Misperceptions of Energy Taxes:

An Experimental Study

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Abstract

Economists generally agree that in theory, fuel taxes are the most cost effective policies to address efficiency losses and combat environmental pollution (see eg. Baumol (1988); Dasgupta (1979); Izzo (2007); Mankiw (2006); Sitglitz, (2006)). Despite popular agreement amongst economists, nonetheless, fuel taxes remain extremely unpopular. The high perceived social cost associated with these forms of taxes makes it difficult to implement, as evident from the wide variation and low usage, globally, of energy taxes.

What possible reasons could there be for resistance? Taxes have an effect in dynamic systems, where their impact is associated with delays, non-linearities and feedbacks. Such systems are highly complex and research has shown mass misperceptions of these systems. Few journals take into considerations these dynamics when discussing policies for implementing sustainable and buoyant fuel taxes in countries. To bridge the gap between theory and practice, this research paper makes use of an internet-based survey tool administered on Facebook (an online social networking service) to explore for possible reasons for misperceptions, as well as test for information policies and general factors that may influence support for fuel taxes.

There has been little empirical analysis in these areas, and no study available that simultaneously tests both for the rationale and possible policy options for biases of energy taxes. Compared to earlier experiments where information policies where not tested, misperceptions persist in this experiment as well, information policies tend to have very little or no impact on decisions of participants. However the survey reveals that some factors namely revenue recycling schemes appears to boost more support for taxes than other variables. The high tendency to misperceive dynamic systems and their unintended consequences provides a strong motivation for this research.

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1. Introduction

Problem

Modern Theory of Economics postulates that under some assumptions public policies should be designed to achieve production efficiency, Diamond and Mirrlees ((1971)) . The rule is applicable to all traded goods including petroleum products. Economic theory and a number of empirical studies (see eg. Gupta et al (2002); Hossain (2003); Pigou (1924); Baumol & Oates (1988) shows that taxation of petroleum may help minimize the loss of efficiency and correct market failures in energy markets. In the presence of various externalities and market distortions, taxes are generally seen as tools to increase efficiency especially since instruments to address these inefficiencies are limited. Subsidies in energy markets, on the other hand, are often regarded as inefficient, inequitable tools that frequently lead to a deadweight welfare loss where the loss in government revenue is greater than the increase in domestic consumers' surplus, Gupta et al (2002).

Interestingly, though domestic taxation of petroleum[1] products have been proven to be environmentally effective and economically efficient policy tools, globally, there is a wide variation of tax rates on petroleum products across countries, which cannot be explained by economic theory alone. In optimal fuel taxes, —in terms of level and use of revenues—leads to inefficiencies and lost welfare, this continues to be an issue of daily political concern in many countries, and this is the problem we focus on.

The main aim of the research is to gain a better understanding of the misperceptions that people generally have of fuel taxes that make them a highly unpopular economic instrument, despite being a powerful one.

Above all, the research work's focus on misperceptions is of great importance to policy makers and to the general public. So far as the beliefs of the public affects government policy, if widely held mental models of complex systems are faulty, people may inadvertently favor policies that yield outcomes they neither intend nor desire, Sterman & Booth Sweeney (2007). Policy makers have to find ways to correct these biases in order to successfully implement sustainable efficient policies.

[1] The word 'petroleum' is used throughout the paper to refer to final petroleum products and not to crude oil. The paper focuses just on the main petroleum products - gasoline, diesel, fuel oil and kerosene.

Hypothesis

When countries choose in optimal tax levels, this may result from widespread misperceptions of several long-term effects of taxes linked to the misperceptions of dynamic systems. Similar works by Moxnes (2007b)(2007a) reveal misperceptions with regards to greenhouse gas taxes and emission quotas. His work gives strong incentive for this study. In this work however, we progress a step further than other works done on these misconceptions, we test hypothesis for these biases and make use of simple information policies to test if this has an impact on subject decisions.

Do voters understand the delays and feedbacks effects in the form of the corrective workings of the 'invisible hand' in a market system when forming opinions about fuel taxes? Similar to other works, Moxnes (2004) (2007b), it is highly unlikely that people comprehend or consider these dynamics when making decisions.

Moreover, few journals take into consideration the above stated dynamics when discussing policies for implementing sustainable and buoyant fuel taxes in countries. Instead, many papers (Hammer et al (2004) link public resistance and sensitivity to fuel taxes to the public's belief that government would misspend the tax proceeds and it may impose economic hardships upon certain individuals, groups and industries. In some articles, resistance has been linked to mental cognitive gaps in reasoning Hsu et al (2008). The reasons stated in these articles may very well be the catalyst for opposition; however this work additionally explores the possibility that, it is misperceptions of the underlying, dynamics of the system that prevents people from objectively appraising the merits of fuel taxes as a corrective measure for market failures. At the same time I test for the effect of information and certain economic and biographical factors that previous studies have recommended may explain political resistance to fuel taxes Hammar et al (2004). There has been little empirical analysis in these areas, and no study available that simultaneously considers both of these types of explanations. The most relevant papers in this regard are Moxnes (2007a),(2007b). Moxnes (2007a) makes some interesting observations which indicate that people and the media only perceive the short term effects of environmental taxes on trucker profits and misperceive the long run benefits through the feedback mechanism. They hence misperceive the mechanism that Adam Smith called "the invisible hand". These works give a key insight for the problem

of focus in the proposed paper as it gives evidence to people's disregard for long run benefits of taxation.

Analysis

To explore for various types of misperceptions we make use of online, web based questionnaire (survey) administered on Facebook. The subjects are given the chance to benefit from learning. This is ensured by the sequence of the questions and the increasing amount of information given out in the questions as they progress along the survey. The questionnaire method also ensures less complexity for the subjects than controlled laboratory experiments and allows for a larger sample group to be involved in participating in the survey.

Main findings

Compared to earlier experiments where information policies were not tested, misperceptions persist in this experiment as well, information policies tend to have very little or no impact on decisions of participants. However the survey reveals that some factors namely revenue recycling schemes appears to boost more support for taxes than other variables.

Policy and implementation

In general, political acceptance of gasoline taxes may be enhanced by policy makers targeting potential revenue recycling schemes from tax proceeds that are most beneficial to the public as well as creating more awareness of the possible benefits of taxes.

Subsequent chapters

The rest of the paper is organized as follows: Chapter 2 discusses the appropriate principles for setting petroleum taxes efficiently based on reviews of the relevant studies, giving evidence to variations between optimally efficient energy tax levels and the actual tax levels of petroleum products, globally. Chapter 3 introduces the experiment/ questionnaire design and develops the causal loop diagram as well as the hypothesis for misperceptions. Chapter 4 deals with results of the experiment, while Chapter 5 analyses and discusses the results of the survey using statistical packages. Conclusions from the work are drawn in Chapter 6. Appendix is included in the end as background information.

2. Problem

2.1 Rationale for energy taxes: Normative Argument

An important question to consider is; what are the optimal levels of taxes and pricing for petroleum products? Economic literature provides a number of considerations and principles to consider for taxing petroleum products. These considerations can be classified under three (3) main objectives; under these objectives, it is possible to identify seven (7) major reasons for taxing petroleum products as presented below:

1) For efficiency gains
    - To cover production/ transport and refinery costs
    - To charge for benefits and costs associated with its consumption
    - To raise revenue for government
    - To improve energy efficiency
2) Equity considerations
    - To improve distribution of income
3) Price stabilization and energy security
    - To conserve foreign exchange and reduce over dependence on oil
    - To maintain price stability of petroleum products

(i) To cover production/ transport and refinery costs

The theory of economics suggests that input prices for energy products should be set equal to the efficient level of prices. Ideally, assuming there are no barriers to trade internationally, Hossain (2003) shows that the efficient price for a fully traded good would be the international or border price (import or export parity price)[2] , suitably adjusted for quality differences and full cost recovery of producers/importers, refiners and distributers including the cost of maintenance of facilities and assets. This rule is generally applicable to all internationally traded goods. This basic rule however requires adjustments in the presence of externalities at the local and environmental level that cannot be corrected at the source.

[2] Import parity price is applicable in countries that are net importers of oil, and export parity price are applicable in net exporters of countries.

(ii) To charge for benefits and costs associated with its consumption

Road use:

By far the rationale for charging petroleum products in order to maintain and finance road infrastructure has been the most applied. Fuel taxes are often used as instruments for generating revenues in the transport sector for road infrastructure financing, GTZ International Fuel Prices (2008)**.** This rationale gains more grounding since the level of driving of people is strongly correlated to the amount of fuel consumed, GTZ, International Fuel Prices (2009). Therefore, taxing fuel consumption directly charges consumers for road use, thus implementing the 'users pay' principle which states that road users should pay for using road infrastructure. It serves as a cost to consumers for the use of social public goods. It is therefore comparable to other costs levied by the government for the provision of public goods such as health care and education. Other options such as road tolls are more costly to implement and may increase traffic jams.

Ideally, the tax should be able to cover the use of road infrastructure and maintenance of such infrastructure. In many OECD countries a portion or all of fuel taxes is earmarked towards highway maintenance and construction, very few developing countries however earmark petroleum revenues for this purpose. The 10 US cents duty advocated by SSATP (Sub-Saharan African Policy Programme), Meeting of African Transport Ministers of November 2005 held in Bamako/Mali for developing countries and the World Bank is regarded as the benchmark for road financing, and has been cited by a number of works on fuel taxation (see GTZ International Fuel Prices (2008) (2009)), this supposedly will not lead to major economic distortions**.** In addition to the 10 US cents, the World Bank further recommends a vehicle tax of USD 75 per Annum for small passenger vehicles and USD 500 for medium-sized trucks, GTZ International Fuel Prices (2009). In the USA, fuel taxes of about US 10 cents per liter of diesel and gasoline are levied to cover all direct expenditure for roads and highways (maintenance, refurbishment, new construction and capital recovery for the road and highways department). For the United Kingdom, research Newbery (2005a.) estimates that the road-user component is about half of the current fuel tax; pollution and other externalities bring the optimal tax up to about 70% of the UK fuel tax, or more than $2 per gallon, Parry et al (2006). In Ghana, the road fund levy accounts for 7% of the total ex pump price which in 2008 was 90 US cents/liter.

The above recommendations on road duties appear reasonable, however to gain support, it has to be customized to the countries of implementation. The lower traffic density in many developing countries means that revenues received from road users will be lower than that of industrialized nations. Hence the adoption of the US 10 cents per liter levy will only cover periodic road maintenance expenditures and not new construction of roads. The levy however may include maintenance of the more inaccessible rural roads, for which portions of the total levy sum (US 2 cents per liter) suggested by GTZ, International Fuel Prices (2009) may form the basis for solving this problem in many countries.

Congestion

Energy taxes can act as a proxy for other social costs (like accidents, congestion etc.) incurred by road transport users. Apart from the externalities associated with fuel consumption it has been argued that internalization of external costs such as delays and traffic accidents to other users and third parties serves as a good rationale for additional taxation of petroleum and vehicle use. These costs, such as vehicle accidents, are frequently ignored in petroleum taxing, but nonetheless impose social costs on the society well above the private costs that the users themselves bear, Hossain (2003).

In charging taxes with this respect, Gupta et al (1995) suggested that policy makers be selective and target the more congested roads. High license charges or surcharges, as is the case in Singapore, for specific locations may be highly effective. Other alternatives are electronic road pricing, parking charges and specific road tolls.

Environment

Fuel taxes are seen as indispensable to the transition of the transport sector to low carbon, energy efficient sector, GTZ International Fuel Prices (2008). Increasingly, policy makers and analysts are turning to energy taxes as economic instruments, as they are environmentally effective and economically efficient policy instruments. Preserving the environment is very important for both governments and society at large. Energy taxes serve as useful instruments to reduce environmentally harmful behavior by encouraging more efficient energy use and stimulating the development of zero-emission technologies by increasing fossil fuel prices. Though energy production imposes health and amenity costs on society they are hardly considered in private economic decisions, hence analysts and policy makers are increasingly turning to energy taxes to address the problem of global climate change. This trend is likely to

gain momentum as developed countries assess their ability to meet their commitments under the United Nations Framework Convention on Climate Change (FCCC) with introductions of strict environmental regulations.

The difficulty here is that attempting to tax pollution damage directly is often administratively costly and is a subject of debate and disagreements. This is because, though there appears a strong correlation between motor vehicle operation and the amount of pollution emitted, there does not seem to be a direct relationship between the combustion of petroleum and carbon dioxide emissions. Motor vehicles generally vary with their rate of pollution; by far research (see Nivola and Crandall (1995.); USEPA (2005.); UNEP) shows that the greatest determinant of most motor vehicle pollutants is the number of vehicle miles travelled and vehicle weight. Another point to consider is that if there is to be a nationwide tax on petroleum, based on environmental considerations in cities and townships, the rural areas may be unfairly penalized as urban areas generally have higher concentrations of environmental pollutants than rural areas. In the case of global warming a broader environmental tax may be justified however very difficult to implement across borders.

Alternatively, another policy tool that can be used to address environmental pollution from energy related products is the use of caps or direct regulation. Direct regulatory activities such as for example setting caps and legal limits on the emission level of certain gases, forces immediate compliance of energy industries not taking into consideration the time delays and comparative costs for different businesses and individuals. On the other hand, using environmental taxes offers more flexibility to adapt for those affected as compared to direct regulation. Additionally, taxes are policy tools that can be easily implanted through existing administrative systems Muller (1996). Energy taxes are seen as more flexible because companies affected can take time to make the necessary changes so that in the future they will not have to pay the tax. The tax, therefore, allows those who have cheaper means of reducing emissions, to do so first, whilst allowing those with higher pollution control costs, to pay the tax and have enough time to make technological adjustments for the future. The economy meets its environmental objective more cheaply than by direct regulation. Moreover, research Zhang (2004) shows that carbon taxes can act as a strong incentive to search for cleaner technologies whilst for direct regulations there is no incentive for the polluters to go beyond the standards.

How high should these taxes be? To a large extent it will depend on how large the externalities are; As long as monitoring and administrative costs are low, a pollution tax equivalent to the marginal social cost of pollution yields a welfare maximizing equilibrium Tietenberg (1992). A recent review, Parry (2001) has estimated that the total environmental and congestion cost of gasoline consumption in the UK is between US$0.25 and US$0.40 per liter, an amount that would imply 100 percent of the free market price Hossain (2003). In developing countries however, it is recommended that externality costs be set lower as incomes and environmental pollution levels are lower than the developed world.

Another factor to consider in taxing fuel for environmental purposes is to differentiate fuel tax rates by fuel quality. For example research GTZ, International Fuel Prices (2007) has shown that higher tax rates on 'dirty and more damaging fuels' (*i.e.* leaded fuel or fuels with high sulphur content) have helped reduce or phase out their usage in European countries.

iii) To improve the distribution of income

Petroleum taxes can have a significant impact on the distribution of income in developing countries, where petroleum products are used frequently for lighting, heating and cooking and transport purposes. It constitutes a large proportion of the consumption basket of the poor. In this case, unless the use of petroleum (especially diesel and kerosene) by the poor, for these purposes is considered, petroleum taxes can be regressive. Detailed empirical studies indicate that taxation of kerosene can indeed be regressive, as was found in Indonesia, Thailand and Tunisia between the mid-1970s and early 1980s Gupta et al (1995). On the other hand the consumption of motor gasoline has been found by many studies (see Gupta et al (1995), Parry et al, (2006)) to rise rapidly with rising incomes in developing countries; hence in this context the tax on gasoline would be considered more progressive.

