of model 4 results.

Table 11: Sensitivity Analysis: Supply elasticity = 5

15% Tariff eliminated	*1 % decrease in raw materials causes a 2.6% increase in supply*	
	Supply elasticity = 5 and Elasticity of demand = 0.5	**Supply elasticity = 5 and Elasticity of demand = 0.9**
Returns to scale Parameter	**1**	**1**
Percentage fall in producer prices	7.09%	6.6%
Percentage fall in consumer prices	5.10%	4.75%
Percentage increase in consumer purchases	2.55%	4.28%
Estimated annual quantity demanded for ITNs = 1 100 000		
Estimated increase in quantity demanded	28 050	47 080
Elimination of 15% sales tax and 15% tariff		
Percentage fall in consumer prices	5.87%	5.5%
Percentage increase in consumer purchases	2.9%	4.95%
Percentage increase in consumer purchases	2.9%	4.95%
Estimated increase in quantity demanded	31 900	54 450

As shown in the table 11, a 1% fall in the price of raw materials would lead to a 2.6% increase in the supply of ITN inputs. The fall in the price of raw materials due to the removal of the tariff would induce a 7.09% fall in the producer price of the ITNs. Consumer prices would then respond by 5.10% decrease. With a price elasticity of demand of –0.5 the fall in consumer prices would culminate in consumer purchases increasing by 2.55% (an increase of 28 050 nets per year).

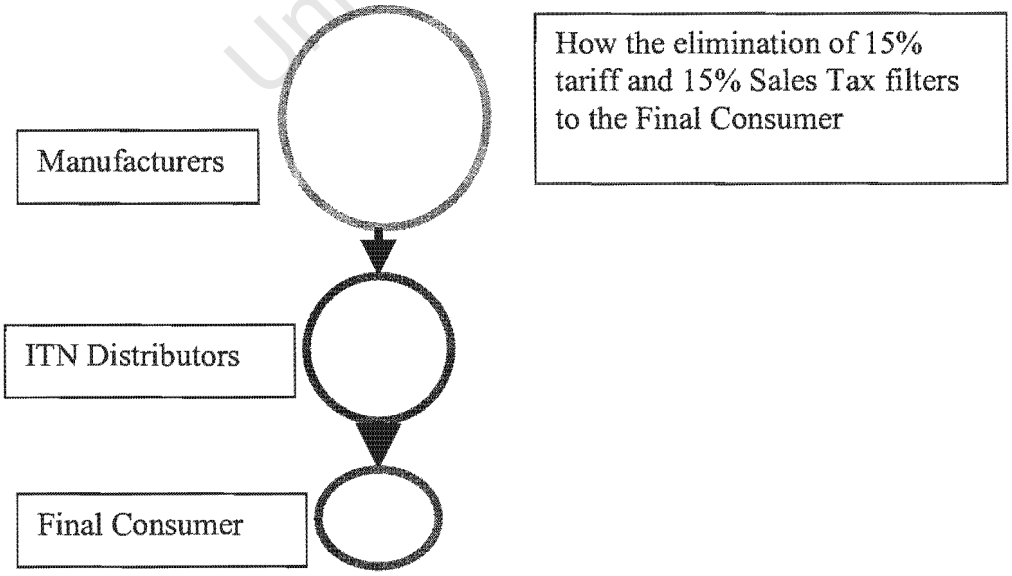
With a different and higher price elasticity of demand of -0.9, and same supply elasticity (5) as above, the results also show that the producer price falls by about 6.6% leading also to the fall in retail prices by 4.75%. This fall in retail prices would then translate into a 4.28% increase in consumer purchases (an increase of 47 080 nets per annum).

This implies that given a supply price elasticity of 5 and price elasticity of demand of between –0.5 and –0.9 coupled with a removal of 15% tariff, consumer prices would fall by between 4.5% and 5.10% leading to an increase in ITN purchases of between 2.25% and 4.28% (an increase of between 24 750 nets and 47 080 nets per year).

In the other case where both 15% tariff and 15% sales tax are removed and the supply elasticity is estimated at 5 and demand elasticity estimated at -0.5, retail prices fall by 5.87% resulting in consumer purchases increasing by about 2.9% (31 900 nets per annum). And with a price elasticity of demand of -0.9, the retail price falls by about 5.5% resulting in consumer purchases increasing by about 4.95% (an increase of 54 450 nets per annum).

In summary results from the model and sensitivity analysis have shown that the removal of both taxes indeed lead to retail prices falling and retail ITN purchases increasing. The combined absolute sum of 30% taxes would lead to retail prices falling by between 4.45% and 6% and consumer purchases increasing by between 2.5% and 5% (that is between 28 380 nets and 54 450 nets per annum). The increase in retail purchases is, however, marginal even though both taxes are removed. This is basically due to the nature of the industry, which is an increasing marginal cost industry and the complex marketing distribution in the ITN industry as shown by the 'shrinking ball benefit' illustration below.

Figure 7: 'Shrinking ball benefit'



The illustration implies that the entire 30% absolute sum of both tariff and sales tax does not go to the consumer on account of the structure of the industry, ITN industry profitability setting mechanisms and the general 'stickiness' of prices in adjusting downwards.

6.5 COMPARISON OF THE TWO MODELS

In this section the study compares and contrasts results from both models to show which type of industry between a constant and increasing marginal cost industry would benefit more if tariffs and domestic taxes were removed on ITNs. Firstly it gives a combined summary for both models and secondly it juxtaposes the two models. Table 12 below gives a summary of the important results from both models.

Table 12: Comparisons of Models 3 and 4.

Model Type	**Model 3**		**Model 4**	
	Elasticity of demand = -0.5	***Elasticity of demand = -0.9***	***Elasticity of demand = -0.5***	***Elasticity of demand = -0.9***
Removal of 15% tariff				
Range of retail price fall	12%	12%	4.5% - 5.10%	4.5% - 4.75%
Range of increase in consumer purchases	6% *(66 000 nets per year.)*	10.8% *(118 800 nets per year.)*	2.25% - 2.55% *(24750–28050 nets per year)*	3.87% - 4.28% *(42570-47080 nets per year)*
Removal of both taxes (15% tariff and 15% sales tax).				
Range of retail price fall	23%	23%	5.18% - 5.87%	4.45% - 5.5%
Range of retail purchases	11.5% *(126 500 nets per year.)*	20.7% *(227 700 nets per year.)*	2.58% - 2.9% *(28380-31900 nets per year)*	4% - 4.95% *(44000-54450 nets per year.)*

Assuming that the ITN industry is competitive and depending on the behaviour of marginal cost of production, a removal of 15% tariff would likely cause a fall in retail price of between 4% and 12%, resulting in consumer purchases increasing by between 2% and 11%. And in case where both taxes are removed, retail prices are likely to fall by between 4% and 23%, resulting in consumer purchases increasing by between 2% and 21%. However, more benefit of this tariff and tax policy would be realized in an industry that exhibits constant marginal cost of production than in the case of an industry that exhibits increasing marginal cost of production. The results shown in the table also indicate that greater purchases of ITNs would be made if both taxes were eliminated, although this is substantial in a constant marginal cost industry and marginal in the case of increasing marginal cost industry.

