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Can Environmental Tax Reduce Dilapidated Motor Vehicles Importation and Pollution? Insights from Dar-es-Salaam, Tanzania

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Abstract
The influence of tax regime in reducing dilapidated vehicles' demand and attendant pollution is puzzling global south cities. This article provides an assessment on how environmental tax is or is not curbing down the importation of the Dilapidated Motor Vehicles (DMVs) with a view to reduce vehicular emissions in the city of Dar es Salaam, Tanzania. A multilevel perspective employing mixed methods of data collection was used to collect qualitative and quantitative data through document review, group discussions, in-depth interviews from selected Members of Parliament, policymakers, government officials, and brand new as well as DMVs dealers. Content, trend and discourse analysis enabled to interpret qualitative data. Findings reveal that taxing importation of DMVs is not significantly reducing air pollution. The side effects of the increased DMVs import in polluting the environment are increasing due to the rise in income levels, population increase and technical challenges of estimating marginal social cost. As DMVs tax was not reflected in the exporter's cost schedule, the non-inclusion gives a market failure scenario a la Pigou Theorem. Rethinking of an optimal environmental tax remains a complex socio-political issue calling for research and policy attention.

Keywords: Dilapidated Motor Vehicle, environmental tax, demand, air pollution, Tanzania

Introduction
Air pollution caused by dilapidated motor vehicles (DMVs) has become a major problem in many countries, including Tanzania. Itching eyes, sporadic headaches and cardiovascular complications always alert us the type of environment we are living in (Mrema, 2011; Njee et al., 2016). In 2012 and 2015, vehicle emission captured from NOx, NO2, and NO levels

in Dar es Salaam for the areas with heavy traffic such as Magomeni and Vijibweni found that NO2 concentrations at some sites was as high as 231 ug/m3, as compared with the WHO (2005) required standard of 40 ug/m3 (Dasgupta et al., 2020).

At the same time data show that the number of DMVs imported in Tanzania continue to soar annually from 3,120 in 2006 to 104,844 in 2016 (Figure1). Most of the DMVs are from Japan (UNEP, 2018a). Motor vehicles account for nearly a quarter of all transportation energy consumptions, and such dominance may persist for decades to come as their fuel share is expected to grow rapidly (UNEP , 2021). Furthermore, the increasing number of DMVs in a density of tall buildings obstructing pollutant dilution by natural ventilation on just 4.4% of the road length in the city intensifies the problem (Mbuligwe & Kassenga, 1997).

After being overwhelmed with the influx of DMVs and attendants air pollution, the East Africa Community (EAC) was prompted to institute a resolution requiring all member states to impose taxes on importation of all motor vehicles aged 10 years and above intending to discourage their importation in the region (EAC, 2011). To mitigate negative consequences that would occur as a result of reduction of DMVs, the resolution, among other things required all member states to promote efficient public transport, establish motor vehicle assembly plants and use environmentally friend technology in powering motor vehicles (EAC, 2019).

The United Nation Environment Program (UNEP), workshop to harmonize vehicle emission standards in the EAC, held in Kenya from 10 - 11 June 2019 realized that the region had “an old and aging vehicle fleet” which posed a major threat to public health and climate change (UNEP, 2019). Country vehicle analysis showed that lack of stringent vehicle importation regulations in the region was leading to the importation of vehicles with obsolete emission technologies.

There is no doubt that the situation needs to be put under control. The big challenge remains on how DMVs agreement controls should be designed and implemented, (UNEP, 2018a). The pollution control mechanisms adopted in Tanzania have tended to be toward regulation of importation of DMVs, leaving polluters with little choice on how to achieve the environmental goals. However, the factors that influence the efficacy of this “command-and-control” strategy are unknown.

In this paper we discuss the effects of the environmental taxation in reducing air pollution from the importation of DMVs in Tanzania for the period of 2006 to 2016. The paper is divided into four sections. Section two assesses the effect of the environmental tax in curtailing importation of the dilapidated motor vehicles and attendant pollution. Section three examines the impact of the environmental taxation on resource mobilization for environmental purposes and others. It also, determines the cost of administrating the collection and enforcement of the environmental taxes in curbing down the importation of dilapidated motor vehicles in the context of the prevailing political condition. Finally, Section four summarizes and concludes the paper.

Theoretical Framework

The Pigou Theory and the Political Economy Approach of Motor Vehicle Dependency guided the present study.

Pigou's theory

The Pigou Theory is based on the principle of welfare economics which posits that emissions produce social costs that negatively impact third parties. As such, the government duty is to address the pollution problem through market mechanisms (Pigou, 1932). The theory was postulated by the British economist Arthur Pigou, one of the most prominent contributors to the externality theory in early 1900s (Baumol, 1972). Pigou proposed that the producers and consumers should be liable for their polluting actions. Taxation is one of the major market-based instruments or economic tools that is used to internalize private social cost in order to achieve social marginal benefits.

From Pigou's theory on Polluters Pay Principle, the present study has been used to assess the ability of the environmental tax in abating emissions through curtailing the importation of the DMVs. Most importantly, the theory was used to understand its strengths vis-a-vis: first internalizing the cost of pollution, second discouragement of the use of DMVs, and third mobilization of resources for investing in; environmentally friendly vehicles, efficient public transport and motor vehicle assemblage plants. Such assessment was based on assertions that Pigou theory has potential for providing double dividend in terms of improvement of quality of environment and increasing of revenue for the state to finance its activities (Freire-González, 2018).