In most countries the question of the appropriate tax rates between gasoline and diesel is highly complex. In many developing countries gasoline and kerosene is mainly used for individual consumption purposes whereas diesel fuel is used as an intermediate good for transport of goods and services, and for agricultural and manufacturing production. A high level of taxation on an intermediate good may impede international competitiveness. Diesel is highly used in the railways, in industries as well as for electricity generation. Perhaps, if diesel fuel for non-road purposes can be differently taxed as in the UK, Germany and other industrialized countries this would reduce the problem of competitiveness considerably.

However in many developing countries it is difficult to separate road use of diesel and gasoline from its other uses.

Many countries are averse to the idea of adjusting petroleum prices upwards in response to current rises in world oil prices because of the fear that rising oil prices may have inflationary effects which would adversely affect the poor. In the short run these concerns may have strong support, however, policy makers have to be mindful to compare the direct inflationary consequences of this price rises, to the inflationary consequences of a larger budget deficit that is likely to result as petroleum product prices are subsidized, Gupta et al (1995). If public support of fuel taxes is to be secured, policy makers have to find means to design the tax in such a way as to alleviate the short run regressive impacts on the poor. In Ghana, for instance in 2006, a number of mitigating measures to protect the poor were adopted such as investment in the provision of mass urban transport, extra funds were also made available to expand a rural electrification scheme.

iv) **To improve energy efficiency**

Fuel taxes play an important role in acting as a great incentive to achieve efficiency in the transport sector. Higher fuel prices acts as a financial incentive to reduce consumption of fuel and increase adoption of conservation methods. High fuel prices promote fuel efficiency either by stimulating the purchase of fuel-efficient vehicles as well as their appropriate maintenance or by encouraging economical driving behavior (eco-driving) GTZ, International Fuel Prices (2009). Excessive vehicle purchase and use, a problem in many urban areas becomes more expensive, making walking; cycling, 'car pools' and public transport more attractive, GTZ, International Fuel Prices (2009). It is also a motivation factor for the construction and design of more energy efficient transport networks in the medium to long – term. Higher fuel prices can be an important driving force to a low-carbon and energy efficient transport sector**.**

It has been observed that in the long run higher fuel taxes encourage the development of dense settlements, often in combination with mixed use areas that makes trips shorter. Experiences from countries with high fuel prices reveal that users and providers of transport services and infrastructure often smartly adapt habits and policies, GTZ, International Fuel Prices (2009). These trends should encourage countries with low taxation levels to gradually increase taxes on fossil fuels to promote more energy efficient mobility solutions

Recent studies Litman (2009) have shown that consumers and businesses are not only affected by the fuel prices (cost per gallon or liter) but by the total fuel costs, i.e. the product of fuel prices times vehicle fuel economy (miles per gallon or kilometers per liter) times vehicle mileage (motor vehicle miles or kilometers driven), as summarized below:

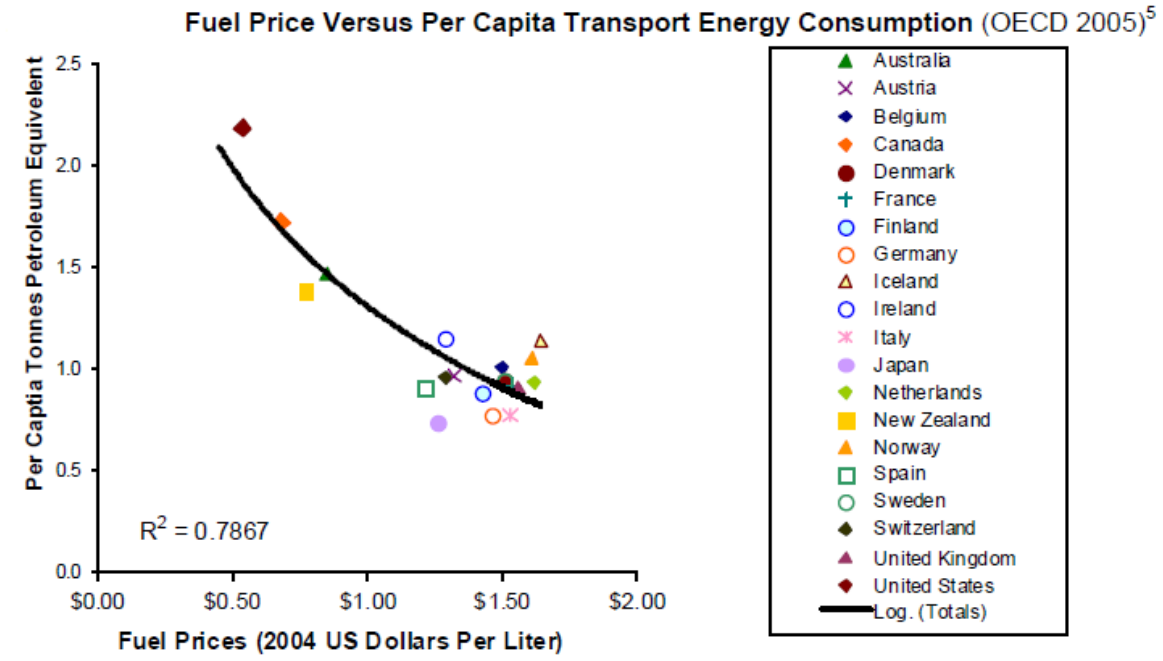
Annual Fuel Cost = Fuel Price x Fuel Economy x Annual Mileage (Adapted from Litman (2009))

This formula is a sensible, true economic approach to analyzing fuel costs , as it makes consumers not only focus on the problem of fuel pricing but also on improving fuel economy and reducing per capita vehicle travel. It can be described as true economy because it increases overall efficiency and helps provide maximum benefits whereas other policies such as subsidies may just shift cost burdens to other goods and exacerbate the problem.

People often believe that fuel demand is inelastic but there is strong research to show otherwise, (see T. Sterner (2006), Litman (2009), Litman (2010)) refer to table 1 below. The price elasticity is quite high but only in the long- run, in the short run it tends to be quite inelastic, (see Table 1 below). A fuel tax would have a stronger impact on fuel consumption in the long-run having important implications for policy makers.

Table 1 Summary of price elasticity's of gasoline consumption

Source	Short Run	Long Run
'Appropriate response to rising prices' VTPI (2009)	--	-0.05 for a 0.10 fuel price increase. Range -0.04 - -0.06
Goodwin, Dargay and Hanly, 2003	-0.25 Range -0.01, -0.57 Number of estimates: 46	-0.64 Range 0, -1.81 Number of estimates: 51
Graham and Glaister (2002)	-0.27 Range-0.2 to -0.3	-0.71 Range -0.6 to -0.8
Average elasticity (by author) (use of Goodwin et al (2003) and Graham et al(2002)	-0.26	-0.68



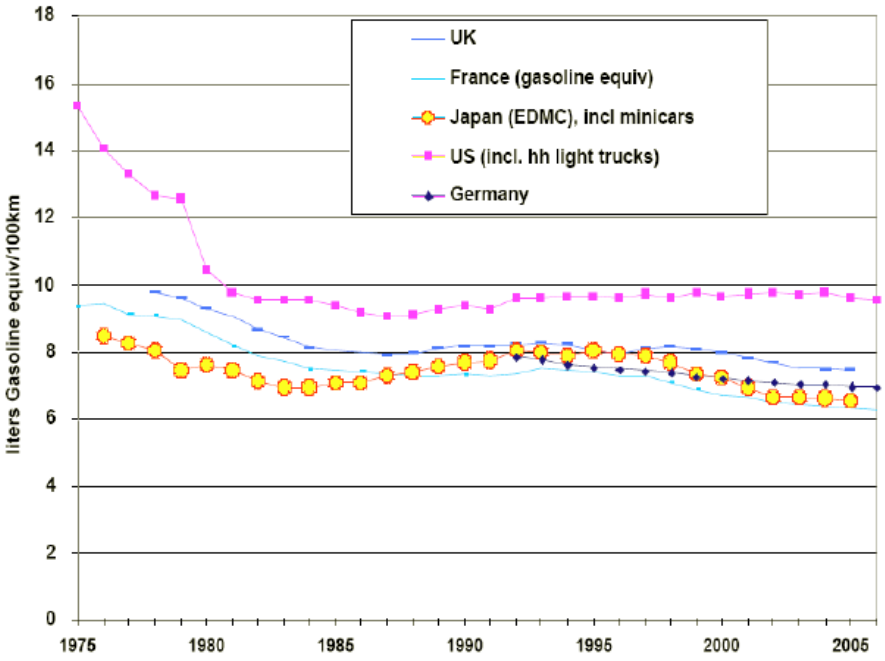
As fuel prices increase, per capita transportation energy consumption declines.

Figure 1: Fuel Price versus fuel consumption (Source: OECD 2005)

Figure 1 compares fuel prices and per capita transportation energy consumption in various countries. High fuel prices appear to be associated with low energy consumption. The U.S., Canada, Australia and New Zealand have low fuel prices and high transportation energy consumption, while people in other developed countries pay two or three times as much for fuel and consume about half as much transport energy.

Some articles have asserted that had Europe not followed a policy of high fuel taxation but had low taxes, then fuel demand would have been twice as large. The experience of fuel taxes in Europe, Japan and a few other countries may in fact provide some evidence to these assertions, Sterner (2006). The statement by the CEO of Daimler Chrysler, Tom La Sorda at the U.S. House Subcommittee on Energy and Air Quality (2007), in this respect, further support this affirmation. He called for the U.S. to adopt policies that rely more on market forces to drive consumer demand in order to improve the fuel economy of the U.S. vehicle fleet and fight climate change GTZ, International Fuel Prices (2008). Research GTZ, International Fuel Prices (2008), shows that the European vehicle fleet has 50% better fuel economy than U.S. fleet. The statement by the CEO of Daimler Chrysler emphasizes the

importance of fuel tax policies, he said "They've highly taxed gasoline, making the price three times higher than in the U.S., and they have incentives on diesel fuel. As a result of these policies, fuel economy is always high on a customer's list and not just when there's a spike in fuel prices". Studies in OECD countries have also shown that energy taxes do increase energy efficiency in the long run see Figure 2 below.



Source: Lee Shipper – Automobile Fuel; Economy and CO2 Emissions in Industrialized Countries: Troubling Trends through 2005/6: „New vehicle sales-weighted fuel economy gasoline equivalents for each year shown, using each country/region's testing procedures, from each country's official publications."

Figure 2: Source: GTZ, International Fuel Prices (2008) Effect of fuel taxes on fuel economy in kilometers per liter

As can be seen from figure 2. , the implementation of fuel taxes over the years has contributed to a reduction of usage of gasoline for vehicles; this implies an increase in fuel economy in industrialized nations. The conclusions drawn from this trend is that, fuel costs per vehicle-mile, declined during most of the last four decades because manufacturers responded to high fuel prices in the 1970s and 80s by developing more efficient vehicles.

v) Important contribution to general budget revenues

Many governments see fuel taxes as a means of generating revenues for the public budget. They can be seen as a reliable source of revenue for the state because they can be collected relatively easily even with just a few refineries or fuel distribution centers. An energy tax is potentially an excellent way to reduce the budget deficit. According to an article in the Economist (1993), it offers not just revenue but a cleaner environment too, and with relatively little effect on economic growth or competitiveness. Additionally, fuel taxes are

administratively less costly than say income taxes or value added taxes (VAT) which in many developing countries are hard to enforce and thus often constitute a weak and unreliable basis for public revenue.

As stated above, the taxation of the domestic consumption of petroleum products is an important source of revenue in many countries. In developing countries it generally accounted for about 7% to 30% of total revenue in the early and mid 1990's and was equal to between 1 and 3.5% of GDP, Gupta and Mahler (1995). Even in some industrial countries, petroleum revenue has amounted to up to 2% of GDP. Some studies have even gone so far as to claim that it usually provides far more revenue than any other product, including tobacco or alcoholic beverages Gupta and Mahler (1995)**.** This claim may be highly possible, as fuel products are universally consumed unlike tobacco and alcohol which are more specific to consumer tastes and cultural regulations.

In addition, given that energy demand is price inelastic and that there are negative consumption externalities associated with its use, taxation of petroleum products is generally regarded as an efficient and easier way to raise government revenue. A conventional guide to raising revenue has been the Ramsey tax rule, which suggests that commodities that are relatively insensitive to price changes (low price elasticity of demand) should be taxed more than a commodity that are susceptible to price changes (high elasticity of demand). However this rule has been subject to criticism as it directs taxation towards 'necessities' Hossain (2003). It is proposed that where income distribution and equity concerns are important the tax has to be adapted to the situation.

The possible advantages of fuel taxes as a revenue raiser are immense. Revenues from these taxes form major contribution towards financing core state functions, such as the health services, education and security. Recent World Bank analysis shows that taxes on petroleum products are a critical source of government revenue for low-income countries. . In Ghana, for instance, tax revenue from fuel products accounted for nearly 4 percent of GDP in 2004.

Taxation of petroleum may help minimize the efficiency losses of taxes in general, if the revenue collected is recycled to reduce taxes on other products that are more distortionary 'double dividend'. This claim though weak, provides a possible mitigation measure for the

regressive impact of these forms of taxes on poorer households. It is important however, to caution that excessive reliance on petroleum taxes however, may distort resource allocation.

There is general agreement amongst Economists, that taxation of petroleum products for revenue reasons should be based on same general tax principles[3] as in the case of other goods. As fuels are regarded as any other commercial good, they should always be subjected to a sales tax (example Value Added Tax). VAT should ideally be charged on the full sales value of fuels (including the fuel tax element) GTZ, International Fuel Prices (2009). Generally, imposition of a VAT (or general sales tax) is preferable to arbitrary taxes on individual commodities. VAT has been described as a nondiscriminatory and neutral tax that avoids distortion[4] associated with taxation of inputs to production, Hossain, (1995)(2000).

It is important to note that petroleum taxes may be less effective in countries that border other nations that have subsidized petroleum products, as this allows for smuggling from these neighboring countries. In such a situation, setting a tax on petroleum products will yield very little revenue to the government. A possible line of action, that a government can take to salvage this situation, is to enforce laws to outlaw smuggling.

vi) To conserve foreign exchange and reduce dependence on oil (energy security).
Over the past 35 years, oil prices have fluctuated widely. The 'limits to growth' study emphasizes the finite nature of our global energy resources Meadow (1972). Hubbert (1950) 'peak oil' theory explains that, oil and gas production must follow a 'life cycle; a period of exponential production and low prices followed by a long period of rising costs and reduced production as resources are depleted. In recent years the rise in energy demands, depletion of oil and gas resources and long delays in the implementation of alternative energy sources raises the potential for increases in petroleum price.

In periods when energy prices have been low, the market continues to expect that prices will remain low over time; this becomes a major barrier to the improvement of energy efficiency

[3] It has been shown that, it is more efficient to tax all commodities at the same rate (e.g. Atkinson and Stiglitz 1976).
[4] When goods are excluded from consumption taxes, some distortion of relative prices is likely to occur, particularly to the degree that goods are complements to or substitutes for the excluded goods. It has been shown that ,

and the development of alternative technologies and infrastructure. In many cases, even relatively modest taxes can help reduce the 'cheap fuel' psychology, Muller (1996), in effect, energy taxes serves as a means to prepare consumers for a future rise in energy price trends (transition effect).

In addition to the transition effect, many countries that are net importers of petroleum products may resort to petroleum taxation as a means to lessen consumption and strengthen or maintain the value of its domestic currency. This policy may be more effective if other non petroleum product imports are targeted as well.