6.6 DISCUSSION OF THE RESULTS

The analysis above has highlighted a very exciting scenario, where if the dictates of market economy and the basic principles of marketing are followed, then benefits are certainly set to accrue to the consumer. It may not be the entire 15% tariff or 15% sales tax that goes to the final consumer in terms of price reduction, but that any price reduction that is above 5% in a non-inflationary economy is set to benefit the consumer. However, as shown in the analysis, the magnitude of the benefits of this policy are affected by a number of things:

- The perception of the ITNs by the consumer and how it affects their incomes and welfare. If ITNs are viewed as a luxury good, then chances are that the price reduction due to the tariff and sales tax removal may not make such a huge impact. But if the consumers view the ITN product as a necessity by virtue of its life saving nature, then a price reduction may have a huge impact on future ITN purchases. It is also interesting to juxtapose this important point with KAP studies that were undertaken by Tim Freeman *(ibid)* and Charimari *(ibid)* and his team in Zimbabwe in which they found out that people in malaria areas had the knowledge of malaria that was not, however, complimented by the use of ITNs. Somehow the implication was that the people did not view ITNs as a necessary good. Skovbolling *(ibid)* also found out that

although 97% of the people interviewed in her study said they had heard about mosquito nets, only 9% of them owned a net with about 64% of those interviewed saying that they did not have mosquito nets due to exorbitant price of ITNs and the issue of inaccessibility of the product.

- Information asymmetry between the seller and the consumer. Should the benefits be realized, then every agent in the net distribution chain should act as an 'honest broker' and play his/her part without any malicious intentions. Market failures are common even in developed countries and they are worse in developing countries. In third world countries like Zimbabwe, there are no guarantees and certainly no mechanisms that would ensure that important information such as the policy on ITNs and how it is intended to function, would be known by the intended beneficiaries.

- Thirdly, by the nature of the marketing distribution in the country and the fact that prices are generally 'stick' in adjusting downwards.

The situation prevailing in the ITN market is not, however, as simple as calculating the gains and losses at each distribution node. On account of the complex distribution chain that the study described earlier on, the effect of the removal of tariffs and domestic sales tax does not filter as systematically as the models have assumed. Either the retailers or the manufacturers themselves may decide to profit from this policy and then pass on a small decrease in price that will not be enough to induce a major shift in the use of ITNs.

For economies such as Zimbabwe that have unsustainably high levels of inflation and unstable currency and undefined checks and balances, it may be difficult to see the impact of the removal of these taxes in the Long run. With prices rising almost on a monthly basis, the benefits of the policy may be swallowed by frequent price changes to the extent that even any mechanism to monitor the policy implementation may become bogged down to expensive non-productive bureaucracy. Price distortions due to inflation and over-valued exchange rates may also act as a disadvantage to this policy measure.

In the theory of tariffs and taxes section the document alluded to the fact that the government revenue and the final redistribution of this income may be greater than the welfare loss

suffered by both the consumer and the producer. It is clearly evident that a removal of 15% tariff and 15% sales tax do not filter to the consumer in their entirety as the analysis has shown. Proponents of theories of distribution would support a situation where government collects these taxes and re-distributes them and benefit the poor. One should, however, note that this suggestion is difficult to understand in Zimbabwe since when these taxes are collected they are pooled together with revenue from other taxes such as income tax, company taxes, property taxes etc, into what is known as the consolidated revenue fund.

Once they are pooled together they 'lose' their identity, and one will not know whether the tax collected was collected from products that benefit health directly or otherwise. In other words, there is no such policy as earmarking of taxes that would ensure that taxes collected from health goods would benefit more the health sector, or that a certain percentage of income tax should be specifically earmarked for health care financing. The 15% tariff and the 15% tax collected from ITNs will not be completely earmarked for malaria intervention. If it were the case then there would be no need to advocate for the removal of these taxes. In the following paragraphs the study tries to justify the argument by analyzing the health expenditure pattern in Zimbabwe and comparing it to the situation of elimination of tariffs and sales tax.

In Zimbabwe, health expenditure as a percentage share of total government expenditure in nominal terms, accounts for between 4% and 7%. Using these figures one can calculate just how much of the 15% tariff and 15% sales tax would go towards health expenditure, even though one is aware that even a very small percentage of these taxes would not really go towards malaria intervention.

Equation 1: 0.15 * 0.04 = 0.0006 that is 0.6% of the tariff goes towards health expenditure. Since sales tax is also 15%, we therefore assume that approximately 1.2% of the combined sum of 30% taxes is allocated to the health sector and therefore goes towards health expenditure in general.

Equation 2: 0.15 * 0.07 = 0.0105 that is 1.05% of the tariff goes towards financing health sector activities. Since both taxes are 15% each, this analysis therefore assumes that approximately 2.10% goes towards financing health care activities, but again without specifically going towards the financing of malaria prevention.

In summary, of these two taxes the analysis showed that approximately 1.2% to 2.10% of the combined sum of 30% of both taxes goes towards health expenditure in general without even specifically going directly towards the financing of malaria prevention programmes.

Comparing the 1.2% to 2.9% allocation to health sector expenditure and the fall in consumer prices of between 4% and 23% in both model 3 and 4, one would rather advocate for the elimination of taxes rather than for redistribution of the taxes after they have been collected into the consolidated revenue fund.

- Fourthly the benefits of the removal of taxes would be affected by the commitment from various interested parties to work towards a common goal. Ministry of Health and Child Welfare is still drafting the ITN policy document under pressure from WHO under its Roll Back Malaria Initiative to take stock of various ITN programmes and their benefit to the country. The private-public partnership needs to be defined and parameters set. Since the Private sector has to have at least an idea of the potential market they should serve, the study therefore carried out a market assessment of the potential theoretical ITN market in Zimbabwe.