One of the criticisms of the theory is on how to determine and then implement it (Carlton & Loury, 1986). Pigou himself was not very

comfortable with the assumption that the government could determine the marginal social cost of a negative externality and convert it into a value. Because in practice estimating a unit of marginal social cost for the purpose of internalizing the same unit of damage is practically not feasible because of technicalities involved and burden of the cost to be passed onto the tax payers. Other factors are grounded on technical, economic and social aspects.

Similarly, in the 1960's Pigou Theory was challenged by Ronald Coasen for being one sided targeting the third party. According to Coasen Theory, any goods which are freely provided in nature are prone to serious degradation (Coase, 1960) As such, assigning property right might solve the problem. Air is one of the examples. The Coase theorem further asserts that the polluters are not polluting deliberately but because there are some circumstances forcing them to do so. The same applies to the DMVs users. Despite these criticisms, Pigou's theory was useful in informing the study on the one cause of externalities, unfortunately the theory failed to significantly explain the factors underpinning certain societies to use polluting goods. As it overlooked factors that lock certain societies to continue using polluting goods like DMVs, this has led to a rethinking of the political economy of motor vehicles dependency.

The Political Economy Approach of Car Dependency

The second strand is the political economy approach of motor vehicle dependency. Political economy explains difficulties for certain societies to shift away from overreliance on polluting motor vehicles transport system. Mattioli et al. (2020) advance the following five factors positioning and maintaining high carbon motor vehicles dependent societies. First, as motor vehicle industries and producers are in the global north, they have comparative advantage of using the new motor vehicle than the global south. Second, the provision of motor vehicle industry infrastructure is well established in the global north unlike in the global south due to the existence of driving laws, improved roads and packing as the key aspects in accommodating mass production of motor vehicles. Third factor relate to the political economy of urban sprawl. The urban settlement, land use pattern and streets arrangement create demand for the use of motor vehicles transport system. Developing countries like Tanzania is overwhelmed by the mushrooming of DMVs which are blamed for causing traffic congestion and excessive pollution in the urban areas such as Dar es Salaam (Mrema, 2011). Concentration of motorization in big cities is due to rapid population growth and poor settlement pattern which trigger the demand for a robust transport system for the urban dwellers (Shuhaili, Ihsan, & Faris, 2013).

Fourth factor relate to the provision of public transport. Lack of efficient and reliable public transport and low use of environmentally friendly technology are such factors that entail the use of motorized transport. Kanyama et al. (2004) indicated low investments in public infrastructure in Tanzania due to resource scarcity and competing needs in provision of other public services and debts serving. As a result high dependence of personal used motor vehicles and few min buses for transportation needs in Dar es Salaam has created serious traffic jam and attendant pollution in the city (ADB, 2015). Fifth factor relate to culture of motor vehicle consumption. In the global north DMVs are considered to be end life vehicles while in the global south imported DMVs are second life vehicle (UNEP, 2020). The business of used goods, including DMVs, is embedded on the culture and the economic capability. In the global north, used goods are mainly preferred because of historical reasons while in the global south the imported used goods are prevailing because they are cheaper as compared to the new ones. The main reason for the over reliance of DMVs in SSA and developing countries in general is their low cost (Coffin et al., 2016).

Methodology

Factors influencing the implementation of fiscal space to abate vehicles emissions and the impact of the environmental taxation in curtailing the importation of DMVs is investigated based on mixed methods in assessing the meaning and understanding of constructs (Chu & Chang, 2017). Key informants were drawn from tax and the environmental management authorities. The 284 motor vehicles owners were interviewed. The respondents were knowledgeable on issues related to importation and usage of DMVs.

Key informants were drawn in the Tanzania Revenue Authority (TRA), National Environment Management Council (NEMC), Ministry of Finance and Planning (MOFP) and Vice President's Office (VPO)- Environment as they were representing the implementers of the tax regime on the DMVs. Representatives of importers of brand new and DMVs informed the study via interviews and group discussions. They provided information on perceptions of the tax regime and the trend of DMVs' importation in Tanzania. Data on CO2 emissions were obtained from World Bank records and Fuel Data Assimilation System (FFDAS) data repository (https://ffdas.rc.nau.edu/About.html). Perceptions of the Members of Parliaments (MPs) on the debates on environmental tax on DMVs were obtained from the official reports of the Parliament (The Hansard). Data on DMVs imported in the country over time were obtained from the TRA.

Results and Discussion

In this section we present and discuss the trend of DMVs imports before and after imposition of environmental tax, revenue accrued from dilapidated vehicle imports, environmental tax redistribution related to equity issues, feasibilities, and alternative measures to control pollution. Air pollution trends with correlation between the importation of DMVs and air pollution after imposition of environmental tax is explored.

Efficiency of Environmental Taxes in Tackling Vehicular Emissions

In these sub-sections we present and discuss the trend of DMVs imports and emission levels before and after environmental tax imposition.

Trend of DMVs Importation before and after ET Imposition

The findings of the study indicate that the importation of DMVs kept increasing despite environmental tax imposed as a penalty discouraging its use (Figure 1). Sulemana (2012) published more or less similar findings in Ghana that although the pigovian taxes were used to suppress the importation of DMVs it did not reduce their imports in the country. In contrast, in Uganda, the environmental taxes in DMVs reduced their importation from 35,901 in 2014 to 18,922 in 2015. As a result, new vehicle imports rose from 2,696 in 2014 to 3,360 in 2015 (Uganda Bussines News, 2016). Probably, one of the plausible explanations it could be that taxes rate imposed by Uganda were very punitive compared to what Tanzania did or they might have reduced the taxes on importation of new motor vehicles