Some countries seek to achieve energy security by raising the costs of petroleum products in relation to other domestic alternatives. This may be done by charging a premium on petroleum products (excise duty). This strategy allows consumers to be less dependent on oil imports and turn to domestic alternative technologies, over time, which are less price volatile. It also allows for more energy conservation.

Furthermore using a carbon/energy tax to provide a steady price signal over time, has the added advantage of moving people away from carbon-intensive energy choices. Such a price-driven shift will not be possible in the short run but can only occur in the medium to long-term, due to the rate of capital stock turnover and existing infrastructures. This explains why in most cases, carbon/energy taxes are used as one instrument in a much broader package of policies aimed at reducing greenhouse gas emissions.

vii) Price Stabilization

Fuel prices have increased significantly in recent years. Between 2003 and 2008 alone, average U.S. gasoline retail prices more than doubled, from $1.77 to $4.10 per gallon, and high prices are expected to continue due to growing international demand and rising production costs Jackson (2007).

In the face of such unstable international price volatility, a case can be made for using taxes as instruments to stabilize domestic prices of petroleum products. Most producers and consumers appear to be risk averse and hence this frequent price changes may impose costs on them. If there are insurance markets and economic agents have access to facilities that hedge risk, then there may not be a crucial need for intervention in the market to attain price

stability, however in many developing economies these risk protection facilities are not available. In such situations, a case can be made for 'cushioning' the domestic prices from price fluctuations by using variable taxes. The benefits of this price stabilization measure must however be significant in order to justify such taxes.

Based on the discussion so far, it is possible to place the seven (7) components that should be considered whilst setting prices of petroleum products into equation (1).

$$P = P^* + t_{1+}t_2+t_3+t_4+t_5+t_6 \quad (1)^5$$

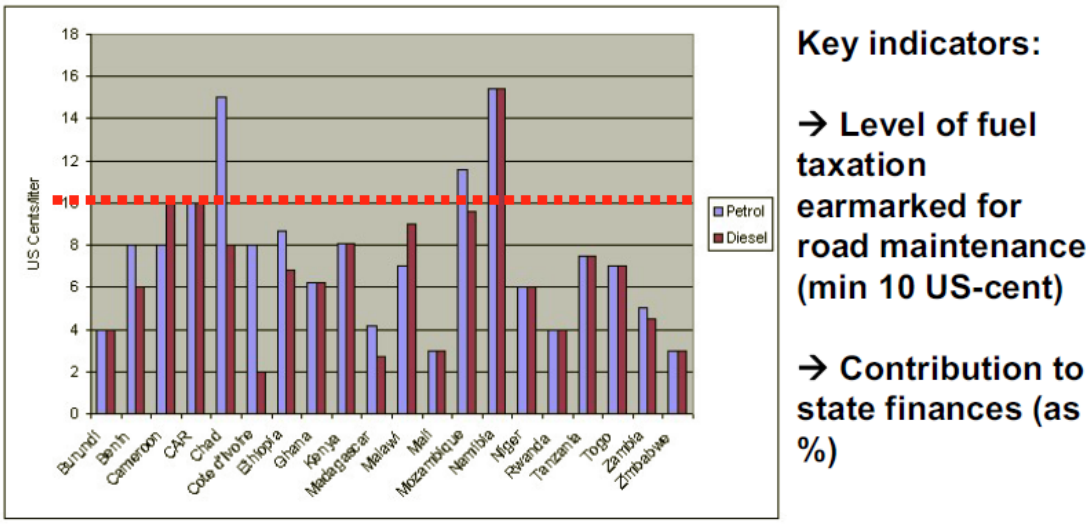
Where
P* = International (border prices),
t_1 To charge for benefits and costs associated with its consumption
t_2 Tax set to improve distribution of income
t_3 Tax set to raise revenue for government
t_4 Tax set to conserve foreign exchange and reduce over dependence on oil
t_5 Tax set to maintain price stability of petroleum products
t_6 Tax set to improve energy efficiency

2.2 Variations from the optimal (Descriptive)

Though petroleum taxation serves as an important instrument to policy makers and the economy as a whole, there is an extremely wide variation from the optimal considerations discussed in Chapter 2.1, which cannot be explained by economic rational theory alone. Studies have shown that no other product is subject to such divergent treatment, Gupta and Mahler (1995). These variations are visible in the retail prices and tax rates on the various petroleum products and across countries. Appendix H. shows the prices of gasoline and diesel in 174 countries around the world in November 2008 (adopted from a survey carried out in mid November 2008 by GTZ International Fuel Prices (2008) for 174 countries). This survey reveals that 20 out of the 174 countries used in the survey have some form of gasoline subsidies of which ten (10) have set the retail prices of gasoline below the price of crude oil on the world market. It indicates several striking patterns. First, the prices of gasoline and diesel varied widely across the countries. For instance, in Africa gasoline prices per liter in 2008 varied from as low as 14 cents in Libya and 34 cents in Algeria to on the high side about 120 cents in Kenya and 253 cents in Eritrea. Similarly, in OECD countries the gasoline price per liter varied between 78 cents in the US and 165 cents in the UK. Second the level of gasoline and diesel prices is generally very low in oil exporting countries and higher in net oil

[5] Equation adapted from Hossain (2003) and modified by author.

importing countries. Third, it is noticeable that the prices of gasoline are generally higher than the prices of diesel fuel. Another interesting observation that has also been made in a recent study Coady et al (2007) that is however not visible in the survey, is that variations in fuel prices also occur across time, fuel prices tend to be lower in times when world crude oil prices are higher, reflecting slow responses of governments to rises in oil prices. At the time of the survey, November 2008, crude oil prices where on the low (US$48 per barrel). These patterns and wide variations in prices of products are highly dependent on wide variations in the levels of the taxes and subsidies on petroleum products imposed for different reasons Hossain (2003).



Source: Benmaamar M: Financing of Road Maintenance in SSA: Reforms and Progress Towards Second Generation Road Funds, SSATP Discussion Paper No 6, September 2006

Figure 3: Comparison of actual and optimal level of fuel taxation earmarked for road maintenance in 20 African countries (source GTZ, International Fuel Prices (2009)).

Figure 3 above shows variations from the optimal road maintenance tax level of 10 US cents across countries in Africa. The survey shows that out of 20 countries in the sample only seven (7) implemented the 10 US cents levy for road maintenance. On average, the level of fuel taxation earmarked for road maintenance in the sample countries averaged approximately 7.5 US cents/Liter. For Petrol, Namibia recorded the highest value of approximately 15 US cents/liter whereas Cote d'Ivoire recorded the lowest of approximately 2.9 US cents/liter.

Subsidies: Evidence of variations from optimal taxing of petroleum products

Energy taxes and subsidies are economic tools that are used as corrective measures of private market distortions. Generally, large subsidies redirect public expenditures away from more productive spending or contribute to unsustainable budget deficits. Low fuel prices fail to provide the appropriate incentives to households to be more efficient in their use of energy, which could mitigate the overall adverse effect of higher world prices on the economy.

Generally, there is popular support[6] for policies that minimize fuel prices through subsidies and tax reductions, but such policies harm consumers and the economy overall because they increase total fuel consumption and vehicle travel, and therefore associated costs such as traffic and parking congestion, infrastructure costs, traffic crashes, trade imbalances and pollution emissions. Economic theory and several studies have shown that fuel price reductions are an inefficient way to help low-income households (see GTZ, International Fuel Prices (2009), Gupta et al (2002), Coady et al (2006) (2007) Litman (2009) ; other strategies are more efficient and provide long term benefits. Because many transport decisions are durable, it has been observed that low fuel price policies are particularly harmful over the long term, Litman (2009).

Additionally, petroleum product price subsidies can impose significant fiscal and social costs that are highly misperceived. When oil exporting countries do not adjust domestic prices of fuel product prices to reflect world prices, they forgo all the revenues that they could have received had they put in place taxes. Subsidies also increase domestic consumption, however from a revenue raising point of view, every barrel of oil consumed locally could have been exported for higher revenues internationally, indicating a cost. This can be described as an implicit subsidy. The initial cost of implicit subsidies is typically assumed by the National oil company without any explicit compensation through the budget. The size of these subsidies

[6] Bangladesh: Implicit subsidy for diesel and kerosene is estimated at US $1.2 billion
 Cambodia: Annual energy price subsidies of about USD 120 million
 China: State price regulation leads to bottlenecks in supplies, since the fuel producing and distributing businesses do not bear the losses that can be expected
 Indonesia now expects to spend nearly $14 billion on fuel subsidies in 2008 (situation before current fuel price hike), more than double last year's $6 billion bill,
 Iran: Rationing of fuel and the sale of additional quantities at higher prices
 Jordan: Fuel subsidies in 2007 totalled about USD 350 million
 Burma: Price rises led to unrest at the beginning of 2007

cannot be measured however it is predicted to be large Coady et al (2007). They include costs borne by public entities such as oil producing companies that are not typically reported in the budget; tax expenditures, such as tax exemptions for oil products; and the difference between retail prices and import parity prices. Estimates (source IMF staff estimates in Coady et al (2007)) were available for six countries for 2006 and range from 0.3 percent (the Dominican Republic) to 10.4 percent of GDP (Azerbaijan), and average 3.9 percent of GDP (higher than the 3 percent observed in 2005) (refer to table 2 below). On the other hand when oil-importing countries do not adjust petroleum product prices, there is usually a direct fiscal cost. Implicit subsidies are much harder to measure and often are not reported.

Petroleum subsidies tend to be inefficient mainly because they are not targeted accurately. Studies have shown that those who mainly benefit from subsidies in the long run are the rich GTZ, International Fuel Prices (2009), Coady et al (2007). The reasoning here is that the higher the household income, the higher the subsidy; because higher income households consume more petroleum products, they benefit more from the subsidy. A study by the World Bank (2006) estimated that in Venezuela in the early 1990s, the richest 20 % of the population received six times more in fuel subsidy than the poorest third of the population. By distorting price signals fuel subsidies may lead to wasteful and misallocation of scarce resources.

Subsidies may also encourage rent seeking and smuggling. Especially in situations where countries subsidizing fuel, neighbor highly taxed countries. Citizens may travel to neighboring countries that subsidize fuel in order to access cheaper fuel. Several countries have responded to the increase in world oil prices by increasing *explicit* and *implicit* price subsidies on domestic fuels. Explicit subsidies mainly reflect compensation to the national energy company for the increased difference between the wholesale domestic price and the world price of fuels Coady et al (2007). Estimates of such subsidies (at different levels of government) were available (refer to Table 2. source IMF staff estimates in Coady et al (2007)) in sixteen cases, and they range from 0.1 percent (Lebanon) to 8.5 percent (Yemen) of GDP in 2006, and to average 1.5 percent of GDP (smaller than the 2 percent registered in 2005).

Table 2: Fuel Subsidies (Source IMF staff estimates in Coady et al (2007)

(In percent of GDP)

	2003	Est. 2005	Proj. 2006
(a) Explicit subsidies			
Argentina	0.0	0.2	0.2
Azerbaijan	5.1	2.8	1.9
Bolivia	0.6	0.8	1.3
Cameroon	0.0	0.2	0.3
Congo, Republic of	0.8	1.0	1.0
Dominican Republic	...	0.5	0.4
Ghana	0.2	0.9	0.7
Honduras	...	...	0.6
Indonesia	1.5	4.2	2.0
Jordan	0.0	5.8	1.2
Lebanon	...	0.1	0.1
Nigeria	0.0	0.0	1.0
Pakistan	0.1	0.2	...
Senegal	...	0.6	0.8
Sri Lanka	...	0.8	...
Yemen, Republic of	5.0	9.2	8.5
(b) Implicit subsidies			
Armenia	0.0	0.0	1.0
Azerbaijan	10.0	13.9	10.4
Bangladesh	...	1.0	...
Bolivia	1.7	5.2	6.6
Cameroon	0.1	0.0	
Colombia	1.2	1.6	
Congo, Republic of	...	...	...
Dominican Republic	...	0.2	0.3
Ecuador	1.4	3.6	...
Egypt	3.9	4.1	6.2
Ethiopia	...	0.7	
Gabon	0.4	1.6	2.8
Nigeria	1.6	2.2	...
Sri Lanka	...	1.0	...

Source: IMF staff estimates using authorities' data.

A more recent survey by GTZ, International Fuel Prices (2008) shows the calculated transport fuel taxation as a percentage of total tax revenues (see figure 4. below). Not surprisingly negative taxation (or petroleum subsidies) tended to be higher in net oil exporting countries, example Venezuela with 8% subsidies and Azerbaijan with 5% subsidies. Countries in the OECD on the other hand tended to have high petroleum tax rates, for example, Norway, with 8% of fuel taxation as percentage of total tax revenues and the UK with 12% of fuel taxation as percentage of total tax revenues.

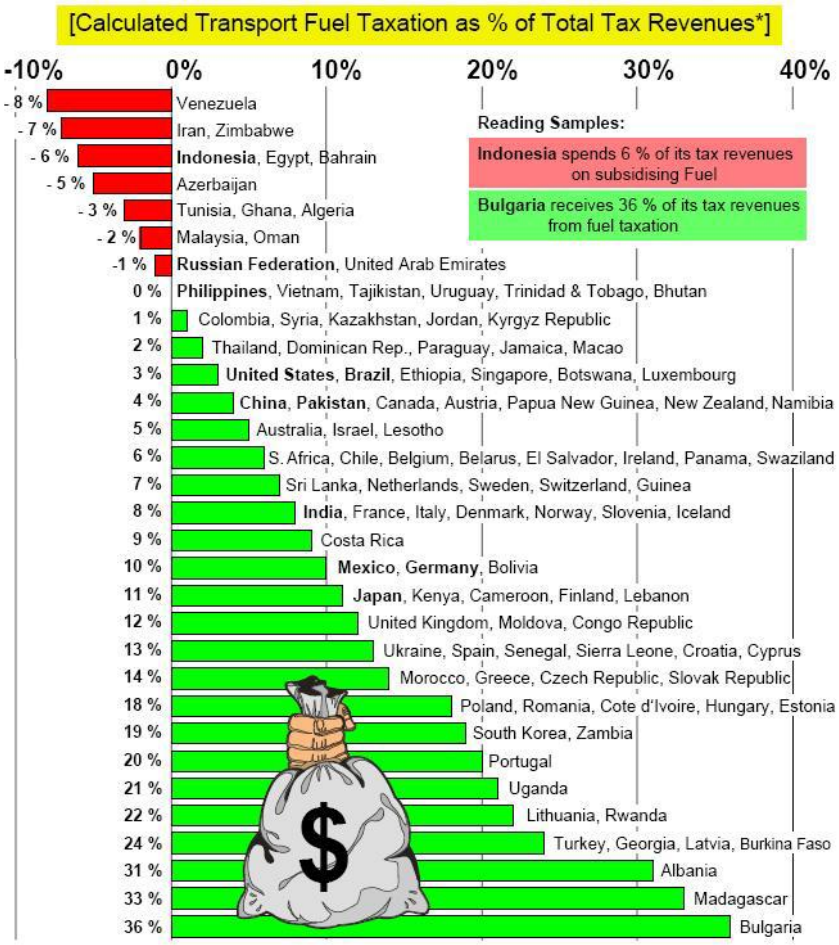


Figure 4. Transport fuel taxation as % of total revenues. Source: GTZ International Fuel Prices (2008)

2.3 Prior findings of Misperceptions of Dynamic Systems

Economists generally agree that in theory, fuel taxes are the most cost effective policies to address efficiency losses and combat environmental pollution (see eg., Baumol and Oates, 1988; Dasgupta and Heal 1979; Izzo, 2007; Mankiw, 2006; Sitglitz, 2006). As discussed in previous chapters, despite popular agreement amongst economists, nonetheless, fuel taxes remain extremely unpopular.