6.7 MARKET ASSESSMENT

Having shown in the results section that there are indeed gains to be made by consumers when tariffs and domestic sales tax are eliminated on ITNs and its inputs, in this section the study gives a potential market outlook to the private sector. The private sector needs to be convinced that there is a market to serve in order for it to be interested in producing more nets hence this market assessment (MAE) exercise.

Of the 13 million people in the country, there is a total market potential of 50% (6.5 million people) for the ITN industry in Zimbabwe (SAMC bulletin 2000). This figure refers to total population of those people at risk from malaria. And of the estimated 2.8 million families in Zimbabwe, half of them are at risk from malaria hence constitute an estimated 1.4 million

families that have the potential to buy ITNs (Family size is on average 4.76, therefore 6.5million divided by 4.76 results in approximately 1.4 million families).

Given the family size of 4.76, this MAE assumed that there are about 4 members in a family, and if it further assumes that the father and mother use 1 net, and the other net is used by the children, then it estimates an average of 2 nets per household. Given this scenario one can therefore calculate the average-sleeping[26] units in the country as:

That is, 1.4 million families multiplied by 2 nets per household resulting in 2.8 million sleeping units. This implies that of the 1.4 million families that have a potential to buy nets if one should limit a household to only 2 nets, then on average there would be 2.8 million sleeping units in the country.

The figure of 2.8 million sleeping units gives us the 'nominal' maximum theoretical market for mosquito nets in the country. However, if one assumes a single dose treatment of the mosquito nets every six months as recommended by the WHO guidelines on net treatment, therefore the actual theoretical market for the mosquito nets can be re-calculated. It is as if after every six months a household has to purchase a new net. The MAE assumed so because of the fact that after every six months the household has to purchase two insecticides sachets for re-treatment.

Given the above understanding it implies therefore that the country has a (2.8 million sleeping units * 2, i.e. two six months periods in a year), 'real' total of 5.6 million sleeping units. The figure 5.6 million sleeping units gives the maximum 'real' estimated total theoretical market. But, however, because of poverty the study assumed that this kind of scenario is not feasible. Instead of above potential market being considered, the study looked at a minimum and maximum case scenario for potential ITN market.

A similar MAE analysis by SAMC assumed a minimum scenario as a case where the use of ITNs is targeted at the groups that are normally viewed as the most vulnerable: the under–five year olds and the pregnant women who live in endemic malaria areas. Given estimated population of under-fives at risk of malaria at approximately 987 500 and the pregnant

[26] There a re two members of a family in a sleeping unit.

women at approximately 219 000, The SAMC Bulletin of 2000 estimated the number of nets to protect the under-fives and the pregnant women as 959 625 nets. In calculating this figure, it assumed that the under-fives shared the same bed with their parents.

Contrary to SAMC MAE analysis, this MAE study did not complicate the whole issue by assuming a minimum scenario in which only pregnant women and children under the age of five would be analyzed. Rather it looked at potential market growth estimates to calculate a band of minimum and maximum scenarios. Limiting a family to buying one net of the two nets theoretically required per household as previously envisaged, since a large proportion of our target group is made of the poor people the MAE calculated the potential market growth using three sales growth figures. Assuming the ITN industry wants to meet sales growth of 2% (low growth), 10% (medium growth) and 22% (high growth), the MAE calculated the potential growth in sleeping units.

One may be tempted to ask for the basis and rationale for the percentage sales growth targets referred above? Note that in the results section it was concluded that if tariffs and sales tax are eliminated on the ITNs and their inputs consumer prices would fall by between 4% and 23% and retail purchases increase by between 2% and 21%. These later percentage increases in retail purchases are the figures that were used to as the bands for the low, medium and high growth scenarios in the ITN industry.

1. At Low growth of 2%, (2.8 sleeping units * 0.02) 56 000 sleeping units can be achieved per year.
2. At medium growth of 10%, (2.8 sleeping units * 0.1) 280 000 sleeping units can be achieved per year.
3. At the high growth of 22%, (2.8 sleeping units * 0.2) 616 000 sleeping units can be achieved per year.

The MAE analysis showed a potential theoretical market for the ITNs in Zimbabwe. Given a conducive environment to operate the private sector on a minimum basis can reach a market of 56 000 nets per year, a medium growth of 280 000 nets per year and can also realize a maximum growth in ITN sales of 600 000 ITNs per year.

It has to be pointed out that the other vector control methods were not taken into consideration in the calculation of these figures. This has left out the option of any preferences where one would say that one prefers larvisciding to ITNs or one prefers residual house spraying to ITNs. Factoring these preferences into our market assessment analysis would have resulted in complicated analysis that would have required sophisticated modeling techniques.

In summary there is indeed a market for ITNs in the country and the only thing that needs to be done is for the public policy makers to appreciate that only a positive public-private mix would achieve that.

6.8 BALANCING EQUITY AND SUSTAINABILITY

Subsidization versus commercial pricing:- For purposes of commercial pricing and marketing of ITNs the provision of subsidies or free provision of nets, although a noble idea, should not be encouraged, but neither should it be discouraged since there are some situations and contexts that necessitate that. Because of the lack of resources in developing countries certain programmes, for example the extensive procurement of ITNs, may need to rely on foreign assistance (Mills 1998), and normally the assistance comes in form of projects and programmes that would supply nets at either subsidized prices or for free to the affected people.

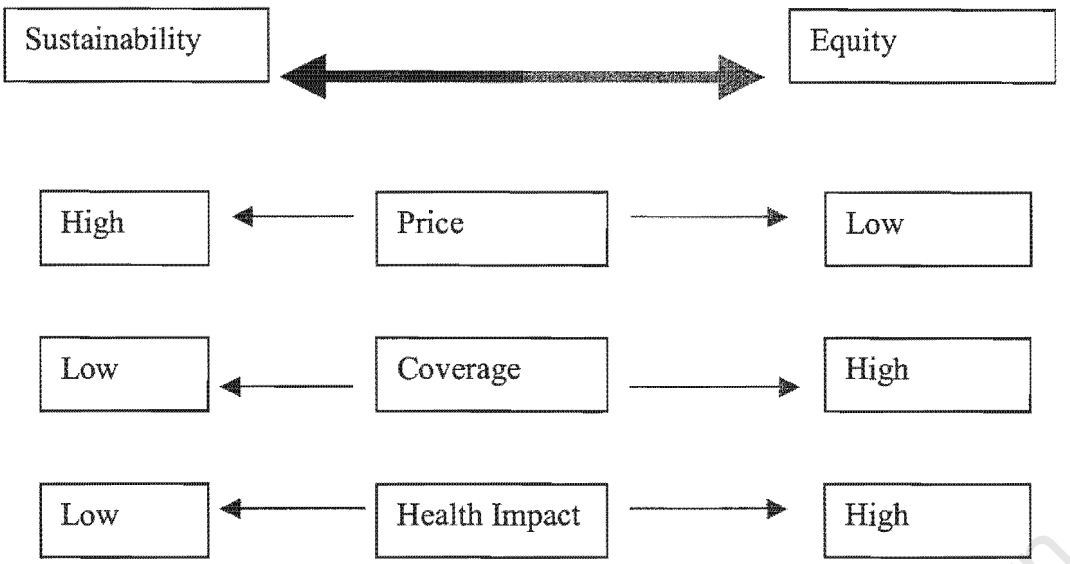
Proponents of equity will argue that market pricing of ITNs will not benefit the poor and the vulnerable but that programmes and projects that subsidize ITNs would. However, without specifically designed targeting mechanisms in endemic areas of poor households and the vulnerable people subsidization may prove expensive. More so subsidies may also lead to the intolerable situation of the emergence of black markets in the ITN market. In reality there is no 'optimum' approach to the provision of subsidies in general. Even what economists term the marginal benefits will still exclude the poorest, the very vulnerable group that these programmes are designed to serve.