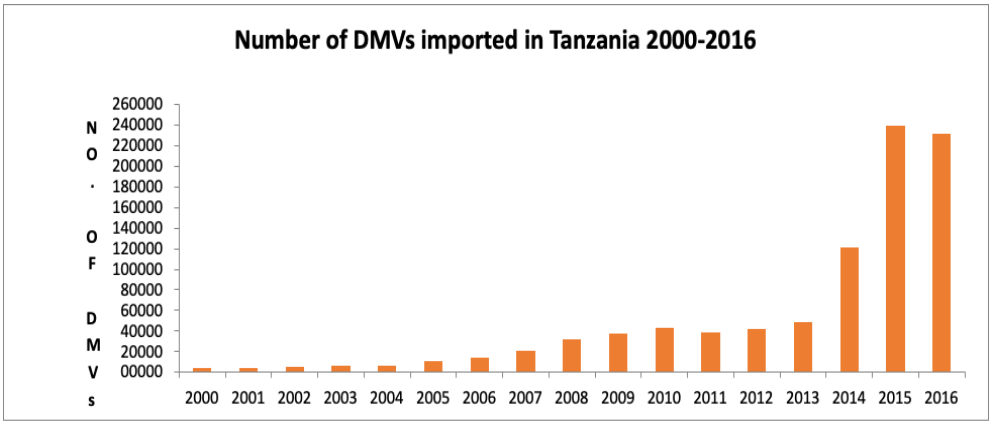

Figure 1. The number of imported DMVs, 2000 to 2016

S**ource**: Authors' compilation from TRA, 2021 Data F disposable income levels among the populace (Figure **2**).

Thus, availability of various sources of income in Dar es Salaam play an important role in enabling ownership of DMVs in Tanzania. This findings

on income are in line with those by Chia & Phang (2001) study, who did a study on the relationship between income levels and demand for motor vehicles in Singapore. The findings show that economic growth accompanied by increase in income levels is a key determinant to the increase in demand for motor vehicles and transport. The study findings also resemble those of Wu et al. (2014) who found out that there was a positive relationship between motor vehicle ownership and income levels of the households in China. A similar observation was made by Ukonze et al. (2020) for Nigeria who found that the rise in income levels is among the major determinants of rise in motor vehicles ownership in Nigeria.

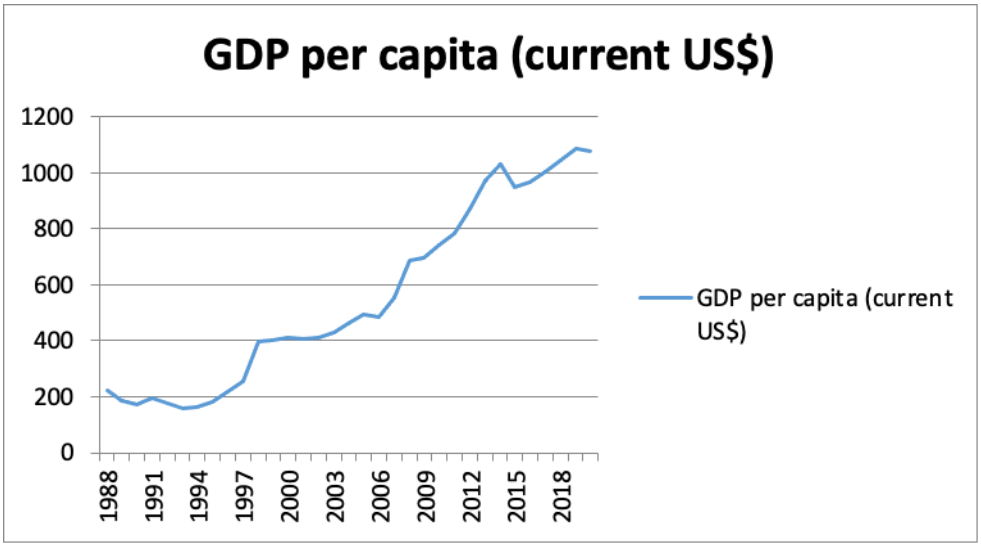

Figure 2. Tanzania GDP per capita (USD$) before and after tax imposition

Source: World Bank (2021).

As shown in Figure 3 personal income and credit facilities had an impact on the decision of DMV owners to acquire motor vehicles. Acquisition of the DMVs by the middle income earners have been also made possible by loans agreement arranged by the importers of the used motor vehicles and some of the financial institutions in Tanzania. Some of the importers have arranged special program which entails a customer to pay in installment before allowed to take a motor vehicle. This program has been instrumental in increasing number of buyers of the used motor vehicles.

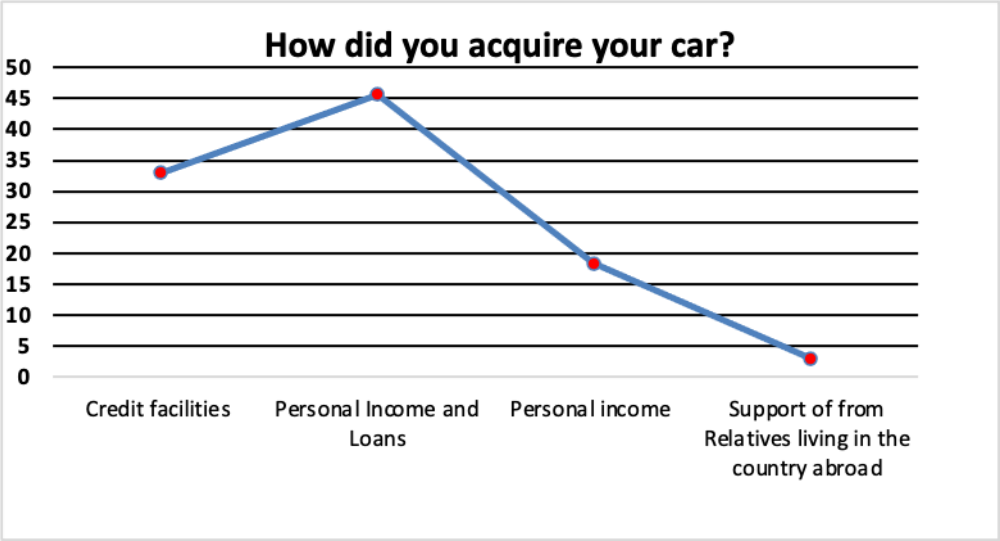

Figure 3. Means of motor vehicle acquisitions.
Source: Field Data (2018).