This is unfortunate from an economic perspective as fuel taxes are policy tools that can be easily implanted through existing administrative systems Muller (1996), and have been described as a reasonable pigouvian tax, scaling proportionately with the harms of consumption, Hsu et al (2008).

Even though to a large extent fuel tax increases are unpopular now this may change in the future; Parry et al (2006) suggest that pressure for higher fuel (or other automobile) taxes from those concerned about global warming, energy dependence, under-funded highways, and widening federal deficits, is only likely to intensify. Hence it is important to find possible reasons for resistance and target policies to address them.

Several articles have researched into people's misunderstandings of dynamic systems, (see eg. Sterman and Booth Sweeney (2002); Moxnes (2003)). These articles give some insights into possible hypothesis that tax systems, being complex and dynamic are frequently misperceived. Generally, in democracies the beliefs of the public affect government policy, still, choices may be constrained by limited information and misperceptions among voters and politicians. If widely held mental models of complex systems are faulty, people may inadvertently favor policies that yield outcomes they neither intend nor desire Sterman and Booth Sweeney (2007). Fuel taxes can be described as one of such issues. Research, Opinion and newspaper surveys show that people have highly emotional and contradictory attitudes towards energy taxes in general Moxnes (2007). The fuel tax idea seems to have remained politically unpopular Hsu et al (2008). Gasoline taxes, in particular, are a form of pollution tax that have been politically dangerous to propose Nivola and Crandall (1995), despite even stronger support from economists Mankiw (2006).

Fuel prices are often described as a highly sensitive political issue[7]. Many countries face rigid resistance from its citizenry concerning in particular fuel taxes, even at lower prices many consumers feel they pay more than is fair. There are frequent demands for investigations and demands for cheaper fuel, Litman (2009).

The widespread resistance to these taxes makes it difficult for governments to implement fuel taxes effectively. In many democratic governments, policies are shaped by economic interests and hence, in countries in which the electorate populations are highly dependent on fuel

[7] **Political unrest in many countries**
– Mozambique: Riots after fuel price increases, Gov was forced to reduce fuel levy for PT operators
– Cameroon: Riots after fuel price increases
– Burkina Faso: Riots after increases in fuel and food prices
– In Asian countries (Burma, Indonesia) fuel price increases triggered political unrest in the past – Indonesia in facing new unrest
– Protests are often linked to general political instability/unrest; increases in fuel prices are rather a trigger of than actual reason of conflicts.

consumption, the more difficult it is politically to raise fuel taxes, Sterner (2007) see also Hammer et al. (2004).

Sterman (1992) demonstrates that decision making in complex dynamic environments is poor relative to normative standards, or even simple decision rules, especially when decisions have indirect, delayed, nonlinear, and multiple feedback effects. Sterman (1989a), (1989b) also argues that the mental models people use to guide their decisions in dynamic settings are flawed in specific ways: that they tend to ignore feedback processes which cause side-effects and also that such "misperceptions of feedback" generate systematically dysfunctional behavior in dynamically complex settings.

Other efforts in studying misperceptions of simple dynamics have been made by Booth Sweeney & Sterman (2000), Kainz and Ossimitz (2002), and Moxnes(2003). Moxnes (2003) demonstrate that people misperceive even basic simple systems.

As stated earlier, fuel taxes impact dynamic systems which are constantly misperceived. In the short run fuel taxes have very little desirable effect on households but a big resistance that makes politicians hesitate; the important balancing and beneficial effects come in the long run but that is a limited consolation to politicians trying to get reelected and therefore looking for visible progress in the short run T. Sternar (2007). The main challenge for the subjects in the experiment is to take in to account the long delays of the 'invisible hand' and in energy taxes increasing energy efficiency in the long term and hence reducing dependence and vulnerability to oil price shocks . Retrofits are delayed by time needed to perceive benefits, to plan, finance, and reconstruct Moxnes (2007).

On the other hand, if price minimization policies are applied they may impose costs elsewhere in the Economy, and increase total fuel consumption and vehicle travel which exacerbates other economic, social and environmental problems. In addition, as many transport decisions are highly durable (cars, road infrastructure) and have associated relatively large capital costs, low fuel taxing policies are particularly hazardous in the long term. Similar to Climate change policy issues Sterman and Booth Sweeney (2002), targeted policies must take into account delays and dynamics of a system. If fuel tax policies are introduced at later stages, the adjustments to these changes will be a lot more costly due to lost opportunity costs for more efficient and cheaper alternative sources of energy. Additionally, if conflicting policies such as subsidies are put in place in order to

mitigate the effects of a fuel tax on the people, it may redirect public expenditures away from more productive spending or contribute to unsustainable budget deficits Coady et al (2006) .

Policies that attempt to reduce fuel prices through subsidies and tax reductions usually only provide modest consumer savings (a few cents per gallon or liter). This is because larger reductions are so costly. In addition, producers may capture a portion of the savings through higher profit margins rather than passing savings on as price reductions.

Few Journal articles deal with the dynamics of the system when addressing energy tax policies. The most relevant papers include Moxnes (2007) in his report on Green tax, trucker actions, media coverage, misperception and political reversal. To the extent that people are still aware of delays, they usually underestimate their length, Sterman (2000). Even when they have full information about delay times, this information may not influence decisions, Brehmer (1989), Sterman (1989a), and Diehl and Sterman (1995) and Sterman (1995). The likely reason for deviations from optimal is that people tend to operate with mental models that do not take account of delays. These misperceptions of delays are related to misperceptions of dynamic systems in general (Sterman (1989a), Funke (1991), Moxnes (1998), Sweeney and Sterman (2000)). Evidence showing that misperceptions persist in dynamic systems ultimately contests economics rational actor models which are insufficient to improve the understanding of the internal mechanism of the system.

In addition to the above referred researches on misperceptions of dynamic systems, other tax literature have given empirical evidence to the sources of 'fiscal illusion',[8] Smolders (1993) and misperceptions of tax burdens. Ashworth (1997) also investigates politician local tax preferences as a function of political costs (expected loss in votes). Other investigations also indicate that people misperceive certain aspects of tax systems. For instance, people do not differ clearly between marginal and average tax rates, De Bartolome (1995). Eriksen (1996) found that people's attitudes towards taxation were influenced by their knowledge about the tax system.

[8] The notion of fiscal illusion is associated with the misperception of the fiscal burden that is the amount of taxes paid. There is also a negative version of fiscal illusion, which means that taxpayers perceive their tax burden to be heavier than it actually is. energy taxes serve as typical example of a negative version of fiscal illusion (**Kalle** Määttä - 2006 - Business & Economics - 114 pages)

All these studies contribute significantly to our knowledge about how people misperceive the underpinnings of dynamic systems and provide a strong motivation for our study. The main contribution of this paper is to test for possible misperceptions that the public may have construed of fuel taxes and explore some possible information policies that may mitigate this misperceptions. A useful method to implement successful policies is to first and foremost reveal biases (the objective of this experimental paper) and then explore for some determinants of these biases. If we are successful in revealing such misconceptions and find some influential determinants, that should motivate further research to further test these determinants. This phenomenon of misperceptions is of great importance to policy makers, theorists and the public in general. For the former group, an understanding of the gap between perceived system structure and actual structure and its impact on observed behavior is the key to finding leverage points for policy initiatives. For the theorist, the system dynamics paradigm builds on the notion that structure causes behavior. For the public a deep understanding of the structure of taxation may reduce opposition to oil taxes and hence policy reversal.

Prior studies show that mental models-

- tend to focus on salient relationships
  - Closeness in time and space

- Miss out on:
  - Side effects
  - Feedback effects

To give evidence of such misperceptions, this paper tests participants' level of understanding of fuel taxes by testing five elements:

- Tests peoples understanding of the decision (whether to tax Petroleum products or not)
- Tests peoples understanding of the size of the impact of the decision
- Tests peoples understanding of the timing of the effects of tax (whether its' important effects would be in the short or long run.
- Tests peoples understanding of the general effects of tax.
- Tests factors that may influence peoples decisions on fuel tax levels

3. Methodology

3.1 Experimental Design

The experiment used a combination of limited information and limited outcome feedback allowing for learning. We use survey responses from a web-based internet mail questionnaire sent out in February 2010 to a random sample of 300 individuals from the adult population aged 18–65, gathered from a social networking source (Face book, http://www.facebook.com/). In total 119 individuals returned the questionnaire (net response rate 39.6%).In total, 77 questionnaires were fully completed and available for analysis. The questionnaire itself was designed in such a way to prevent subjects from returning to previously answered questions and changing their answers, thereby distorting the overall output of the survey.

Use of Facebook in collection of responses for surveys

Face book is a social networking service that allows you to connect and share with the people in your life. It is a very powerful social networking tool. This was the choice of method used for transferring and collection of responses for the survey. Its advantages in survey collection include; its ease of transferability of survey to other members on users' page, this allows for a larger number of responses. Additionally, it is a free service, and its privacy settings allows for restrictions on those who see and fill out the survey.

The most common problem for surveys on facebook is that they are not randomized, this could lead to self-selection bias. According to the New Dominion Philanthropy Metrics, unfortunately, the friends and family who volunteer to take surveys often have more in common with each other than they do with the whole group the facilitator is trying to assess. Voluntary surveys often attract only the happiest and unhappiest participants, which skews the survey data beyond repair. Even some randomized surveys suffer from problems when potential respondents can easily opt-out of taking a survey. This is known as non-respondent bias.

Laboratory experiments vs. Survey questionnaires.

Surveys are the most popular form of measurement because they seem to be straightforward, easy and relatively cheap compared to the alternatives. On the other hand the use of Laboratory experiments in economics and system dynamics have become an important source of data. The latter allows one to benefit from repeated outcome feedback Moxnes (2004) and

hence mistakes made at earlier stages can be corrected later on. Questionnaires do not usually allow for this pedagogical aspect. To make up for this deficiency, in this paper's survey, more information is provided as the respondents progress along the survey , earlier questions are also repeated at later stages in order to allow and test for learning effects.

3.2 Benchmarks

Moxnes(2007) asserts that people misperceive the effects of fuel taxes on profitability in the trucking industry in the long run. In the short term an increase in taxes has a downward pressure on profits but this is short-lived, in the long run profits return to their normal levels, this is what Adam Smith referred to as the ''invisible hand''. Moxnes (2007) makes an interesting observation that, the ''invisible hand'' appears to be literally invisible to the public in the context of fuel taxes. Other studies Sterner (2007) have also shown that people misperceive the timing and effects of these taxes. In order to illustrate these misperceptions, the causal loop diagram created by Moxnes (2007) is reproduced in Figure 5 and Figure 6 below.

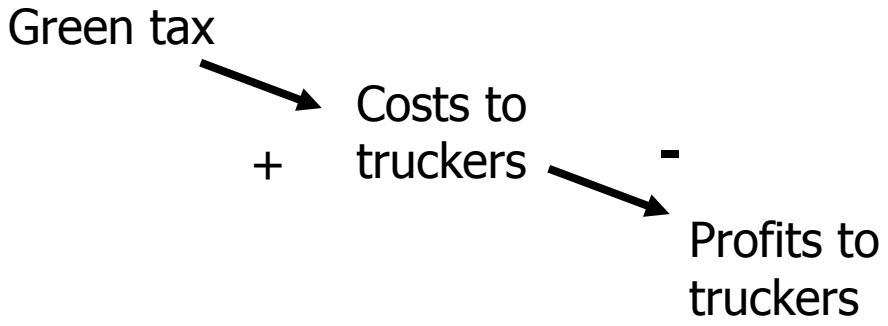


Figure 5: Visible causal loop diagram of perceived effects of tax on trucker profits.

Figure 5 shows the relationship that is obvious to the public, the relationship that causes an upsurge. The popular notion here is that an increase in taxes causes an increase in costs to truckers and hence a reduction in profits, this is the causal links that lead to resistance to such taxes. Figure 6 however shows the complete closed loop system that are often ignored by the general public

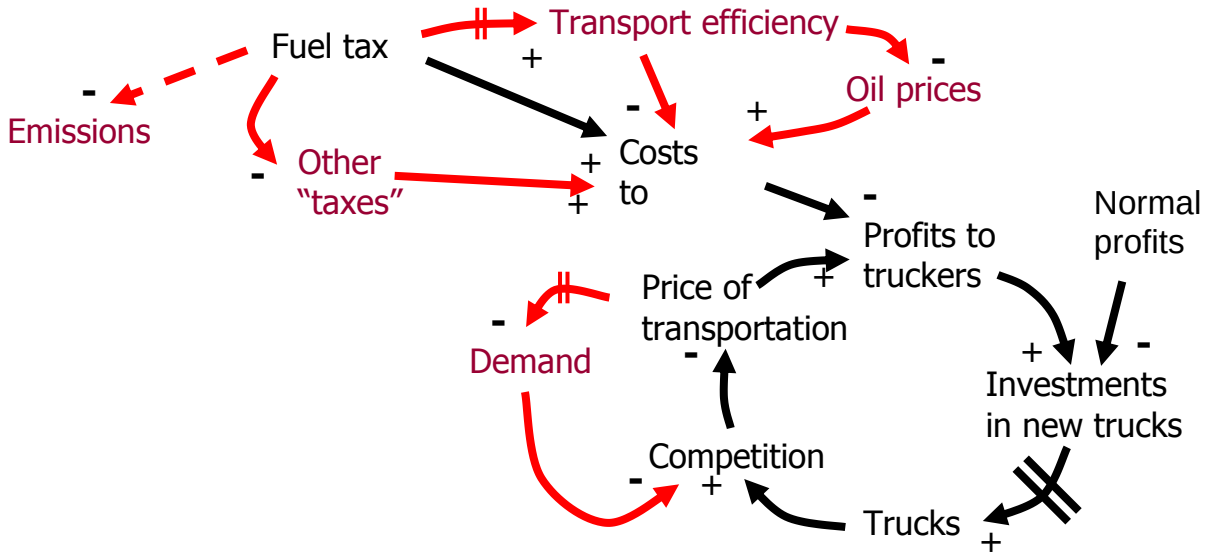


Figure 6: Complete causal loop diagram of fuel taxes and trucker profits: Workings of 'invisible hand' (Source Moxnes (2007))

What does the public overlook? The causal loop diagram also shows a feedback loop by which lower profits lead to higher trucker profits in the long term. Thus, there is a balancing effect on profits. First, low profits lead to reduced investments. Then over time, the stock of trucks will grow more slowly than it would do otherwise. Fewer trucks imply less competition, which lead to higher prices and higher incomes for the truckers, Moxnes (2007). The balancing effects represent the normal workings of a well functioning market system. To further illustrate this phenomenon, Moxnes(2007) makes some simulations; first without the 'invisible hand effect and then with the workings of the 'invisible hand'. Figure 7 and Figure 8 show the results of the simulations