But the provision of subsidies requires huge financial investments that may not be feasible in the long run. One should not be seen to encourage a situation where one achieves short- term equity at the expense of sustainability (here sustainability referring to efficiency and self sustenance of the ITN industry in developing country context) and lead to the crowding out of commercial players *(ibid)*. Programmes and projects do come and go and leave communities even more vulnerable. The point to note being that most programmes and projects will not be in handy to provide re-treatment insecticide sachets every six months once they finish handing out nets (Netmark Africa 2000).

Proponents of sustainability argue for a commercialized product that is sustained through the development of a robust and highly commercialized private market. However, one should note that the main goal for an entrepreneur is to maximize profits, which means that for the private sector to be sustainable in the long run, prices that guarantee sufficient profitability must be realized in the ITN market. However, In general decisions based on the philosophy of profit maximization are not for the best interests of the consumers. They are not welfare enhancing, rather they eat away the consumer surplus and lead to welfare loss hence the notion of profit maximization excludes those who cannot afford who happen to be the poor and vulnerable sections of the population who are most at risk to malaria. Out-of pocket payments especially by the poor people are highly regressive than even the indirect taxes.

So far it implies that there is a trade-off between equity and sustainability in ITN industry in developing countries hence sustainability can only be achieved at the expense of equity. Figure 8 below analyzes the balance between sustainability and equity in a Developing country context.

Figure 8: Balance between Equity and Sustainability in Developing Countries.



Source: Netmark Africa 21st Century Document 2000.

Figure 8 shows that a greater health impact coupled with a high coverage can only be achieved if the price of ITNs is set low enough for the poorest sections of the community to afford to purchase one. It can be clearly seen in the illustration above that sustainability is achieved at a greater cost. It is only a situation of high price that guarantees sustainability, which is, however, achieved at the expense of low coverage and low health impact. A scenario of low price, high coverage and high health impact leads to an equitable distribution of ITNs. This is basically the kind of mechanism that projects and programmes would like to see in place. However, if the goal of promoting ITNs is to be realized then, prices have to be set high enough to attract the private sector. The illustration above shows that with a scenario of high prices, ITN coverage is minimized resulting in low health impact, even though such a situation is considered sustainable.

The only possibility therefore may be to strike a balance between these two polar points, and this can only be achieved by combination or mixture of different financing mechanism that promote both equity and sustainability. These may include the selling of ITNs at cost price, use of strict targeting mechanism to identify the poorest of the poor and use of the willingness to pay studies that are able to identify the real beneficiaries.

In the following paragraphs the study looks at the demerits and merits of some of financing options for ITNs other than subsidies that the above section has indicated may promote the balance between sustainability and equity.

Price Controls: - Besides subsidies, setting a maximum price on the price of ITN is an alternative that the government can pursue. A maximum price would at least induce ITN manufacturers to opt for allocative efficiency and to further induce the firms to seek static and dynamic internal efficiencies due to reduced unit production costs. These would simultaneously ensure equity since ordinary consumers would be protected since ITNs would have become affordable. However, the unfortunate scenario is that price controls are a short-term measure, and can only be successful in a situation where there is asymmetric information between the government and the ITN firms. Worse still, price controls are difficult to administer (Koutsiyiannis 1984).

Setting a Maximum Profit margin: - The other alternative of price controls, although economically it would result in lower prices for ITNs in the country, it is also fraught with irregularities. Establishing a maximum profit margin as a form of price control is difficult for the regulatory authorities since they do not have control over the unit costs. The regulated firms would instead be motivated to let unit costs rise so that they can earn total profit given the margin fixed by the regulator.

Fixing the rate of return: - This other form of price control has the advantage of determining a maximum unit price that would ensure allocative efficiency and hence equitable distribution of ITNs in the country, but firms faced with this measure will have an incentive to opt for capital intensive production techniques rather than one which results in allocative efficiency.

CHAPTER 7: CONCLUSIONS AND POLICY RECOMMENDATIONS

7.1 CONCLUSION AND RECOMMENDATIONS

This study has shown that there are indeed benefits that accrue to both the ITN industry agents and the consumers in form of decreased input prices and decreased consumer prices if tariffs and domestic taxes are eliminated. A combined absolute sum of 30% tariffs and sales tax is bound to reduce consumer prices by between 4% and 23% resulting in consumer purchases increasing by between 2% and 21%. These results are quite significant to the policy makers in Zimbabwe who would want to promote the extensive use of ITNs. There are also benefits that accrue to the government in that this form of financing would reduce the fiscal burden on the government of financing health care and shift it to both the private sector and the consumer. It is indeed a good form of cost recovery for the government and health sector.

The analysis also showed that, since there is no earmarking of taxes, there is no guarantee that tariffs and domestic taxes collected from health improving goods such as ITNs would be specifically targeted at financing health care let alone malaria vector control measures. Using annual health per capita expenditure figures, the study estimated that at most 2.1% to 2.9% of the combined 30% tariff and tax collected would be likely to go towards health expenditure. Comparing this to a 23% reduction in retail prices of ITNs, one would indeed see that there is a direct and substantial benefit to the consumer when both tariff and sales tax are eliminated rather than when they are re-distributed within the fiscal budget.