The findings of the study also reveal that a counter force of the exporting companies was enormous (Plate 1). In order to continue marketing their DMVs, they reacted in the following ways:

1) Lowering the price of DMVs so as to make them affordable even if the environmental tax is added.
2) Introducing discount and arrangement of down payment schemes to enable the majority to afford DMVs.
3) Establishing many dealers and branches of DMVs in the city of Dar es Salaam including such companies like *Be Forward*, *Car Junction* and *STB Tanzania Limited*. Highly learned and experienced staff in the area of market and customer care for these branches.
4) Harnessing ICT technology in promoting online business in order to facilitate the imports of DMVs

Such influence impaired the functioning of the Pigovian taxes, especially by subsidizing the DMVs to reach the market, thus making them to increase their demand. As the demand for DMVs was also a function of the market forces, in theory, the market demand schedule for motor vehicles indicates how many motor vehicle consumers are willing to buy and more motor vehicles would be bought at lower prices. The market supply schedule also shows how many motor vehicles the suppliers would be willing to supply at

the market at various prices which take into consideration of all costs of each unit put in the market.

Plate 1. Branch of the Japanese Company located in Dar es Salaam
Source: Field data (2020).

It is important to note that the sphere of influence on the DMVs business operates within the system of capitalist mode of production which defines the consumption pattern of the global north and global south. Mattioli et al. (2020) affirm that spatial expansion accompanied by the increasing use of carbon emitting motor vehicles may continue to prevail for many years to come. Tanzania depends on the importation of motor vehicles from abroad for its on-road transport. The country does not manufacture its own motor vehicles but it depends on imported DMVs used from other continents such as Europe, Asia and North America. Some of the imported motor vehicles are imported in various conditions such as in parts, damaged or refurbished ones. UNEP (2018b) asserts that the movement of DMVs from global north to global south is due to the fact that they are affordable, absence of stringent policy to suppress their importation and huge costs of maintenance and disposal in developed countries.

It is evident that Dar es Salaam has been experiencing rapid population growth as a result of natural increase and pull factors which attract immigrants from upcountry and Zanzibar Island. The population increases

from 2,487,288 in 2002 to in 4,364,541 in 2012 (URT, 2015). Owing to lack of efficient and reliable public transport in the city, most of the middle income earners resort in buying non-utility motor vehicles in order to ease their transport problems. The study by Dietz & Rosa (1997) found that population is a catalyst in increasing the concentration of greenhouse gases (GHGs) emission and global warming.

Table 1 indicates that GDP per capita and population are both positive and significant at 5% and 1% levels, implying that as income levels of people of Dar es Salaam city have increased the demand for motor vehicles have tended to rise. Similarly, it seems that as the population of Dar es Salaam city increased the demand for motor vehicles has also risen. From these findings, it can be confirmed that the bourgeoning demand for motor vehicles and the attendant pollution in Tanzania is a result of the increase of the levels of incomes and upward trend of the population of Tanzania. Similarly, Yeh & Liao (2017) seem to support this conclusion when they note in their study that population and economic growth are twin forces in fueling GHGs emission at the local and global scales.

Table 1. Demand for motor vehicles regression

Independent variable	Model
Constant	(-2.812).026
GDP per capita (in US$)	(.862).006*
Kilotons of Co2	(3.087).018*
Population	(3.593).009**

Note: t-ratio are in parenthesis; * Significance at 5 percent level; ** Significance level at 1 percent level.
Source: Field Data (2018).

Trends of Fossil Fuel Emissions

The findings shown in Figure 1.4 illustrate that the annual mean fossil fuel CO_2 emission in the Dar es Salaam city exhibited an increasing trend between 2006 and 2012. On average, the CO_2 emission had increased by 34% in the same period. This increase had significant adverse effect because it contributed to the increase of greenhouse gases in the atmosphere. The possible reason for this increase could be the increase of the human activities such as transportation activities in the CBD and nearby areas. Such findings resonate well with those by a team of officials from NEMC and TBS tasked to establish a national air standard. The team found out that the major causes of air pollution in the city of Dar es Salaam emanated from combustion of motor vehicles, plant machinery and burning of firewood.

Similarly, UNEP (2020) affirmed that many of the motor vehicles exported from United States and Japan to the developing countries are of low quality and are responsible for GHGs emission and are eroding the existing concerted efforts to mitigate the impacts of climate change. The report further shows that between 2015 and 2018 an estimated 14 million of the DMVs were exported globally.

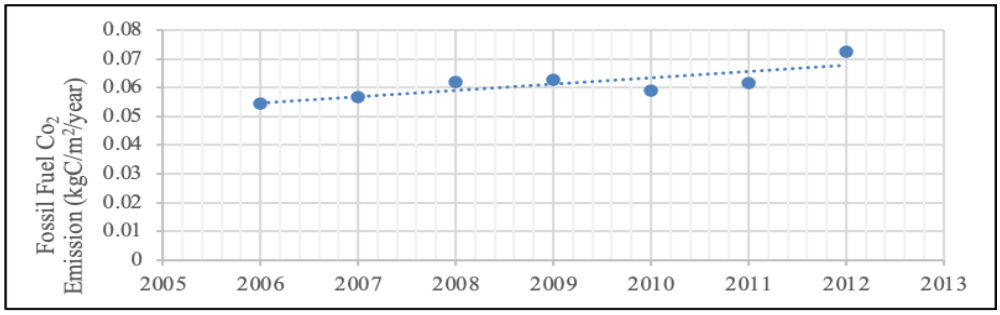

Figure 1. Annual mean fossil fuel CO_2 emission
Source: FFDAS (2019).