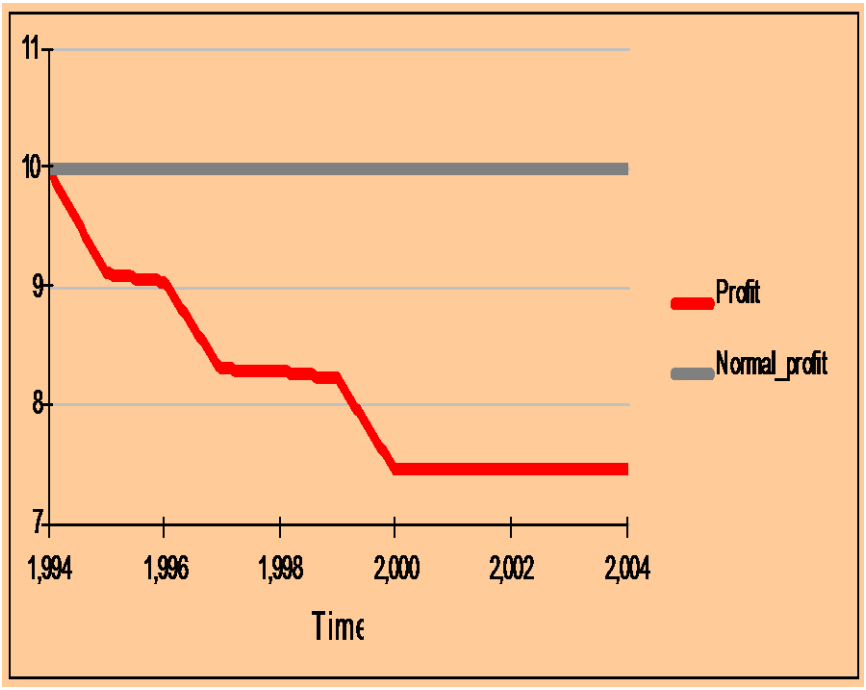


Figure 7. Results of simulations without 'invisible hand' (Source Moxnes 2007))

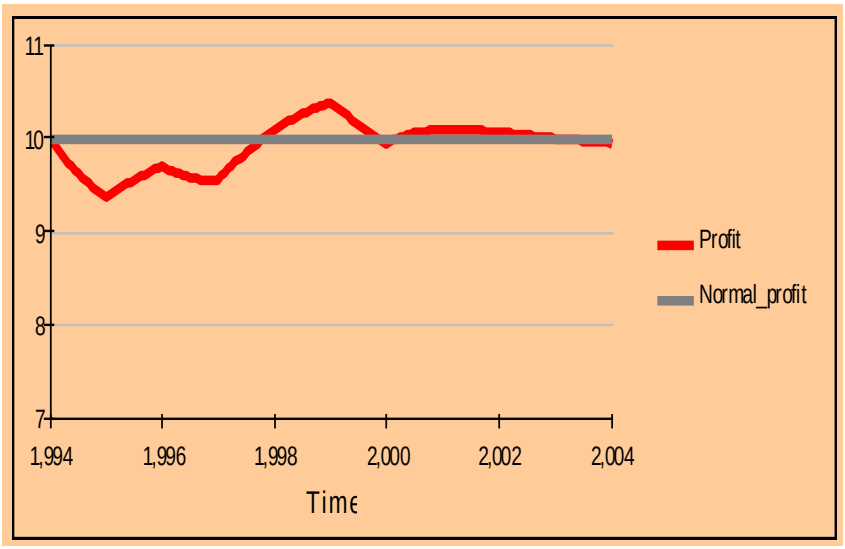


Figure 8. Results of simulations with 'invisible hand' (Source Moxnes 2007)

As can be seen from Figure 7 above, when the 'invisible hand is decoupled the profits do reduce throughout the simulation however the effect is not that much. With the inclusion of the invisible hand in the model (Figure 8), in the first few years (short term) profits begin to decline and competition reduces, this pushes back up the pricing of trucking services, causing profits to go back to normal in the longer term (ie by the 3 rd year after the introduction of the tax.)

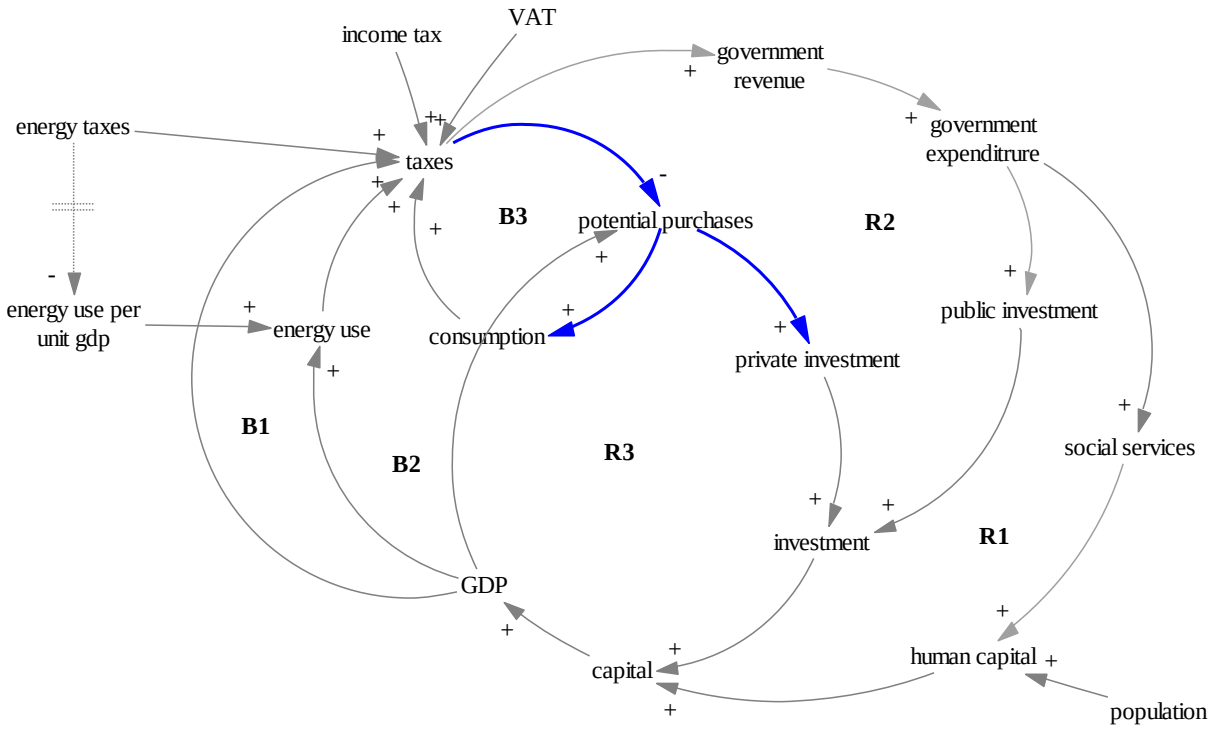


Figure 9: Causal loop diagram for the effect of taxes on the economy

Figure 9 illustrates the general effects of taxes on the economy as a whole. The blue lines in Figure 9 shows the hypothetical part of the tax structure that represents what is obvious and felt of taxes by the general public. The delayed multiplier effect (R1 & R2) of government expenditure is ignored and not taken into consideration. This is typically the case because of evoked emotions and feelings of the general public when it comes to tax issues (2007a). It is easy to decipher the immediate effects of taxes whether directly or indirectly on private investment and consumption and hence the welfare effects. However people may ignore the reallocation of tax revenues to government expenditure, which in turn is expected to increase capital, resulting in future higher incomes and finally more potential purchases (R3). The immediate effects on income however, may cloud the judgment of the general public, hence resulting in increased pressure on government to reduce tax rates. A reduction in taxes then defeats the purpose of the tax, and reduces government revenue for expenditure on social capital. Sterman (2000) asserts that people generally adopt an open loop view of causality, ignoring feedback processes.

Another important structure that is ignored by the public is the impact of energy taxes on energy efficiency. Higher energy tax rates increases energy prices, this is anticipated to increase energy efficiency (i.e. Energy use per unit GDP) over time as it provides the

necessary pressure on households to find alternative sources of energy and become more efficient in their energy usage. An increase in energy efficiency reduces energy demands. This effect weakens all the other feedback loops, including the most obvious impact of taxes on consumption (B3), the stronger the energy efficiency the weaker the impact of energy taxes on consumption as households become less dependent on energy. Of course, this factor may also significantly reduce revenue from such taxes; however the overall advantages and efficiency gains of this tax should far offset this loss. Additionally energy taxes are primarily implemented to correct market failures.

Another significant factor to consider in the budget structure is the time element and its impact on misperceptions and 'tax illusions', the multiplier effect has delayed long run effects, whereas the effect on consumption after tax increases is heavily endured in the short run. The timing may account for some misperceptions.

These structural effects, generally ignored by the public serves as a benchmark for this experiment. To test for possible structural misperceptions, the participants are asked directly about their tax level decisions, their opinion on the size of the effect of a fuel tax and the timing of the effect of the fuel tax, the responses are then compared to the optimal closed loop structure.

3.3 Hypothesis for misperceptions

H0: Rational Expectations

Traditional economic assumptions assert that individuals are rational beings and make rational decisions; this experiment seeks to challenge these assertions. The complicated and anomalous explanations for public opposition to gasoline taxes suggest that it would be futile to attempt to explain public attitudes towards gasoline taxes solely by economic rational actor models Hsu et al (2003).

Hypothesis to test for misperceptions of feedback 'invisible hand' and delays.

To test for possible misperceptions of dynamic systems we investigate three hypotheses based on the respondents' decisions and their perceptions of size and timing of the effect of diesel taxes on profitability in the trucking industry.

H1: Individuals are less likely to support an increase in diesel taxes due to opposition of fuel taxes.

A large number of works have shown that people are less willing to support an increase in tax levels (Hammar et al (2004) Hsu et al (2003), Moxnes(2007),(2010)). Environmental taxes have been met with widespread opposition; this is unfortunate as economists see these forms of taxes as pigouvian, correcting market failures. The hypothesis hence tests the level of opposition for fuel taxes. The null hypothesis is H0, that people make rational decisions.

H2: Individuals misperceive the size of the effect of a diesel tax on profitability in the trucking industry

The null hypothesis is the benchmark response of a small effect of taxes on profitability in the trucking industry based on the simulations in Figure 8.

H3: Individuals misperceive the timing of the effect of a diesel tax on profitability in the trucking industry.

The null hypothesis is the benchmark response of a short term effect of diesel taxes on profitability in the trucking industry based on the simulations in Figure 8.

H4. An individual is less likely to prefer increases of taxes even when informed of its beneficial effects on emission control.

Sterman and Sweeney (2002) assert that people generally misperceive the dynamics of climate change and that public attitudes about climate change reveal a contradiction. The possibility of misperceptions, in this research, were tested by stating fuel taxes can be used to reduce emissions of greenhouse gases and giving participants options to decide on the appropriate tax change direction repeatedly. The purpose was to determine whether subjects would be willing to increase the tax level to support emission control. The null hypothesis a preference for an increase in diesel taxes as it reduces emissions of greenhouse gases, based on the rational expectation theory.

H5: Misperceive the implicit costs in subsidizing fuel costs locally in oil producing countries

A recent study Coady et al (2007) demonstrate that when oil exporting countries do not adjust domestic prices of fuel product prices to reflect world prices, they forgo all the revenues that they could have received had they put in place taxes. Subsidies also increase domestic consumption, however from a revenue raising point of view, every barrel of oil consumed

locally could have been exported for higher revenues internationally, indicating a cost. This can be described as an implicit subsidy. Despite its costs, many oil exporting countries continue to subsidize or charge low taxes on their petroleum products, examples include Libya and Venezuela. Our final hypothesis is based on this misconception that oil producing countries need not charge taxes on petroleum products. In order to test this misperception, participants are asked directly if they believe such oil producing countries should pay taxes. The null hypothesis is the benchmark response that more people would support fuel taxes in oil producing nations, based on the rational expectation theory.

Hypothesis to test for misperceptions of effects of fuel taxes on income.

- **H6: Individuals misperceive the effect of taxes on lower income groups**
- **H7: Individuals misperceive the effect of taxes on their personal economy.**

Some resistance to fuel taxes has been likely related to issues of tax distribution. There is concern that poorer members of society will be disproportionately affected by pollution taxes (Clinch and Dunne (2006); Dresner et al (2006); Klok et al.(Dresner, Jackson et al. 2006; 2006) 2006) or that such a tax burden will be unfairly distributed (Beuermann and Santarius, (2006)).

Regressivity of fuel taxes is an often-cited reason for rejecting gasoline taxes Wachs (2003) . Linked to the first hypothesis, people generally tend to believe that fuel taxes have an adverse impact on their personal income. Whereas that is true in the short term, a smattering of studies (see Litmann (2009), GTZ IFP (2009) show that in the long run, when elasticity of demand is higher people smartly adapt habits and policies and become more efficient in their use of fuel, reducing the impact of higher oil prices on their personal income. In reality gasoline taxes are less regressive than alternatives forms of transportation financing, such as sales taxes, Wachs (2003). The null hypothesis is that people, in accordance to the rational expectations theory, correctly perceive the benchmark closed- loop system as shown in Figure 9, and take them into account in decision making.

H8: Willingness to increase taxes is higher if people trust their government to use proceeds from fuel tax revenues to the benefit of most people.

Previous studies show the importance of trust as a factor explaining public support for an increased green ta*x*, previous research show that trust in public officials and the legal system has a significant positive effect on tax morale, H. Hammar(2006), Klok et al. **(**2006).

Resistance to gasoline taxes has a number of demonstrated sources. Studies from Germany, Denmark, Ireland, France and the UK have demonstrated that some resistance to pollution taxes derives from the fact that the public does not trust politicians to spend environmental taxes solely on environmental measures, Beuermann and Santarius, (2006); Clinch and Dunne, (2006); Deroubaix and Le´ ve`que (2006); Dresner et al. (2006).

In order to test this relationship, participants are asked if they trust that their home government would spend revenues on income taxes well. I explore for possible relationships between trust of government use of tax revenues and participant decision on tax levels.

Exploratory tests

In addition to the above stated key hypotheses we will explore for other factors that may have bearing on willingness to support fuel taxes:

- I will test whether fuel taxes are more acceptable if packaged with a revenue recycling scheme.

It has long been thought that revenue recycling of fuel tax revenues, would overcome some political opposition to taxes, Buchanan and Tullock (1975). This scheme could take the form of income taxes or sales tax rebates to individuals, or, revenues could be spent on improving health, education, military strength, technological improvements to reduce dependence on fuel oil. A number of empirical studies confirm this revenue recycling schemes, Harrington et al (2001); Krupnick (2001); Thalmann (2004). To test this hypothesis, the survey directly asks subjects to choose which revenue recycling schemes options they would be more likely to support if coupled with an increase in taxes, as well as the ones that would be of most benefit to them.

- I will explore for the most ‘visible’ consequences of diesel taxes to the respondents.

Preliminary studies show that people are more likely to report the most obvious, direct negative effects of taxes, and forget beneficial effects of taxes Moxnes (2010). The survey

asks participants to list, from their own knowledge, in a ranking order, what they believe the consequences of fuel taxes would be.

- I will explore for possible relationship between decision on level of diesel taxes and the size of its effect on profitability in the trucking industry

It is expected that if participants believe that the size of the effect of a tax on profitability is large they are less likely to support an increase in diesel taxes.

- I will explore for possible relationship between decision on level of diesel taxes and the timing of its effect on profitability in the trucking industry

It is expected that if participants believe that the timing of the effect would be in the long term they are not likely to support increases in fuel taxes and vice versa.

- I will explore for possible relationship between the size and the timing of the effect of diesel taxes on profitability in the trucking industry

- I will compare the results of the survey on the decision of tax level, size and timing of the effect on profitability to preliminary work undertaken by Moxnes (2010)

- I will test if there a significant difference in the mean decisions on tax levels across age groups.