One cannot, however, guarantee that a removal of tariffs and sales would benefit the final consumer. The study of the market showed that because of mark up pricing and the complexity of interrelationships between ITN distributors, one could not say with absolute certainty that this policy would truly benefit consumers. The study and results did show that the absolute sum of 30% tariff and sales does not filter entirely to the consumers. For such a policy on eliminating tariffs and sales tax to function effectively, a number of factors have to

be considered. These include factors that the study suggests, may hinder or promote this policy on elimination of tariffs and domestic taxes on ITNs and their inputs.

Information: - There is little knowledge on the operation of the private sector, especially when it comes to pricing policies. In the analysis on mark ups it was shown that the entire 30% reduction in taxes does not filter in its entirety to the final consumers because of the issue of profitability, production and market structure. Most private sector companies are not willing to divulge their cost of production costs hence their pricing mechanisms. Without these vital pieces of information it becomes difficult to monitor the effects of reducing tariffs and taxes. The government must therefore promote a healthy relationship between the private sector and public sector so that vital information can be passed around. Information asymmetry causes market failures and so complicate this policy that is based entirely on the dictates of perfect competition. Either through the Consumer Council of Zimbabwe (CCZ) or through other agencies, the government must ensure that ITN companies and Distributors periodically release information on production costs and pricing.

Knowledge, Attitude and Practice (KAP): - Information on consumer attitudes and behaviour and on the market of ITNs is needed by the private sector in order to sell the attractiveness of this product to their businesses. In the study a market assessment analysis, which showed the different market achievements a business could get depending on its growth target per year, was undertaken. At most the ITN industry can increase its market by 22% and increase ITN sales by about 600 000 nets per year. This is quite substantial considering that there are about 1 400 000 households at risk from malaria in Zimbabwe.

A KAP study undertaken by Skovbolling revealed that about 20% of the people she interviewed said that they either did not know how to use the nets or believed that the nets did not work. This shows that there is indeed need to educate people on the effectiveness of ITNs if RBM's objective of increasing net usage in Zimbabwe is to be achieved.

Externality: - Since ITNs are a private good and not a public good, positive externalities can only be achieved if the whole community uses nets. This indeed highlights the need why demand creation mechanisms for extensive use of ITNs must be promoted.

Demand Creation: - Willingness to pay study has to be carried out in Zimbabwe to document the consumer preferences and household behaviour. To date no study has been carried out to assess the willingness to pay in the ITN industry in Zimbabwe. The KAP studies undertaken so far have been limited in both scope and applicability. Constraints to demand for ITNs have been highlighted as the lack of information, the costs faced by consumers such as buying one or more insecticide sachets for re-treatment and the issue of limited physical access such as traveling distances to shops, and the inaccessibility of re-treatment points.

Income or price elasticity for ITNs? - Another simple question one should also ask him/herself is whether ITNs are price-elastic or income elastic. If ITNs are income elastic then targeting a basic household consumer basket and lowering prices of those basic commodities would avail more income to the poor and result in them purchasing mosquito nets, rather than targeting tariff and sales tax reduction on only one commodity. There are, however, no conclusive arguments on whether ITNs are price-elastic or income elastic.

Public Policy Issues: - The MOHCW has already gone a step ahead in drafting an ITN policy for the effective provision of nets. This document sought among other things to document information on all actors in the industry and also to promote partnerships between the private sector and the public sector. A committee known as the Insecticide Treated Nets Vector Committee (ITNSC) is already in place to work on how extensive use of ITNs can be promoted in the country. The private sector was also invited to sit and participate in its deliberations. Its major work to date has been to advocate for the removal of tariffs and domestic taxes on ITNs and their inputs. To compliment these efforts there is therefore the need to provide documented information on market structures, demand creation mechanisms and information about consumer behaviour.

Inter-departmental partnerships: - There is need to strengthen the relationships between Central Government and Local governments and so is the need also to formalize good working relationships between provincial and district committees working on malaria. Also a, policy working group that harmonizes the concerns of the Ministries of Health and Child Welfare, Industry, Trade and Finance should be put in place so all ministries concerned can understand the benefits of tariffs and sales tax elimination.

Regulation of ITN Industry: - Specific regulation in the industry is also needed, especially on the harmonization of tariff classification. So far insecticides for agricultural purposes and those for public health are classified together for tariff purposes. Even ITN inputs are also classified under general textiles. Without proper tariff classification, it would be difficult to monitor this policy, as some industrialists would take advantage and profit from this anomaly.

Supply side issues: - There is need for a thorough analysis of the supply side of the ITN industry especially on issues concerning profitability, procurement of inputs and the cost of production for the objective of extensive use of ITNs to be achieved. The ITN industry in Zimbabwe is dominated by Emnet, which operates virtually like a monopoly. There is need therefore for the government to promote either the entrance of foreign companies, or the direct importation of ready-made nets, so that competition can be created and sustained in the industry. Competition ensures sustainability and quality products on the market.

- *Product differentiation:* - This is a good way of 'technical' targeting that is already in operation in Zimbabwe. Emnet manufactures standard nets for the ordinary people and jumbo nets for the more sophisticated people. It also manufactures on individual orders and specifications. This form of product structure has to be encouraged.

- *Market structure:* - The study devoted an entire section to look at the market structure of the ITN industry. It described it in detail and showed that it was very complicated and did not promote systematic interaction of agents. With such a complex nature of the distribution chain the study pointed out that such an ITN policy, as the issue of tariffs and domestic taxes would be difficult to trace how it filters through to the final consumers. The other important anomaly highlighted by the market structure was the fact that the manufacturer of ITNs can do business directly with all agents and consumers hence for one to trace the movement of a tax reduction poses some great difficulties. Therefore, there is need in Zimbabwe to re-define the ITN distribution chain so that monitoring of this policy can be made easier and more effective.

7.2 OTHER FORMS OF FINANCING

This document has looked entirely at the issue of tariffs and domestic ITN taxes as a form of financing the ITN vector control measure in Zimbabwe. This does not imply that it is the only form of financing that can apply in Zimbabwe. In the following section the study also looks at other forms of financing ITNs that can also be considered even within the framework of eliminating tariffs and domestic taxes.

The issue of tariff and sales tax elimination should not be over emphasized at the expense of other financing measures for acquiring ITNs, such as the use of subsidies, price controls and programmes and projects that give free handouts. It is important to note that about 61% (CSO 1999) of the population in Zimbabwe are classified as poor, and that these form the bulk of the 50% of the population that is at risk from malaria hence the need to consider other financing mechanisms other than the financing of ITNs through commercial pricing. Every measure has to be considered within its own context and to which sections of the population one is targeting.