We also investigated CO_2 emissions with the objective to identify hotspot areas of concern. The results in Table 1.2 show that on average CO_2 emission exhibits an increasing trend in all wards in the study area. However, CBD wards and their neighboring wards had high CO_2 emissions compared to the peripheral wards. This is due to the concentration of CO_2 emission-activities in these areas. The wards in which the CO_2 emission had doubled (100% increase) between 2006 and 2012 were regarded as hotspot areas. The results from Table 7.2 show that 15 wards (17%) are the hotspot areas such as Makumbusho, Sinza and Ubungo. All these wards are located near CBD area. The eight wards (9%) show that CO_2 emission increased by half (>= 50%). These areas are Upanga, Magomeni and Mabibo. The remaining 66 wards (73%), the CO_2 emission increased by less than half (< 50%). These wards include Bunju, Mbezi, Pugu and Chanika..

Efficiency of Environmental Taxes in Revenue Generation for Environmental Protection

An analysis of environmental taxes data indicated that during the fiscal years from 2006 to 2016, revenue from DMVs taxes kept rising annually as shown in Figure 7.6, implying that demand for DMV was on the increase. These findings concur well with those of the Parry (2012) study, which found that in Mauritius, environmental taxes were the largest source of

revenue in the country. For instance, environmental tax receipts in 2009 accounted for 11.1% of all total taxes.

Supporting the performance of environmental taxes in generating revenue in Tanzania, the Minister for Finance and Planning, Hon. Philip Mpango said; *[…] "Honorable Members of Parliaments, you will recall that when we introduced environmental tax for the first time [….] the taxes generated substantial revenues. The revenue collection went up by 226 % against our expectation,'' (URT, 2014).*

While the above quotation confirms that environmental tax revenue enormously supported the government budget, there was no clear evidence that the tax was given to protect the environment. Probably in Tanzania the presence of an environmental protection fund could have solved the problem. The absence of examples of the use of environmental tax receipts to protect the environment might be, because Tanzania greatly depends on tax revenues to finance its operations. The government collects more than USD 6 billion in tax revenue earnings per year. This amount represents 12% of the GDP (Hizipstqirx, 2015).

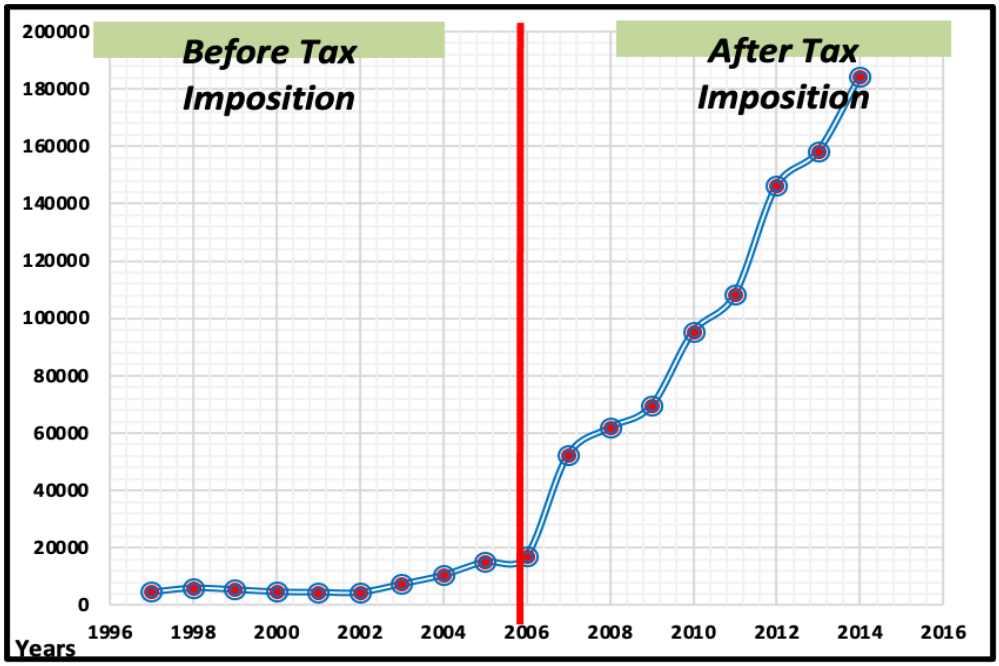

Figure 2. Tax on motor vehicles before and after tax imposition (in million Tshs)

Source: Field data (2018).

The Impact on the Implementation of Environmental Taxes (DMVs taxes) on Equity

Environmental taxes are introduced along with the existing arrays of taxes with different competing objectives. Therefore, in the course of designing and implementing it might result into challenges to both the collectors and the taxer payers because the incidence of tax varies according to market institutions (Cox et al., 2018). The rich and the poor or the sellers and buyers always do not bear the same tax burden. A study conducted by Hizipstqirx (2015), revealed that since Tanzania has a narrow tax base, it targets a few easily captured sectors in the tax system, including the environment.