Studies Thalmann (2004), Hammar et al (2006) have shown some significant differences in decisions across group, we test for these differences in the sample.

- I will test if there is a significant difference in the mean trust of government to use incomes from fuel tax beneficially, across countries?

Research works by Hammar and Jagers (2006) have shown that support for climate policy is very dependent on trust of politicians; we test for trust levels of government across countries, to explain for national support for fuel taxes.

- I will test if there is a significant change in participants' decisions of the diesel tax level in question 1 following more information on potential benefits of fuel taxes in later questions?

This tests the propensity for individuals to make different decisions when faced with the same questions at the beginning and ending stages of the survey, giving that more information is available as they progress the survey, testing learning.

3.4 The Questionnaire

There were four versions of the survey, in different currencies to cater for subjects from different nationalities. The four currencies were: British Pound (£), Ghana Cedi (GHS), Norwegian Kroner (Kroner) and USD ($). The survey itself was divided into two (2) sub-sections, 15 pages and contained 24 questions in total. The first section dealt with questions to test subjects' decision (subjects' willingness to support fuel taxes), size of decision, timing and effect of decisions. The remainder of the questions sought to collect demographic information, such as age, gender, level of income and education, transportation information, such as vehicle ownership, vehicle type, and commuting frequency and length.

To tests for possible misperceptions, the first four questions (Question 1, 2, 3 and 4) directly test participants understanding of the feedback structure and workings of the 'invisible hand'. The questions stated the effects of fuel taxes on emissions and tested participants' decisions on level, understanding of the size and timing and possible effects of fuel taxes respectfully. Coded responses were used for Q1toQ3; Q4 however was an open ended question and sought to deduce participants' general knowledge on broad effects of fuel taxes.

To test for possible misperceptions of climate change Question 1 stated the effects of taxes on emissions and tested participants willingness to increase the tax level due to emission control and effect on the environment. Question 4, an open-ended question, in this context, sought to discover the consciousness level and importance of fuel-based environmental problems in the sample group.

Misperceptions of impact of fuel taxes on income is tested by directly asking participants in Question 5 and Q10, how an increase in fuel taxes would affect their personal economy and which income group they believe would benefit the most from government spending of tax incomes

In order to test the misperception that oil producing nations should pay lower taxes, Question 7 in the survey directly asks participants if they believe such countries should pay taxes.

To test for a possible relationship between trust and willingness to pay tax, participants are directly asked in Q. 6, if they trust that their home government would spend revenues on income taxes efficiently.

Finally to test a revenue recycling hypothesis, the survey directly asks subjects in Q8, Q 9 and 11 to choose which revenue recycling schemes options they believe government would spend the majority of tax proceeds on as well as the ones that would be of most benefit to them and finally, which possible allocation options they would be more likely to support if coupled with an increase in taxes. Q8 and Q9 was an open ended question allowing for full responses from participants own knowledge, whereas Q 11 was coded allowing for multiple responses, this ensured that the participants chose as many options from those given, that they found agreeable. The revenue recycling options for fuel tax proceeds in Q11 were as follows: Health, education, military strength, Research and development, combination of all four purposes, direct return of contributed tax proceeds to inhabitants, reduction of VAT, and reduction of income taxes. The purpose of the coding of Q11 is to reveal a little more information on the potential effects of fuel taxes through the options available. This question is immediately followed by a repeat of Q1 the tax level decision based on emissions, to see if responses change based on additional information given in Q11, consequently testing learning as a complement to the main hypothesis.

3.5 Statistical Analyses

All hypotheses were tested using frequencies to illustrate the proportion of responses allocated for the relevant options. In additions to the use of frequency tables, H1, misperceptions of the 'invisible hand' was tested using multiple response tables to explore frequency relationships between the decision to increase diesel taxes and two independent variables; the effect of such taxes on profitability in the trucking industry as well as profits overtime To explore the relationship between the decisions on the diesel tax level (Q.1) and other variables or possible predictors a multiple regression analyses was employed. A one sample t-test was used to compare the means of the responses in Q1 to Q3 to the benchmark options. To compare for difference in the responses in question 1 (decision of tax level) and later when it was repeated in Q13, a Paired sample T-test and its non parametric alternative (Wilcoxan signed rank test) was used, testing learning. Independent sample t-test was

employed to compare the mean score across gender, age and other categories to explore for other factors that may explain some variations in the decisions of the tax level. Chi square goodness of fit was used to compare the proportion of cases in Q1, 2, and 3 (decision of tax level, size and timing of effect of diesel taxes) to those obtained from a preliminary research undertaken by Moxnes (2010).

3.6 Other design issues

Subjects

Some descriptive statistics are presented in Table 3 below. In general the sampled populations had higher levels of education, drove and used private transport more frequently and were mostly of Ghanaian and Norwegian nationality.

Table 3: Descriptive Statistics

Nationality	**Percent**	**Highest level of education**	**Percent**
1 Norwegian	26.8	2 High School	1.4
2 Ghanaian	62.0	3 Some University	25.4
3 British	7.0	4 Graduated from University	73.2
4 American	1.4	Total	100.0
5 other	2.8		
Total	100.0		
Age	**Percent**	**Gender**	**Percent**
1 25 or younger	49.3	1 Male	60.6
2 26 to 35 years	40.8	2 Female	39.4
3 36 to 45 years	4.2	Total	100.0
4 46 years or older	5.6		
Total	100.0		
If you are/were a student what field of study?	**Percent**	**Current Occupation**	**Percent**
1 Business	33.3	1 Student	48.6
2 Social Science	24.6	2 accounting	4.3
3 Natural Science	17.4	3 Banking	5.7
4 Medical and health science	14.5	4 Administrative	14.3
5 Humanities	7.2	5 consulting	2.9
6 System dynamics	2.9	6 Health worker	2.9
Total	100.0	8 other	21.4
		Total	100.0
Mode of transport	**Percent**		
Car/Taxi	84.6		
Bus	72.3		
Airplane	58.46		
Train	43.08		
Walking	43.08		
Bicycling	70.77		
Other	10.8		
Total	100.0		

4. Results

Misperceptions of 'invisible hand' hypothesis

H1: Individuals are less likely to support an increase in diesel taxes due to opposition of fuel taxes.

Results from the frequencies to test for H1 are shown in Table 7, and the one sample t- test is shown in Table 8 (Appendix b).

The One Sample T Test

The interest is in the two-tail test, so the P-value shown under the 'sig.(2-tailed)' column is 0.000 is used. One can safely reject H0 in favor of H1. The results of the T test reveal that there is sufficient evidence at the 5% level to conclude that the mean values of the decision on the diesel tax level is different from the benchmark option of increasing the diesel tax level. Statistically less people support an increase in diesel taxes.

H2: Individuals misperceive the size of the effect of a diesel tax on profitability in the trucking industry.

Results from the frequencies to test for H2 are shown in Table 9, and the one sample t-test result is shown in Table 10 (Appendix b).

The results of the one sample test for the size of the effect on profitability in the trucking industry reveals that at the 5% level the mean value of the sample is similar to the benchmark value that the size of the effect is small, P-value = 0.227 >0.05. Hence we fail to reject the null hypothesis and rather reject the alternate hypothesis.

H3: Individuals misperceive the timing of the effect of a diesel tax on profitability in the trucking industry.

Results from the frequencies to test for H3 are shown in Table 11, and the one sample t-test result is shown in Table 12 (Appendix b).

The results of the One sample T-test reveal that there is sufficient evidence at the 5% level to conclude that the mean values for the responses on the timing of the effect of diesel taxes on profitability in the trucking industry are different from the benchmark options of profitability

being reduced mostly in the first half year, P-value=0.000 <0.05. Hence with regards to this hypothesis, we can safely reject the null hypothesis in favor of the alternate, H3.

H4. An individual is less likely to prefer increases of taxes even when informed of its beneficial effects on emission control.
Results from the frequencies to test for H4 are shown in Table 7, and the one sample t-test result is shown in Table 8 (Appendix b).

Using the one sample test results, we can safely reject H0 in favor of H1. There is sufficient evidence at the 5% level to conclude that the mean chosen option of the sample group is different from the benchmark option of increasing diesel tax levels to reduce emissions of greenhouse gases.

H5: Misperceive the implicit costs in subsidizing fuel costs locally in oil producing countries

Results from the one sample t-test to test for H5 are shown in Table 13 (Appendix b).

The results of the one sample test indicate that there is no evidence at the 5% level to suggest that the mean value of the options chosen by the subjects regarding whether oil exporting countries should pay fuel taxes is different from the benchmark response of agreement, P-value = 0.150 > 0.05. In this case we fail to reject the null hypothesis.

H6: Individuals misperceive the effect of taxes on lower income groups

To test for this hypothesis and in effect exploring the relationship between tax decisions and expected effects on income groups, multiple regression analysis and correlation statistic were employed. The results of the regression are shown in Appendix a. The results of the correlations are shown in Table 33 and Table 34 (Appendix g.)

The relationship between the decision by subjects, on the tax level and its expected effect on the different income groups was investigated using spearman's rank order correlation. Preliminary analyses showed some violation of the assumptions of normality, hence the use of the non-parametric alternative. There was a very weak, negative relationship between the two variables, r = -0.058, n= 74, p>0.05, with decisions to increase tax level associated with

subject's belief that higher income groups would benefit the most from government spending of incomes.

Similar to the correlation results the regression results display a weak but positive relationship between the perceived effects on the various income groups and the level of diesel taxes. Our model[9] which included the variable of interest explained 6.3% of the variance in the decision on the diesel tax level. The model does not reach statistical significance (Sig = .777 > 0.05), however it may be interesting to take note of the beta coefficients to compare the contribution of each independent variable to the decision on tax levels. Respondents' choices on which income group would benefit the most from tax proceed contributed for 4.9% of the variance in the decision. The fourth largest contributor to the dependent variable, in the model.

H7: Individuals misperceive the effect of taxes on their personal economy

Results of the Spearman's Rank order Correlation for the perceived effect of taxes on participants' personal economy is shown in Table 37 (Appendix g) and the frequency table for effect of fuel taxes on personal economy is shown in Table 17.

Table 4 shows that a larger proportion of the sample tend to believe that an increase in fuel taxes will negatively affect their personal economy (84,4%). The relationship between the decision of participants on the diesel tax level and the perceived effect of an increase in fuel taxes on their personal economy was investigated using Spearman's rank order correlation. The results indicate a weak (small) positive correlation between the two variables, r = 0.104, n= 65, p>0.05, with higher perceived positive effects of fuel taxes on personal economy associated with higher (increased) levels of diesel taxes.

Similar to the correlation results, there is a weak, positive relationship between the perceived effects on personal economy and the level of diesel taxes. Our model which includes the variable of interest, explains 6.3% of the variance in the decision on the diesel tax level. Respondents' choices on the effects of fuel taxes on personal economy contributed for 13.5%

[9] The model included the following independent variables: Highest level of education, Gender, Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?, Which income group do you think would benefit the most from government spending of tax incomes?, f you are/were a student what field of study?, Age, Do you trust that your home government would use incomes from fuel taxes to the benefit of most people, Current Occupation, If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy? Nationality.

of the variance in the decision on the tax level, the third largest contributor in the model to the dependent variable.

H8: Willingness to increase taxes is higher if people trust their government to use proceeds from fuel tax revenues to the benefit of most people.

To explore for possible relationship between trust and willingness to pay tax, linear regression analyses and correlation was employed. The results of the correlation are shown in Table 36 (Appendix g), the regression analysis results are shown in (Appendix a.).

The relationship between the decision of participants on the diesel tax level and the level of trust of government was investigated using Spearman's rank order correlation. The results indicate a weak (small) positive correlation between the two variables, $r = 0.034$, $n= 65$, $p<0.05$, with higher perceived level of trust of government to use incomes from fuel taxes beneficially, associated with higher chosen increase of levels of diesel taxes.

The correlation results (Table 36) reveals that our model on the whole which includes subjects opinion on effects of taxes on personal economy, trust of government to use fuel taxes beneficially, as well as their perceptions on which income group would benefit the most from fuel taxes explains 6.6% of the variance in the decision on diesel tax level made by subjects. Trust of government according to the results does not correlate substantially with the decision on the diesel tax level, correlation (0.264). Of the three independent variables, trust of government makes the second largest unique contribution 18.1% (beta = 0.181). We fail to reject the null hypothesis based on the weak relationship; trust of government does not significantly explain variance in decisions on diesel tax level.

Similar to the correlation results there is a weak but positive relationship between the level of trust of governments to use tax revenues well and the level of diesel taxes. The variable on the level of trust of government to use taxes to the benefit of all makes the strongest unique contribution to explaining the decision on the tax level (Beta = 0.135, 13.5%) when the variance explained by other variables in the model is controlled for.

Exploration of most popular revenue recycling options from proceeds of fuel taxes.

Frequency tables and graphs were employed to illustrate the most popular and the least popular revenue recycling scheme use of fuel tax incomes.

Table 4. Frequency table for responses on revenue recycling of fuel taxes

Would you accept a 5Gp per liter increase in fuel taxes if: Tick off none or as many of the options that you like

Category	health facilities	Educational facilities	Military strength	R&D	Combination	Split evenly amongst all inhabitants	Reduce VAT	Reduce income taxes
Count	50	48	6	52	26	7	20	21
Total	74	74	74	74	74	74	74	74
Percent	67.6	64.9	8.1	70	35.1	9	27.03	28.4

Table 4 shows that when subjects were faced with a closed question allowing for multiple responses, the sample tended to support the increase in taxes when proceeds are allocated to research and development to reduce dependence on oil (70%). Health and Education followed in second and third place, (67.6%) (64.9%) respectfully. The least support went to allocation of proceeds to increase military strength (8.1%) and splitting of proceeds amongst inhabitants (9%).

Table 5. Frequency Table for responses on most beneficial governmental use of fuel tax proceeds.

What likely governmental uses of revenues from fuel taxes will be of most benefit to you?