Identifying the target group for ITN product is a necessary exercise before even one thinks of proposing any measures. Firstly, it is those sections of the population that live in endemic malaria areas that one needs to look at. The population living in these endemic areas may be rich or poor depending on why those rich and indigent people prefer to live there. Secondly, ITN programmes have always been targeted at the under-five year olds and the pregnant women as being the most vulnerable members of the society. This is a section of the society that has neither the mobility nor the income at their disposal should the scourge of malaria escalate and intensify. Tariff and sales tax elimination may not mean anything to them, but subsidies and free provision of nets may mean a great deal. In this regard, balancing equity concerns and sustainability by effective targeting means would ensure enhanced welfare. Government can ensure equity by targeting those who cannot afford and providing subsidies and free nets, and at the same time ensure sustainability by letting those with the ability to pay, pay for the nets. Estimates from the Statistical Office or from the Tax Department may be used in this case to identify those who can afford and those who cannot afford.

Specific subsidies always guarantee the presence of the government in the ITN industry and so would ensure continued monitoring of the prices of the ITN, unlike the leaving of the pricing and purchasing of ITNs to the whims and dictates of the free market system. Within this argument, the study also argues for the inclusion of ITNs within the country's essential package of health services so that the government can continue to take the financial responsibility of making ITNs affordable and accessible to the poor and the most vulnerable. Affordability would imply removing the tariffs and domestic taxes and making it easier for the private sector to manufacture and provide more nets at affordable prices, while accessibility would imply the government providing direct subsidies and supporting programmes and projects that reach out to the poor and the vulnerable members of the society.

The ITN policy should therefore not discourage the subsidization of nets and the free provision of the nets to the poor and vulnerable members of the society rather there should be an integration of these measures within the framework of identifying the differences and similarities in socio-economic characteristics of the targeted groups. While there are calls for the greater role of private sector in low-income countries, the most vulnerable and impoverished groups will not be catered for effectively unless there is guaranteed substantial foreign assistance (Mills 1999). It is therefore imperative that a mixture of all viable financing mechanisms for the ITNs, just like the mix of vector control measures, be promoted. This can only be promoted by funding of projects that either subsidize or give nets for free to the communities.

The option of importing nets: - Fitzgerald 1998, did show that Zimbabwe can make a saving of 20% on the retail prices of ITN if import duties are removed from directly imported ready-made nets. This is an exciting development for Zimbabwe since it implies that if domestic taxes were also taken off, then a greater saving could be made. Instead of relying on Emnet alone to cater for the domestic market, policy makers would be justified to encourage ITN industry agents to import ready-made nets directly from cheaper foreign supplies. Tendering can be done for suppliers who can guarantee the provision of cheaper nets to the country.

Company related financing mechanisms:- Extensive mass procurement of nets for workers by companies will lessen the price and burden on the workers since they are able to purchase in bulk and get discounts from the sellers. Lending schemes where workers can have a longer

time span in which to pay for the nets while monthly deductions are made on their salaries can be implemented with easy. A company called Ecomark initiated such a programme in the farming areas and it proved a success.

Voucher System: - This is also one form of financing that can be used for ITNs, especially as a tool to identify those that can afford and those that cannot. The poor and the vulnerable members of the society can be given vouchers to use to purchase nets while those with income and ability to pay can acquire the nets at the going commercial price using out-of-pocket money.

7.3 FURTHER RESEARCH

This particular study has shown the merits of advocating for the policy on elimination of tariffs and domestic taxes on ITNs and their inputs as a viable alternative financing tool for ITNs in Zimbabwe. However, it also revealed the inadequacies of such a policy, such as the issue of market failures, the 'stickiness' of prices in adjusting downwards and the issues around complexity in understanding and modeling consumer behaviour.

This research employed partial equilibrium analysis by only looking at the price of ITN and quantity demanded as the only variables. There is therefore need for further research to look at some of the following areas: [1] ascertaining the issue of price or income elasticity for ITNs in Zimbabwe, [2] a general equilibrium analysis that incorporates all the factors that affect the consumer when he/she is making choices to purchase something, [3] better and more suitable financing mechanism for ITNs in a country that has more than half of its population classified as poor.

APPENDIX 1

MODEL 3

A ITN RETAIL PRICE

Model 3 assumes constant marginal production costs, hence we regard the cost of producing 1 insecticide treated net as the marginal cost. In all these models we shall be looking at the basic standard nets which the poor can afford since they are the cheapest of all net types. For the sake of consistency we shall follow the production of a standard net from production level through the whole marketing process. The cost of producing a standard net in Zimbabwe is given as Z$900, and this is the figure that we are going to treat as the constant marginal cost. Equation 1 gives the components of marginal cost;

1. $Marginal\ cost = p^w (1 + r^T) + b,$

Made up of the tariff ($1+r^T$), total price of raw materials and labour costs and other costs (b), which we will now reformulate as;

2. $Z\$900 = p^w (1 + r^T) + b$

On account of the manufacturers' reluctance to divulge a lot of information on production costs that they considered to be highly sensitive, we will estimate the other costs from manipulating equation 1. From the interviews that we conducted with the manufacturers and the retailers, we gathered that producers charge on top of the cost price, a mark-up of 25% and that retailers charge a mark-up of 20%. It should be noted that our marketing chain does not accommodate wholesaling since it is not a major component of the marketing chain in the ITN market. Mostly since the wholesaler we visited such as Jaggers, sell ITNs directly to the consumer, we have lumped together retailers and wholesalers. Hence in our analysis we shall have 2 levels of mark-up pricing. Equation 3 gives the basic mechanics of arriving at the retail price that incorporates both the tariff and the tax of ITNs in Zimbabwe. Tariffs and taxes are charged at 15% apiece.

3. $P_R(Tt) = [p^w(1+r^T) + b + M1+M2](1+r^t)$, substituting with real figues we have,

$= P_R(Tt) = ([p^w(1+0.15) + b + 225](1+0.15)(1+0.20)$

$= (1.15pw + b + 225)(1.15)(1.20)$, mark of 25% on Z$900= Z$225

$= (900 + 225)(1.15)(1.20)$

$= (1125)(1..15)(1.20)$, where we must note that Z$1125 is the producer price of one standard ITN.

Z$1552.5 $= (1125)(1.15)(1.20)$,

Hence the figure for the retail price with a tariff and tax for 1 standard ITN is Z$1552.5. This figure approximates the nominal average retail price of a standard net which lies within the range of Z$1500 – Z$1600. Calculating the tariff using the above relationships gives us a figure of Z$135 being the total tariff costs for all the raw materilas used in production.