Hence, the idea of taxes to be redistributive in nature becomes difficult. Owing to this scenario, the debate on the environmental taxes is on transport related polluting goods such as DMVs is not only on equity but also on its efficiency, compliance and administration cost and revenue generation. Therefore, balancing these factors in the proper perspective with ultimate of achieving the intended environmental objectives is critical. On efficiency aspects, the use of taxes in environmental policy is premised on the need to reduce external and inefficient resource allocation through market-based approaches to internalize pollution costs from various sources (OECD, 2011; Parry et al., 2012). Environmental taxation is viewed as an instrument that has a multi-function. Besides addressing externalities through market forces, tax regime can be designed in such a way that it leads to a fair distribution of resources in the society and generate substantial revenue to meet the obligation of providing public goods (OECD, 2011).

Interview with at TRA revealed that in Tanzania, imposition of environmental tax on DMVs was instituted in three different phases. Phase one targeted all non-utility DMVs older than ten years, phase two targeting all non–utility DMVs older than eight years, and the last phase targeting both utility and non- utility DMVs. DMVs ownerships is linked to income levels, those who cannot buy DMVs continued with using the same means of transport they used before and during the introduction of the environmental tax regime on DMVs. It was also observed that the decision to target non-utility in the first phase is because they were big in number and thus responsible for causing air pollution and traffic jams in major cities. Also, during the last phase, environmental taxes imposed on utility DMVS such as lorries and buses were lower as compared to non-utility DMVs. For instance, non-utility motor vehicles attracted 25-30% and utility DMVs attracted 5% of environmental taxes in form of excise duty respectively.

The Administration of Environmental Taxes (DMVs taxes)

Minimization of administrative and compliance costs is a key towards realization of optimal taxations because normally the cost of administration is borne by the tax payers hence reduce their income that could be used to promote their welfare (Mankiw et al., 2009). Both compliance and administrative costs tend to be cheaper in environmental policy while using economic instrument rather than regulatory mechanism such as Command and Control system (Miller & Vela, 2013). The reasons behind could be because environmental taxes are collected within similar national tax regimes and most importantly, with the aid of the state of art technology permits efficiency and effectiveness in managing data. Unlike the use of prescribe laws and enforcing the compliance require huge resources to enforce them (Henderson, 2010).

The present study found that the cost of administering environmental tax is relatively low because it was collected along with other taxes in the tax collection system. On average the cost of collecting taxes in Tanzania dropped from 2.8 % to 2.5% between 2012 and 2014 (TRA, 2015). The Tanzania tax collection system is automated to capture relevant data for taxes collected and the process of payment is done by using a control number which can be used to deposit money in most of the financial system in the country. The improvement of tax collection system can be attributed to tax reforms carried in Tanzania since 1980's especially during the period when the government of Tanzania was implementing tax reform under Structural Adjustments program (Ng'eni, 2016). This finding echoes those of Isaac & Lilian, (2010) study, who found that the automation of tax system in Uganda had positive correlation with the cost of tax administration.

Assessment of Technical Feasibility of Environmental Taxes (DMVs taxes)

The design of environmental tax is premised on the attempt to alter the behavior of the polluters through imposing taxes directly on the source of emissions. Calculating marginal damage cost technically requires a consideration of many factors, such as the location where the polluting unit will be used. This is because scientifically it has been proved that the rate of emission in the hot weather and higher terrain will be more than in the cool weather and in areas where the slope is low (Marrouch & Sinclair-Desgagné, 2012).

The environmental tax rates used on DMVs were unrealistic. For instance, as depicted in Table 2. DMVs aged more than 8 years and above all attracted a rate of 25%. From the existing evaluation system, a DMV unit of a Toyota (IST) manufactured in 2001 and the same Brand manufactured in 2009 with the same specification, country of origin and condition will attract the same tax rates. The IST unit of 2001 was cheaper than those of 2009 (Table 2). Ultimately the final price of those brands before port charges were TZS 4,412,536.31 and TZS 7,545,303.34, respectively; almost twice as much. Most of the customers will, of course, opt to buy the Toyota Brand (IST) unit of 2001 than the car brand manufactured in 2009. This is because there is a saving of TZS 3,132,767.03 - an amount which is more than ten times the amount of the lowest Salary Scale in Tanzania.

This is contrary to the result expected after the introduction of the environmental tax to reduce importation of DMVs and the attendant air pollution. Interview with a dealer in motor vehicle sales revealed that the imposition of the environmental tax did not affect the business of DMVs. Instead, customers resorted to buy low priced DMVs, of old age of course. Implicitly, the TRA used Motor Vehicle Valuation System does not internalize the cost to polluters. The environmental tax regime is as such serving as effective in generating revenue for the government. TRA key informants also revealed that customers avoided environmental taxes by importing DMVs parts including engines. DMVs parts small sizes economized space in the ships and imported in a large quantity with least cost. As such, they attracted less taxes bypassing environmental taxes altogether. Finally, DMVs parts are assembled and use the registration numbers of serious damaged motor vehicles. Most of the imported engines are replaced in existing DMVs. Ultimately, the increasing use of imported engines rise of emissions. The findings of the study resemble those of Gilda et al. (2020) who found that Cameroon is experiencing the mushrooming of DMVs made of assembled DMVs parts imported from Europe.

The current study also reveal that some customers avoided environmental taxes by buying used motor vehicles aged below 8 years old because they were not qualified to be under the category of DMVs as provided in the law (URT, 2014b). The findings are corroborated by an interview by a dealer in motor vehicles who stated that the business of DMVs was not affected by the imposition of the environmental tax as he (if a man) claims. *"Our business has remained the same because our customers have resorted to buy used motor vehicles which are low priced because of age",* A DMVs Dealer in Ilala, Dar es Salaam. The quote reveal that the designing and establishment of the TRA used Motor Vehicle Valuation System does not

internalize the cost of polluters, though it is effective in generating revenue for the Government.