	Category	Counts	Total	Percentages
1	Education	15	68	22.1
2	Health	18	68	26.5
3	Distributional issues	1	68	1.47
4	Security	1	68	1.47
5	Water	3	68	4.41
6	electricity	2	68	2.94
7	road infrastructure	12	68	17.6
8	environment	4	68	5.88
9	alternative energy sources	8	68	11.8
10	public transport	14	68	20.6
11	critical attitudes and misuse of funds	0	68	0
12	reduce other taxes	1	68	1.47
13	employment and wages	4	68	5.88
14	agriculture	1	68	1.47
15	other	16	68	23.5

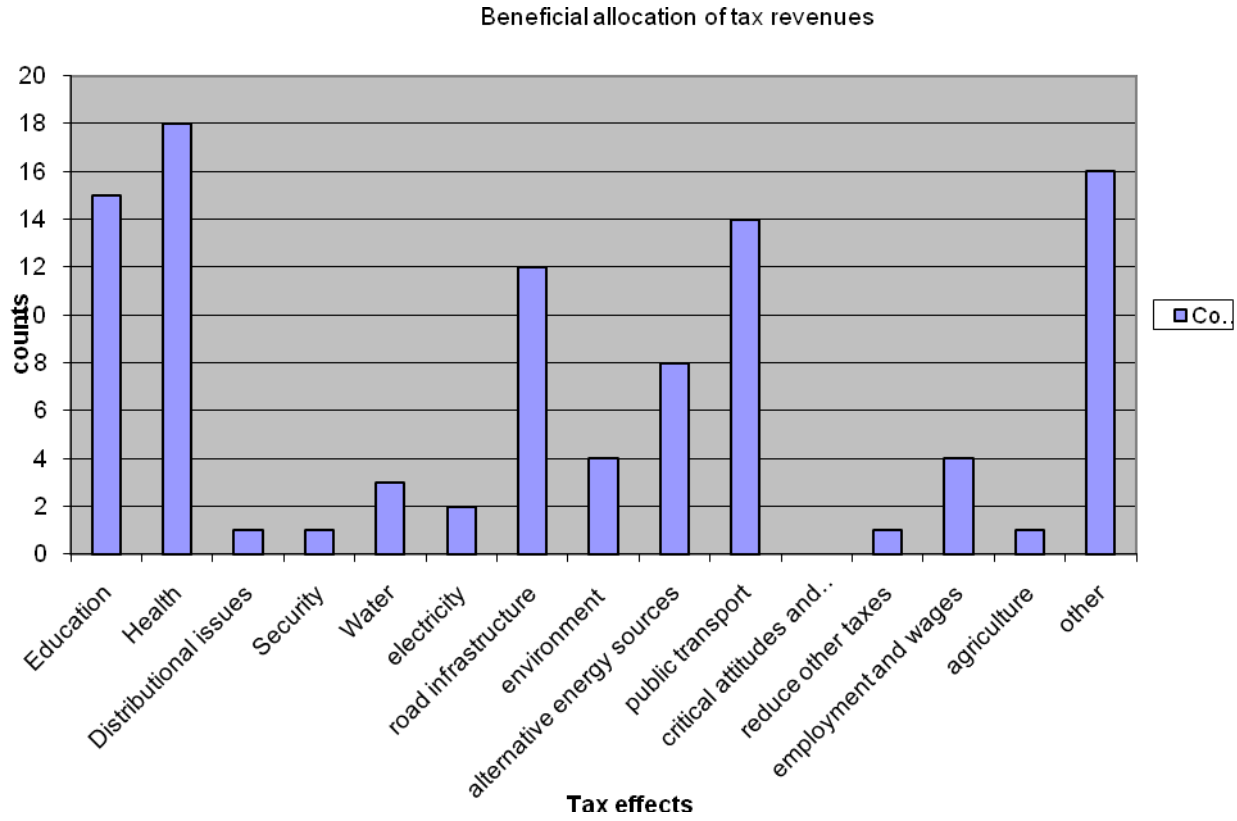


Figure 10: Bar chart for responses on most beneficial governmental allocation of tax revenues

Alternatively when subjects were faced with an open question to list what likely governmental uses of revenues from fuel taxes will be of most benefit to them, Figure 10 and Table 5 above, shows that the most popular response was for the provision of Health (26.5%) and Educational facilities (22.1%). Road infrastructure was fairly popular (17.6%). The least beneficial to respondents were reduction in other taxes (1.47%), security (1.47%) and distributional issues (1.47%).

Exploration of most 'visible' effects of diesel taxes.

Table 6. Frequency Table showing responses on effects of taxes

Assume that there will be a significant tax on all uses of energy that leads to emissions of greenhouse gases. What consequences will such a tax have? Mention as many effects as you can think of.

Category	Counts	Total	Percent
Direct cost increases	13	77	16.88
General cost effect	27	77	35.06
Reduced use of energy	19	77	24.68
Energy efficiency	7	77	9.091
Use of alternative energy sources	24	77	31.17
Consciousness about energy and environment	13	77	16.88
Emissions of CO2	17	77	22.08
Other environmental conditions		77	0
Economic activity		77	0
Distributional issues	3	77	3.896
Governmental revenues	3	77	3.896
Reductions in other taxes		77	0
More public services	1	77	1.299
National competitiveness		77	0
Critical attitudes	7	77	9.091
Other	14	77	18.18

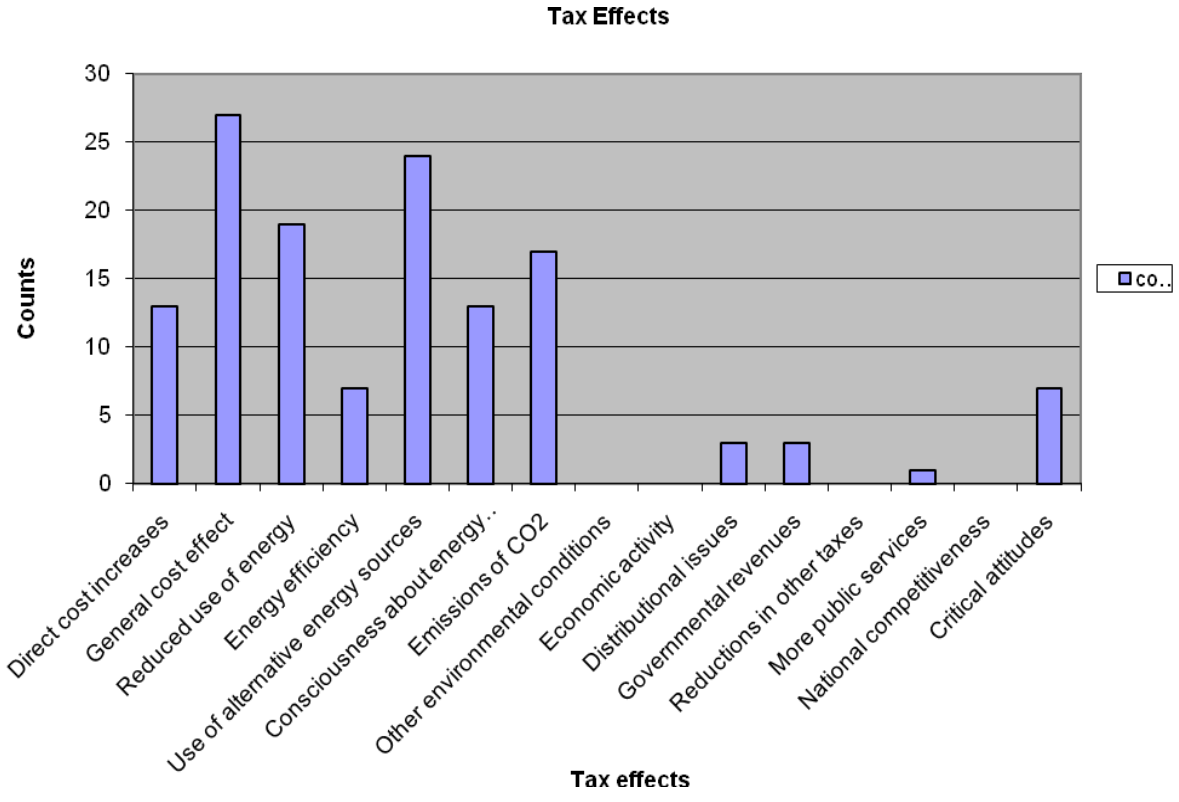


Figure 11: Bar chart showing responses on effects of taxes

Frequency table results

When the sample were faced with an open question, to list the consequences of such a tax, Figure 11 and Table 6 shows that the largest proportion mentioned general cost effects on prices of other goods and services (35.06%). The second most popular option was an increase in the use of alternative energy sources (31%). In addition a relatively large number also refer to a reduction in the use of energy (24.68%). A moderate number (22.08%) mention emissions of CO_2 and are conscious of relationship between energy and environment (16.88%). Very few mention energy efficiency gains, or the provision of more public services. There was no mention of reductions in other taxes.

Exploration of possible relationship between decision by respondents on diesel tax level and the perceived size of the effect on profitability in the trucking industry

The multiple response tables in Table 30 (Appendix f), gives an interesting insight into the relationship between the subjects' decision on diesel tax level and their opinion on the size of its effect on profitability in the trucking industry. A larger proportion of the sample tend to be more willing to reduce diesel tax level when they believe that profitability will be reduced much, row % (46.7%). Concurrently, those who believe that profitability will be reduced a little have the highest proportion of decisions to keep the current diesel tax level row % (45.5%). From the table, the largest proportion of those who believe that profitability will not change also choose to increase the diesel tax level row % (16.2%). Finally, a higher proportion of those who believe profitability will increase a little decide to reduce diesel tax row % (13.3%).

Exploration of possible relationship between decision by respondents on diesel tax level and the perceived timing of the effect on profitability in the trucking industry

The multiple response tables in Table 31 (Appendix f) shows some relationship between the decision on diesel tax level and their opinion on its effect on profits over time. It shows that when participants believe that profitability will be reduced in the short term a large proportion of the sample, Col% (54.1%), go with an increase in the tax level or to keep the current diesel tax level (54.5%). When participants believe that profitability will be reduced mostly in the long run a large proportion, Col % (26.7%), go with a reduction in the tax level. The highest proportion of those who chose profitability having the same effect in the long run and short run also chose to reduce the diesel tax level Col% (33.3%).

Exploration of possible relationship between the respondents perceived size of the effect and the timing of the effect of diesel taxes on profitability in the trucking industry.

The multiple response tables in Table 32 (Appendix f.) display the relationship between the samples opinions on the size of the effect of a tax on trucker profits and its effects on profits over time. It shows that a larger proportion Col % (61.3%) of participants who chose profitability being reduced mostly in the first half year also chose profitability being reduced a little. If respondents believe that effects on profits are more in the long term, a larger proportion, col % (24%) believe profitability will be reduced a much. The proportions who believe the impact on profits will be the same in the short run and long run predominantly also believe profitability will be reduced a little, col% (22.6%).

Tests to compare the results of the survey on the decision of tax level, size and timing of the effect on profitability to preliminary work undertaken by Moxnes (2010)

The one sample t-test of Moxnes(2010) shown in Table 14, 15, 16 (Appendix b) reveals that for hypothesis H1, H2 and H3 based on preliminary results where similar questions to this work are posed we can safely reject all the null and accept the alternate hypotheses (p-value =0,000<0.05).

Additionally, the Chi-Square goodness of fit test, shown in Table 19, 21 and 23 (Appendix c) indicates that there was significant difference in all the options chosen in my studies sample group as compared with the values, in the sample group that was obtained in a preliminary study by Moxnes (2010) for questions on decision on the level of tax, the effect of this tax on trucker profits and the timing of the effect.

Tests for whether there is a significant difference in the mean decisions on tax levels across age groups and Nationality?

The results of the Independent Sample T-test used to explore relationships between the decision variable (tax level) and descriptive categorical variables such as Age and Nationality are shown in Appendix d.

The independent sample T- Test conducted to compare subjects' decisions on the diesel tax level for Norwegians and Ghanaians (refer to Table 24 (Appendix d)) shows that there was a significant difference in responses for Norwegians (M = 2,68) and Ghanaians, M = 2,30); t=

2,037, p = .047 (two tailed). The magnitude of the differences in the means was moderate (eta squared = .063) and lies between 0.006 and 0.772.

To compare across age groups, an independent sample T-test was conducted to compare subjects' decisions on the level of diesel taxes for the age groups 26 to 35 years and 36 to 45 years, (refer to Table 25). There was a significant difference in scores for age group 26 – 35 yrs (M = 2.41) and age group 36 to 45 years (M = 1.33); t (2,198), p = ,036. The magnitude of the difference in the means was large (eta squared = 0.139) and lies between 0.007 and -0.104.

Moreover, an independent sample T-test was conducted to compare subjects' decisions on the level of diesel taxes for the age groups 36 to 45 years and 46 years or older, (see, Table 26 (Appendix d)). There was a significant difference in scores for age group 36 – 45 yrs (M = 1,33) and age group 45 yrs or older (M = 3) ; t (2,988), p = ,031. The magnitude of the difference in the means was very large (eta squared = 0.56) and lies between 0.007 and -0.104.

Test for significant difference in the mean trust of government use of incomes from fuel tax beneficially, across nationalities

An independent sample t-test was conducted to compare the level of trust of government to use tax proceeds well amongst Norwegians and Ghanaians (see Table 27, (Appendix d)). There was a significant difference in scores for Norwegians (M=3.21, SD = 1.084) and Ghanaians; M = 2.48, SD = 0.927; t = 2,736, p=.008 (two-tailed). The magnitude of the differences in the means was very large (eta squared = .11) Cohen (1988).

Tests for whether there is a significant change in participants' decisions of the diesel tax level in question 1 by question 13 where question 1 is repeated, following more information.

A Paired sample t-test was conducted to evaluate the impact of more information being provided in the survey as subjects progressed along (mostly information of possible effects of diesel taxes), on their decision of diesel tax levels at the end of the survey (test for learning) (refer to Table 28 and 29 (Appendix e). There was no statistical significant difference in the mean scores in Question 1, "Diesel taxes can be used to reduce emissions of greenhouse

gases. If you were to decide the level of the diesel tax for all uses in transportation, would you," to the repeated question at a later stage in the survey, question (13), P-value: 0.374 >0.05.

5. Discussion

Misperceptions of invisible hand

Misperceptions of feedback structure and delays were tested for on three levels, decision on direction of change of tax level, size and timing of the effect of fuel taxes on profitability in the trucker industry. The results showed that on two levels decision and timing there were clear misperceptions. Considering the size of the effect the results show that a larger proportion chose the right option of profitability being reduced mostly in the short term. With regards to the decision, though 48% of respondents chose to increase the diesel tax level, yet still 52% did not choose this option. There is clearly a bias in the participants' perception of the timing of the effect; 48% of the respondents chose more effect on profitability, in the short term and 52% did not choose this option. What are the possible reasons for this bias?

The main hypothesis that motivated this research was the link between the choice of in-optimal tax levels and misperceptions of dynamic systems in general and delays in particular, Sterman (1989b). Even when participants are given information in the question of some potential benefits of increasing tax levels, namely a reduction in emissions, the mean decision is still biased and a larger percentage chose other options besides increasing taxes, Moxnes (2007) points out that people generally tend to dislike taxes; this possible explanation is also backed by Hsu et al (2008). People tend to oppose the imposition of taxes and hence it has become politically dangerous to propose Nivola and Crandall, (1995), Mankiw,(2006). This may account for the lack of popularity of increasing the tax level.

The results also show that people generally misperceive the timing of the effect of taxes on profitability; this is in line with several works on misperceptions Moxnes (2007). Sterman's (1989a, 1989b) argument that the mental models people use to guide their decisions in dynamic settings are flawed in specific ways: that they fail to appreciate time delays between action and response and in the reporting of information best explains the result. Delays are consistently ignored or underestimated in decision making.

Participants seem to perceive the size of the effect of diesel taxes properly, most recognize its effects on profitability as little, however, there appears to be misperceptions on the decision and the timing of the effect of diesel taxes as compared to the benchmarks. The question to reflect on is, if subjects are able to perceive the size of the effects of diesel taxes as small then why don't more of the subjects support an increase in the diesel tax?

It comes back to the same conclusions that people generally dislike taxes and it appears that the size of the effect has a very weak impact on their decision. So far as there is an effect whether small or big, people are generally 'tax intolerant'. It is important however to recognize the weak but nonetheless existent relationship between subject's decision on the tax level and the size.

There are apparent misperceptions in the decision and the timing of the effect of diesel taxes; the one sample t-test results for these two variables were significantly different from the benchmark options. The actual relationship between the two variables may contribute and explain the biases in the choices of subjects. For instance if subjects believe that the effects of diesel taxes will not be only in the short term but may have long term effects then they may be less likely to choose to increase taxes. The multiple response tables give evidence to this weak relationship. The one sample t-test for the timing of the effect on profitability in comparison to the benchmark indicates that the mean responses were not short term effects but long term effects, that being the case, it may have put a slight downward bias on the decision of the tax level.