B REMOVAL OF TARIFF ON RAW MATERIALS

If a tariff is removed on the raw materials, the retail price for the ITN is given as follows ;

4. $P_R(w) = [p^w + b + M1+M2](1+0.15)$

$= [900 (1-0.15) + M 1](1.15)(1.20)$

$= [(900-135) + 225](1.15)(1.20)$

$[(765 + 225)(1.15)(1.20)]$

Z$1366.2 $= [(765 + 225)(1.15)(1.20)]$

Having calculated the retail price with a tariff and without a tariff, we can now calculate the percentage change in retail price due to the effecting of this policy instrument. The formula for calculating the change is given below ;

5. $[P_R(w) - P_R(T)]/ P_R(T) = - r^T /[(1+r^T)+ (M1+M2+ b)/p^w]$,

$= [Z\$1366.2 – Z\$1552.5]/Z\$1552.5 = - r^T /[(1+r^T)+ (M1+M2+ b)/p^w]$

$= - 0.12 = - r^T /[(1+r^T)+ (M1+M2+ b)/p^w]$,

Which means that the percentage change of retail price due to a tariff removal is on average 12%. Since we could not calculate elasticty of demand for ITNs in Zimbabwe due to lack of enough time series data, we will use elasticities that were found in other studies. According to Cropper et al 2001 and Simon J. et al 2001, demand for ITNs is assumed to be price inelastic, which means it is below 1. In their models they used -0.5 and –0.9, with the last figure serving for sensitivity analysis. Given this information we can then calculate the change in retail purchases of ITNs due to the removal of a tariff. The equation below gives the mechanism for calculating the change ;

6. $[Q_R(w) - Q_R(T)]/ Q_R(T) = - [(r^T)/(1+r^T)]* E$

$[Q_R(w) - Q_R(T)]/ Q_R(T) = -0.12*-0.5$

$= 0.06 (6\%)$, with an elasticity of demand of –0.5, retail purchases change by 6% when a tariff is removed.

- and with an elasticity value of –0.9, the change would be ;

$[Q_R(w) - Q_R(T)]/ Q_R(T) = -0.12*-0.9$

$= 0.108 (10.8\%)$

So far we have looked at a situation where the policy makers only remove the tariff, however, since we are advocating for the removal of both taxes and tariffs, we shall look at a case where both are scrapped.

C REMOVAL OF BOTH TARIFF AND TAX

The retail price with the taxes and tariff remains the same as in equation 1(Z$1552.5). Now we are calculating the situation where both taxes are removed. Equation 7 gives the mechanics for estimating the new retail price.

$P_R(w) = [p^w + b + M1+M2]$

$= [900 (1-0.15) + 225](1+0.20)$

$= [(900 - 135) + 225](1.20)$

$Z\$1188.0 = [(900 - 135) + 225](1.20)$

The new retal price without tariff and tax is therefore Z$1188.

Next we calculate as we did above the percentage change in retail price due to the removal of a tariff and tax. Equation 8 summarizes the mechanics that are involved in calculating the change.

$[P_R(w) - P_R(Tt)]/ P_R(Tt) = - r^T r^t/[(1+r^T)(1+r^t)+ (M1+M2+ b)/p^w]$

$[Z\$1188 - Z\$1552.5]/Z\$1552.5 = - r^T r^t/[(1+r^T)(1+r^t)+ (M1+M2+ b)/p^w]$

$\underline{\textbf{-0.23}} = - r^T r^t/[(1+r^T)(1+r^t)+ (M1+M2+ b)/p^w]$

With the removal of a tariff and tax we expect the retail price of ITNs to change by 23%. The next equation 9, calculates the impact on consumer purchases due to the removal of the tax and tariff.

$[Q_R(w) - Q_R(T)]/ Q_R(T) = - [(r^T)/(1+r^T)]* E$

$[Q_R(w) - Q_R(T)]/ Q_R(T) = -0.23*-0.5$

$[Q_R(w) - Q_R(T)]/ Q_R(T) = 0.115 (11.5\%)$

the next scenario calculates the impact of retail purchases if the elasicity value is –0.9.

$[Q_R(w) - Q_R(T)]/ Q_R(T) = -0.23*-0.9$

$[Q_R(w) - Q_R(T)]/ Q_R(T) = 0.207 (20.7\%)$

Therefore the change in retail purchases if tariffs and taxes are removed is 11.5% when the elasticity value is –0.5 and 20.7% if the elaticity value is –0.9.

APPENDIX 2

MODEL 4

Unlike in model 3, this particular model assumes a situation where marginal costs are no longer constant at Z$900. As noted in the methodology section, marginal cost is increasing with each extra unit produced. Using information in model 3 we can give with cetainty some of the values that we will use in the calculation of the changes.

MC with tariff : MC + aX = Z$900. *(for the initial situation).*

MC Without tariff = Z$900 – Z$ 135 = Z$765.

Producer price with tariff (P^T) and mark-up = Z$900 (1.25) = Z$1125.

Producer price without tariff but mark up of 25% = 765 (1.25) = Z$956.25.

Retail price with tariff and taxes as well as the 2 levels of mark-up = Z$1552.5.

Retail price without tariff but with 2 levels of mark-up = Z$1366.2

Retail price without both tariff and tax but with 2 levels of mark-up = Z$1188.

Given the information in model 3 also., we are able to estimate the b, the labour cost and other ancillary costs, and it is given as ;

P^w + tariff = 468.75 + b = Z$900.

Therefore the total cost of raw materilas would be ***Z$468.75***, and this respresents the total cost of raw materials including the 15% tariff charge, while ***Z$360.94*** reperents value b, which is the total cost of labour and other ancillary costs per ITN produced.

Since we have already noted above that our marginal costs are not constant, it therefore means that if a tariff and tax are removed from the raw materials that produce nets, the marginal cost curve shifts downwards as shown in the methodology section of the main paper. Our immediate interest would, therefore be to calculate the magnitude of this shift of MC curve. Doing so requires us to manupilate equations that involve supply elasticity and returns to scale.

Without sufficient information, it would be difficult to estimate the supply elasticities. However, we will draw some lessons from empirical evidence from past studies and the general theory of supply elasticities. Supply elasticity is said to depend on producer's response to price changes. According to Samuelson 1992, if input prices can be found easily at the current market prices such as the case for textile products (netting materials are classified under textiles in Zimbabwe when charging tariffs), then output can be greatly increased with little increase in price. This would therefore make us conclude that the supply elasticity of ITNs is relatively large (greater than 1). However, accoding to Simon et al 2001, a supply elasticity of 10 is considered too large. Hence in our analysis we will employ an elasticity value of 2, and then use value 5 for purposes of sensitivity analysis.