Table 2: TRA Used Motor Vehicle Valuation System (in US$)

ID	19203094178	19203094178
Make	Toyota	Toyota
Model	IST- NCP 60 / 61 / 65	IST-NCP 60 / 61 / 65
Year of Manufacture	2001	2009
Engine Capacity	1001 - 1500 CC	1001 - 1500 CC
Seating Capacity	5	5
Country of Origin	Japan	Japan
Customs Value CIF	1,659.57	2,999.00
Import Duty	414.89	749.75
Excise Duty	103.72	187.44
Excise Duty due to Age (Environmental tax	622.34	1,124.63
VAT	545.55	957.47
Custom Processing Fee	9.96	17.99
Railway Dev. Levy	24.89	44.99
Total Import Taxes	TZS 3,962,536.31	TZS 7,095,303.34
Vehicle Registration Fee	TZS 450,000.00	TZS 450,000
TOTAL TAXES (	**TZS 4,412,536.31**	**7,545,303.34**

Source: (Own computation generated from TRA automated evaluation system)

The Political Feasibility Regime of Environmental Taxation on DMVs

The political landscape in Tanzania is mostly defined during elections and parliamentary sessions (Anyimadu, 2016). Reaching a political consensus in imposing and implementing an environmental tax is normally a hard one to reach. Sometimes an agreement is arrived at after a series of consultations in the party caucus and with the promise of introducing various packages such as exemptions to other goods and services as compensation. Furthermore, the political consensus is reached if the public believe that there is a well-established mechanism which entails the use of revenue accrued from environmental taxes to finance basic social services such health, education, water, social protection and other safety net programs but in most cases environmental programs are least considered (Cottrell et al., 2016).

For instance, when the environmental tax was tabled in the Parliament by the Government in June, 2006 there were serious dissenting views from the members of Parliament on the rationale of imposing it. Despite the strong opposition from the MPs the proposal was sailed through. However, from time to time, the Parliament made some amendments to accommodate some views of the opposing members of Parliament (see Box 2). The most notable

amendment was the increase of the age of the over-aged motor vehicles from 8 to 10 and above years. This implies that all motor vehicles less than 10 years were exempted from the environmental tax.

Implementation of environmental taxes has been rejected elsewhere. In 2009, Republic of Kenya court of law temporally banned taxes on DMVs after a serious confrontation between the Kenya Revenue Authority and Motor Vehicle Clearing Agents. The crux of the matter was unfair criteria used to design the rate of the taxes to be imposed on the DMVs over the price rise of DMVs (Okubasi, 2020) Similarly, in 2015, the importers of DMVs in Uganda went into the street demanding their government to remove environmental taxes on DMVs imports (Reporter, 2015)

Similarly, Kombat & Wätzold (2019) noted that when the Government of Ghana introduced environmental taxes on DMVs, it received fierce opposition from Association of Second Hand Car Dealers (ASCD) to the point that it succeeded to mobilize political parties and their voters to rally against the government stance on the matter. The matter was also reported to the apex body of Economic Community of West African States (ECOWAS). The main point of the opposition was grounded on huge taxes imposed on DMVs thus making the majority not to afford to own motor vehicles.

Box 1. Amendment on the age of the DMVs from 8 to 10 years

Hon. Speaker, We came with a proposal as a government to see how DMV aged Hon. Speaker, We came with a proposal as a government to see how DMVs aged 10-8 years would be charged, our proposal did not mean that we are against, but we want to see that at least a Tanzanian should buy a DMVs aged 8 years but not 10 years and above (Hon. Freeman Mbowe was somehow against with our proposal). Speaker, we said DMVs have many impacts in our country, accidents is number one, but also we want to protect our environment and reduce foreign exchange. Honorable Speaker, we introduced 25% tax penalties for all DMVs imported from Japan and Dubai.

Source: URT (2014)

Efficiency of Environmental Taxes in Promoting Environmentally Friendly Vehicles

Tax regime on vehicular emission is of great importance in providing incentives for environmentally friendly vehicles such as those powered by electricity and condensed natural gas (CNG) and solar (Hagman & Selvig, 2007). In this regard, the present study found out that there are two filling stations for motor vehicles powered by CNG in the study area. Figure 5 depicts the use of CNG in motor vehicles is considered to be

environmentally efficient than those of motor vehicles equipped with petroleum. Such observation echoes the report of CERG (2018) that CNG is less by 35%-75% compared to diesel and petrol, 20% compared to electric and approximately 60% compared to petrol-electric hybrid. Luckily enough, Tanzania is endowed with abundant natural gas that can be used to power motor vehicles and other important domestic, industrial and uses (Shahbaz et al, 2013).

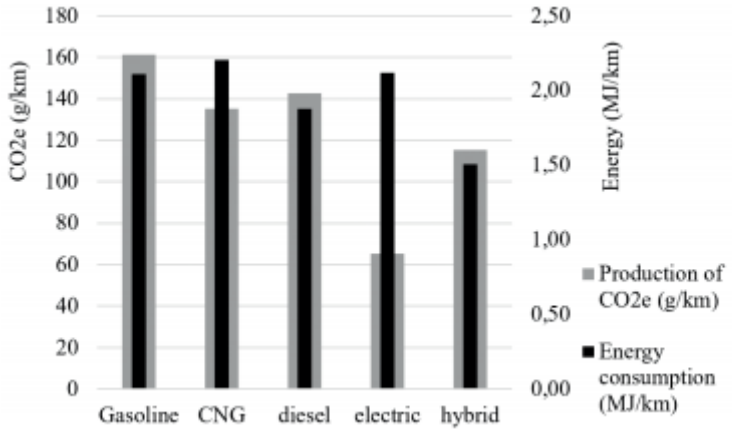

Figure 6. Energy production and consumption of GHGs
Source: Stopka et al. (2018).

On promoting the investments for new motor vehicles plants, this study found out that so far there are two motor vehicle plants namely Tanzanian Automotive Technology Centre (TATC) and GF Vehicle Assemblers both located in Kibaha approximately 42 kilometres west of Dar es Salaam. In 2019, Kenya had four major motor vehicles assemblers with several branches in the country. In combination, they assemble 46,000 units yearly (Miriam et al., 2020). The inability of the country to attract large scale motor vehicle assembly plants due to high cost of investments is considered to be one of the impediments towards suppressing the importation of DMVs (Black, Makundi, & Mclennan, 2017).

While executing the fiscal regime in curbing importation of the DMVs in Tanzania for emission control, the exercise is required to institute measures that would ensure an efficient public transport in order to lessen transport problems as a result of removal of DMVs. Because efficient public transport system is robust in addressing traffic jams hence, emissions in urban areas is inevitable (Le & Trinh, 2016). The advent of Bus Rapid Transport could address the challenges of small buses known as *Daladala,* but the infrastructure network was limited to very few places along with few buses

to carry as many people in the city. Still many buses were grounded due to lack of regular maintenance as a result of traffic jams.

Correlating Dilapidated Vehicles Importation to Air Pollution after ET Imposition

The studies of Wendell et al. (1973) and Caserini et al. (2013) investigated the correlation between age of the motor vehicles and the levels of emissions. For instance, Caserini et al. (2013) gathered a huge amount of data from import used motor vehicles (diesel and petrol) to understand the influence of age and the travelled distances and their annual emission levels. The study found that emission levels were much higher in all motor vehicles aged 10 years and above. This could be probably attributed to leakages in combustion chamber and malfunctioning of the used motor vehicles in a full swing.

Figure 1.7 portrays the trend of DMVs population and CO_2 emission levels in Tanzania between 1996 and 2016. It shows that there was an increase of the level of emissions experiencing upward trend at a higher average before but during 2008 there was a fair stable recorded. Between 2006 and 2008 there was a little increase while from 2009 to 2014 all variable rose exponentially. The increase in the trend of DMVs also kept increasing but in 2011 the number of DMVs dropped slightly and started rising in the subsequent years.

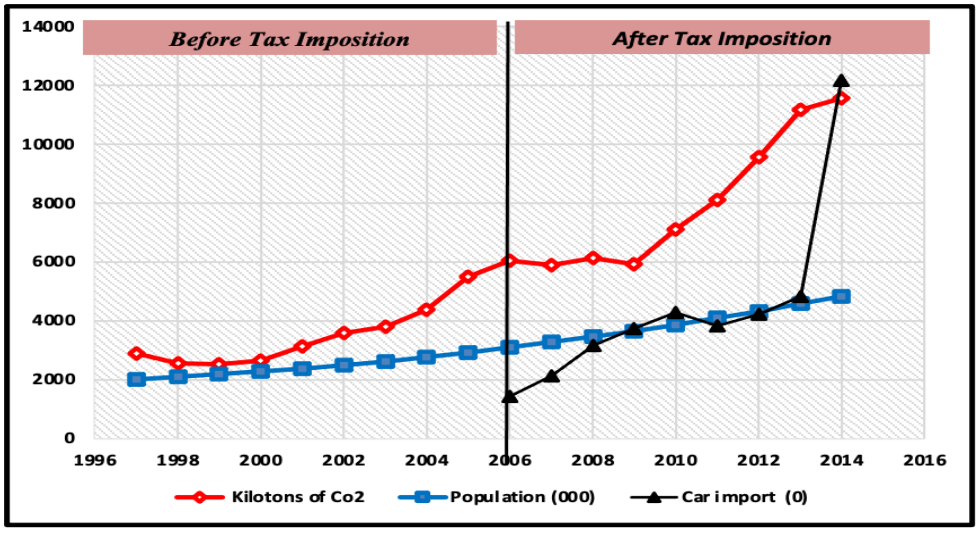

Figure 7. Motor Vehicles Imports, CO2 Emission and Population
Source: Field data (2017).

Conclusion

We have exposed less influence of environmental tax in reducing the air pollution through curbing importation of the DMVs in Tanzania. Despite the imposition of an environmental tax in suppressing the demand of the DMVs, their importation kept rising consequently leading to increased emissions, the trend attributable to many factors, including increase of population and income levels in Dar es Salaam. The environmental tax, however, generated substantial revenue for the government. It was noted for example that, during the first year of its implementation the Government revenue rose to 216%. Though the amount generated was supposed to be ploughed back to protect the environment and address issues of equity, this was not the case. Technically, environmental tax was not properly designed to determine the marginal social cost of polluting motor vehicles.

To this end, we noted that the issue of whether the introduction of additional taxes and tax rates on the importation of DMVs significantly reduce air pollution in Tanzania, the answer is definitely no. The side effects of the DMVs in polluting the environment are on the rise due to the rise in income levels, population increase and technical calculation faults and exporting companies exerted, influence on luring the customers in DMVs, importation. Thus, a critical role is played out in influencing the flourishing of the DMVs as a result various costs of pollution were not reflected in the environmental tax regime. Non-inclusion of those costs gives us a market failure scenario as ala Pigou Theorem pointed. Politically the introduction of the environmental tax was passed in the Parliament despite strong opposition from various Parliamentarians as there was some doubt on the political will on the part of government to really salvage the environment.

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