When it comes to returns to scale, again because companies were not willing to release sensitive information, estimates were used, however, we hasten to confirm that consistency was greatly followed in estimating these fgures. Interviews with industry experts revealed that given an increase in demand, Emnet is able to easily expand production from its current 3000 nets per day to 5000 nets per day. If therefore a company is able to expand production without any difficulties, then the returns to scale parameter is close to 1. Hence in our analysis we will use value 1 as the parameter for the returns to scale.

$S_w = - (wX1/pX2) * S_p * N$, *where X1 refers to the quantity of raw materials and X2 refers to the quantity of insecticide treated nets.*

Netting materials as a percentage of the producer costs is 52% (Z$468.75/Z$900). Given this information we are therefore able to find out how a one percent change in netting price would affect the supply of the ITNs.

CASE 1

A. WITH A TARIFF ELIMINATED

Sw = -0.52* 2*1 = -1.04% in this case a one percent decrease in raw material price would increase supply by 1.04%.

Assuming that the ad valorem tax (tariff on ITN materials) makes up 15% of the cost of raw materials, we can therefore calculate the change in producer prices. This is given as :

- %P = [Sw/(E-Sp)]*%w. Using the demand elasticity value of –0.5 this would translate to ;

%P = [-1.04/ (-0.5-2)]*15 = *6.24%*

- Using a demand elasticity value of –0.9, it would come to ;

%P = [-1.04/(-0.9-2)*15 = *5.38%*

Having calculated the change in producer prices, we can now go on to calculate the percentage change in consumer prices. The mechanics for calculating the change are given below as follows ;

pT/ (pT + M) = %P * [pT/(pT + M)

From the calculations earlier on we ascertained that the producer price with a tariff is about 72% (Z$1125/Z$1552.5) of the consumer retail price. Using this line of argument we can also assume that the percentage change in consumer retail prices would be about *72%* of the price change at the producer level. Therefore in the first case, a *6.24%* drop in producer prices leads to about *4.5%* drop in price for consumers. And with a demand elasticity value of –0.5, consumer demand would be estimated to increase by about *2.25%*. In the other scenario, a *5.38%* drop in producer prices results to about *3.87%* drop in price for consumers, and with a demand elasticity of –0.9, consumer demand would be estimated to increase by about *3.5%*.

B. REMOVAL OF BOTH TARIFF AND TAX

The above case has only looked at a situation where a tariff is removed at the producer level, but we not incorporated the removel of a 15% sales at the consumer level. Using the same mechanics as before we can also estimate the change in consumer retail price if both tariffs and taxes are removed. By simply multiplying the percentage changes in the above equations by sales tax of 15% we will be able to ascertain the new change in consumer prices and purchases when both tariffs and taxes are removed.

In scenario 1 removal of both taxes would lead to (4.5%*1.15) *5.18%* fall in consumer prices, and with a demand elasticity of –0.5, results in consumer purchases increasing by *2.58%.* In the second scenario, the removal of both taxes would lead to (3.87*1.15) *4.45%* decrease in consumer prices, and with a demand elasticity of –0.9, this would result in consumer purchases increasing by about *4%.*

A. WITH A TARIFF ELIMINATION

The second case looks at a situation where the supply elasticity is relatively large at 5.

Sw = -0.52*5*1 = -2.6, in this case a one percent decrease in raw materials would lead to a 2.6% increase in supply.

- %P = [Sw/(E-Sp)]*%w. Using the demand elasticity value of –0.5 this would translate to ;

%P = [-2.6/ (-0.5-5)]*15 = *7.09%*

- Using a demand elasticity value of –0.9, it would come to ;

%P = [-2.6/(-0.9-5)*15 = *6.6%*

The percentage change in consumer prices would therefore be, in the first scenario (7.09%*0.72) *5.10%* fall in consumer prices, which then would lead to a (5.10%*0.5) *2.55%* increase in consumer purchases of ITNs. In the second scenario, the consumer price would fall by about (6.6%*0.72) *4.75%*, resulting in the consumer purchases increasing by about (4.75%*0.9) *4.28%*.

B. WITH BOTH TAXES ELIMINATED

In scenario 1 the percentage fall in consumer prices would be (5.10%*1.15) *5.87%* and with price elasticity of demand of –0.5, would lead to a *2.9%* increase in consumer purchases. In the second situation, the consumer price would fall by (4.75%*1.15) *5.5%*, which would result in consumer purchases increasing by about *4.95%* at a price elasticity of demand of –0.9.

APPENDIX 3 : DATA COLLECTION TOOLS

Table 13 ***Data Collection sheet for Companies, Wholesalers and Retailers.***

1.Supply Price for Untreated net	Z$	US$
Cost per net		
CIF of imported materials		
Tariff and VAT		
Import price after tariff and VAT		
Port Charges (clearance and delivery)		
Total Cost to importer		
Importer's margin @ % of CIF		
Price of materials to manufacturer		
Local Manufacturing costs		
Taxes		
Manufacturer's margin		
SUPPLY PRICE(Price to distributor)		
2.Cost Per Treatment Packet		
CIF of imported packet		
Tariff and VAT		
Import price after tariff and tax		
Port Charges		
Taxes		
Total Costs to importer		
Importer's margin		
SUPPLY PRICE(Price to distributor)		
3.Retail Price for an ITN		
Costs per ITN		
Supply price per ITN		
Domestic shipping costs		
Distributor's mark up		
Wholesaler's mark up		
Retailer's mark up		
Retail Price		
Results		
1. Retail Price reduction to		
tariff and tax reform		
2.Increase in retail purchases		
due to tariff and tax reform.		

INTERVIEW GUIDELINES

MINISTRY OF INDUSTRY, TRADE AND FINANCE

- Basic tax details
- What's the prmary reason for imposing customs duty and taxes?
- How relevant is the tariff system?
- What should the argument on removal of tariffs and taxes highlight?
- What are the potential impacts of the removal of tariffs and taxes on the local production of ITNs and the their distribution?
- Reclassify the nets and insecticides and charge differently.

ITN Strategy for the Ministry of Health and Child Wefare and NGOs.

- Annual number of malaria and malaria related deaths in Zimbabwe.
- Efficacy of treated nets in the country.
- Potential impacts on the Zimbabwe economy of promoting the importation and manufacture of ITNs, netting materials and insecticides.
- Projected costs of changing the malaria policy.
- How can we promote supply ?
- How can we facilitate partnership for sale and distribution of ITNs between public and the private sector.

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