Misperception of climate change hypothesis

It can be deduced from the results that stating that taxes can reduce emissions of greenhouse gases does not influence the decision on the tax level. The mean value is still different from the benchmark of increasing the tax level. Though the question stated the potential benefits of fuel taxes on the environment, this additional information does not sway respondents to increase taxes. This result is not surprising, as earlier works by Sterman and Booth Sweeney (2002) show that when it comes to climate change issues , the public have an indifferent attitude and prefer to take a 'wait and see' approach. As environmental taxes are more corrective rather than fiscal, a possible reason for the lack of support for increasing the tax level could be a lack of belief in the government to use tax proceeds to address climate change issues.

Misperceptions of fuel taxes for oil producing nations

To a large extent the results show that a larger proportion of the sample believes that oil producing countries should pay fuel taxes. This result is surprising, however as the questions' focus was on whether or not to charge fuel taxes and not on the level, respondents may generally agree that all countries should pay some form of fuel taxes though not on an upward increase of it. Perhaps, some people feel that as they pay taxes in their countries it is only fair that all other countries should tax their nationals, as well.

Determinants of willingness to support fuel taxes

Relationship between willingness to increase diesel taxes and its impact on income groups

The results of the correlation and regression show a weak, negative relationship, with subject's believe that higher income groups would benefit the most from tax revenues associated with decisions to increase tax level. Similar works, Hammar et al (2006) show that people are less likely to support a cut in wealth taxes backing the hypothesis that people generally believe that higher income groups should pay more taxes and benefit less from tax revenues.

Relationship between willingness to increase diesel taxes and its impact on personal economy

The results show that a large percentage of the group tends to believe that fuel taxes would negatively affect their personal economy. Additionally there is a positive relationship between their decision on the tax level and its perceived effect on their personal economy. Gemmell et al. (2004) found that self-interest explained a lot of tax preferences. Hence, the more negative the individuals perceive the effect on their personal economy the less likely they are to support such taxes. The high proportion of individuals who believe that fuel taxes would negatively affect their personal economy may partially account for the low support of the increase in fuel taxes.

Relationship between trust and willingness to support an increase in diesel taxes

Studies by Hammar et al (2006) show that, those who distrust politicians do not want to hand over too much power and do not trust them to correct market failure in a proper way. This may account for the low support for an increase in the tax levels.

The results also show that Norwegian individuals in the sample are more likely to trust the government to use revenues from fuel taxes beneficially than are Ghanaian individuals. This may also account for the results which show that the mean value for Norwegians on the decision of tax level is closer to an increase than that of the Ghanaian individuals. The level of trust may be dependent on historical factors; Norway is a welfare state and has some of the highest energy tax rates in the world. Energy Taxes have been used as a climate policy instrument since 1991. In Ghana, however, energy is frequently subsidized, in 2004 energy subsidies accounted for 2.2% of GDP , people may be less familiar with this particular form of tax. Corruption may also contribute to mistrust of government officials.

Relationship between respondents' education level and decisions on the tax level

The results of the regression show a weak positive relationship between the level of education and the decision on the tax level. The higher the education, the higher the support for an increase in the diesel tax. No better explanation can be offered than Hammar et al (2006) they found that information and education decrease the misperception and thereby increase the preferred tax levels. The more educated an individual is the more likely he or she is to make informed decisions, however the weak relationship shows that misperceptions occur even amongst highly educated individuals. System Dynamics teaches that there is a relationship between structure and the effect hence teaching the feedback method; research has shown that some teaching methods rely on static relationships Wheat ((2007)). Errors and misperceptions of dynamics are expected where students are taught using the latter educational methods regardless of the level of education.

Relationship between age of respondents and decisions on the tax level

Results of the Independent sample test show that those aged 46 yrs or older are more likely to support an increase in taxes, 36 to 45 yrs are less likely than all the age groups to support an increase in taxes. This may be because of vested interest, those who use more petroleum products are more likely to be interested in taxing. Gemmell et al. (2004) found that self-interest explained a lot of tax preferences; this may explain why this particular age group has a lower support for an increase in taxes. This age group may be highly affected by fuel taxes and hence have a vested interest in it remaining low.

Test for learning

As subjects progressed along the survey attention was drawn to benefits of taxes in the revenue recycling questions and impact on emissions. I tested for learning and propensity for individuals to make different decisions when faced with the same question at different stages, it appears that information in the survey has no significant impact on the decision of subjects. The majority are still averse to increasing taxes. Even though the options in the survey tips respondents on the possible application of revenue recycling, respondents may still believe that this scheme is not applicable in their respective countries, respondents may perceive a contradiction between theory and practice. Whether these perceptions are accurate or not is left for future research.

On the whole, the variables in the regression model did not show significant bearing on the decision to increase the tax level. In particular, the variables age and gender had much stronger contributions in other works Hammar et al (2006) and Thalmann (2004). Despite being weak, the results are still useful as they show the correlation and collinearity of the relationship between the dependent and independent variables. The smaller sample size may explain the differences in the bearings of the variables.

Revenue recycling scheme

Revenue recycling scheme, where tax proceeds are returned to tax payers have been suggested to reduce opposition to the implementation of environmental taxes Buchanan and Tullock, (1975). The results show some interesting trends , when participants are asked a closed question with several options , where they can choose multiple answers or choose none at all, the support for fuel taxes is a lot higher than the first question on the decision of the tax level of diesel taxes. The most popular revenue recycling option was Research and development into ways to reduce dependence on oil. As much as 70% voted for this option with Health (67.6%) and Education (64.9%) following closely in popularity. There is a vast difference in the counts for R&D, provision of Health and educational facilities to the original count of individuals who chose to increase diesel taxes to reduce emissions, in the original question only about 37 individuals had preference for an increase in taxes, however the revenue recycling option of R&D was approximately 1.5 times greater in support (52).

When one compares the results of the close ended question to the original most visible effects, there is a wide gap in the responses. In the open-ended question, asking respondents

to list the most visible effects of fuel taxes, very few mention public services (1.2%) and energy efficiency (9%) however in the close-ended question people tend to greatly support these options; public services have as much as (67%) (65%) and research and development a subset of energy efficiency had (70%). The fact that the options in the close ended question giving options, gains a lot more support for an increase in taxes than the original question gives evidence of some misperceptions , when reporting the effects people generally forget the positive effects but when their attention is drawn to it , this has an impact on their support of taxes. Similar to preliminary works Moxnes (2010) people generally tend to focus on negative effects, distorting their decisions

Interestingly, reduction of other taxes seems to have very low support and is not mentioned at all in the open question. One possible explanation may be attributed to the endowment effect, the propensity for people to attach greater value to objects in their possession than not (Tversky and Kahneman (1981); Kahneman and Tversky (1984)). To the extent a gasoline tax increase proposes a trade, higher fuel costs in exchange for other tax benefits, the endowment effect would predict sluggish less support of such a proposal Hsu et al (2008).

Reported visible effects of diesel taxes

The results from the frequency tables show that a larger group reports the most direct, obvious effects. The most popular effect that most people felt would be the consequences of the tax was a general cost effect, ie effect on prices of other goods and services consumed by households that are affected by price changes of fuel. These effects were expected as they are closer in time and are more direct. Another reason could be that a larger percentage of the sample was Ghanaian; In Ghana, higher petroleum costs are frequently passed on to consumer prices. Studies by Coady et al (2005) demonstrate that typically in developing countries the bulk of petroleum products are not consumed directly by households but indirectly through their consumption of other goods and services that use petroleum products as inputs. However, these are short term effects, in the long run when there are efficiency gains, these effects balance out. Interestingly, a moderate number also mention an increase in the use of alternative energy sources and a reduction in the use of energy and emissions of gases. The mention of the reduction in emissions may have resulted from it being stated in the first question, where subjects are told that fuel taxes helps to reduce emissions. Very few mention efficiency gains or the provision of more public services. There was no mention of reductions

in other taxes. These results are very interesting especially when compared to the responses on the close ended question

Comparions to preliminary results of Moxnes (2010)

Results on the one sample t test from preliminary work done by moxnes reveals similar results to this work. It confirms that there is a downward bias in diesel taxes, that people misperceive the timing and also the size of the effect. In Moxnes (2010) individuals misperceive fuel taxes on all three levels. The preliminary work and this work should give strong evidence of mass misperceptions.

The chi square goodness of fit test indicated that there was a significant difference between the results of my work and Moxnes (2010) in terms of frequencies of the options chosen, this may have resulted due to the difference in sample sizes, Moxnes (2010) had over 1000 respondents in comparison to77 responses in this survey. Additionally the preliminary survey used only Norwegian respondents whereas this survey got respondents from 4 different nationalities, this may all have contributed to the differences in the frequencies of the responses.

6. Conclusion

The experiment confirms that there is less support for an increase in tax levels regardless of its beneficial and corrective effects. The experiment also demonstrates that similar to other experiments (Brehmer (1989), Sterman (1989a)), the tendency to misperceive the importance of delays has some bearing on the decision variable, in this case support for fuel taxes.

As was recommended by Moxnes (2007), information policies on the consequences of delays should be targeted at relevant stakeholders. In addition to recommendations made by Moxnes (2007), I would also recommend that government adopt mitigating measures that ensure that proceeds from fuel taxes are allocated to the most popular revenue recycling schemes, such as the provision of public services and research into alternative sources of energy, as the results show that these schemes significantly raise support for fuel taxes. The importance of transparency in carrying out these mitigation policies cannot be emphasized enough; it is recommended that governments regularly disclose to the public, full accounts of how

revenues from fuel taxes are spent. In this way, the public is made aware of exactly where revenues are invested; this may perhaps bridge the perception gap between theory and practice.

Furthermore the result of the survey adds another dimension to the suggested information policies: it shows that information policies alone are not significantly influential, policymakers have to decipher the individual importance of certain factors to the public and input these factors in information campaigns. Government should hence target mitigation schemes that are of greater importance to its nationals in order to gain more support for implementation of such taxes. The use of laboratory experiments (where subjects may benefit from repeated outcome feedback) to test for the impact of the influential revenue recycling schemes on decisions, is recommended for future research.

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Appendix

Appendix a. Linear Regression results

Descriptive Statistics

	Mean	Std. Deviation	N
Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	2,37	,858	65
If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?	1,69	,900	65
Do you trust that your home government would use incomes from fuel taxes to the benefit of most people	2,63	1,054	65
Age	1,66	,834	65
Gender	1,34	,477	65
Nationality	1,94	,808	65
Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?	2,88	1,206	65
f you are/were a student what field of study?	2,44	1,446	63
Current Occupation	3,23	2,701	64
Which income group do you think would benefit the most from government spending of tax incomes?	1,82	,788	65
Highest level of education	3,74	,477	65

Correlations

		Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?	Do you trust that your home government would use incomes from fuel taxes to the benefit of most people	Age	Gender	Nationality	Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?	f you are/ were a student what field of study?	Current Occupation	Which income group do you think would benefit the most from government spending of tax incomes?	Highest level of education
Pearson Correlation	Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	1,000	,190	,257	,090	-,005	-,192	,060	-,023	-,100	-,036	-,028
	If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influenc	,190	1,000	,372	,067	-,008	-,413	-,093	,104	-,235	-,103	-,554

	e your personal economy?											
	Do you trust that your home government would use incomes from fuel taxes to the benefit of most people	,257	,372	1,000	,140	-,058	-,376	,050	,132	-,113	-,158	-,195
	Age	,090	,067	,140	1,000	-,179	,177	,160	-,138	,087	-,025	,088
	Gender	-,005	-,008	-,058	-,179	1,000	-,229	-,062	,086	,035	-,039	,052
	Nationality	-,192	-,413	-,376	,177	-,229	1,000	,040	-,148	,232	,325	,444
	Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?	,060	-,093	,050	,160	-,062	,040	1,000	-,104	-,167	,009	,106
	f you are/were a student what field of study?	-,023	,104	,132	-,138	,086	-,148	-,104	1,000	,178	,027	-,149
	Current Occupation	-,100	-,235	-,113	,087	,035	,232	-,167	,178	1,000	,228	,282

	Which income group do you think would benefit the most from government spending of tax incomes?	-,036	-,103	-,158	-,025	-,039	,325	,009	,027	,228	1,000	,160
	Highest level of education	-,028	-,554	-,195	,088	,052	,444	,106	-,149	,282	,160	1,000
Sig. (1-tailed)	Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	.	,065	,020	,238	,485	,063	,318	,428	,217	,387	,414
	If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?	,065	.	,001	,297	,474	,000	,230	,210	,031	,206	,000
	Do you trust that your home government would use	,020	,001	.	,133	,322	,001	,347	,151	,187	,104	,060

	incomes from fuel taxes to the benefit of most people											
	Age	,238	,297	,133	.	,077	,079	,102	,140	,248	,421	,242
	Gender	,485	,474	,322	,077	.	,033	,311	,251	,392	,379	,341
	Nationality	,063	,000	,001	,079	,033	.	,375	,123	,033	,004	,000
	Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?	,318	,230	,347	,102	,311	,375	.	,208	,094	,473	,200
	f you are/were a student what field of study?	,428	,210	,151	,140	,251	,123	,208	.	,082	,418	,122
	Current Occupation	,217	,031	,187	,248	,392	,033	,094	,082	.	,035	,012
	Which income group do you think would benefit the most from government spending of tax incomes?	,387	,206	,104	,421	,379	,004	,473	,418	,035	.	,101
	Highest level of educatio	,414	,000	,060	,242	,341	,000	,200	,122	,012	,101	.

	n											
N	Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	65	65	65	65	65	65	65	63	64	65	65
	If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?	65	65	65	65	65	65	65	63	64	65	65
	Do you trust that your home government would use incomes from fuel taxes to the benefit of most people	65	65	65	65	65	65	65	63	64	65	65
	Age	65	65	65	65	65	65	65	63	64	65	65
	Gender	65	65	65	65	65	65	65	63	64	65	65
	Nationality	65	65	65	65	65	65	65	63	64	65	65

Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?	65	65	65	65	65	65	65	63	64	65	65
f you are/were a student what field of study?	63	63	63	63	63	63	63	63	63	63	63
Current Occupation	64	64	64	64	64	64	64	63	64	64	64
Which income group do you think would benefit the most from government spending of tax incomes?	65	65	65	65	65	65	65	63	64	65	65
Highest level of education	65	65	65	65	65	65	65	63	64	65	65

Model Summary(b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,330(a)	,109	-,063	,885

a Predictors: (Constant), Highest level of education, Gender, Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?, Which income group do you think would benefit the most from government spending of tax incomes?, f you are/were a student what field of study?, Age, Do you trust that your home government would use incomes from fuel taxes to the benefit of most people, Current Occupation, If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?, Nationality

b Dependent Variable: Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4,970	10	,497	,635	,777(a)
	Residual	40,695	52	,783		
	Total	45,665	62			

a Predictors: (Constant), Highest level of education, Gender, Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?, Which income group do you think would benefit the most from government spending of tax incomes?, f you are/were a student what field of study?, Age, Do you trust that your home government would use incomes from fuel taxes to the benefit of most people, Current Occupation, If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?, Nationality

b Dependent Variable: Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF	B	Std. Error
1	(Constant)	1,029	1,340		,768	,446	-1,660	3,719					
	If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?	,129	,163	,135	,786	,435	-,199	,457	,190	,108	,103	,583	1,715
	Do you trust that your home government would use incomes from fuel taxes to the benefit of most people	,137	,124	,168	1,105	,274	-,112	,386	,257	,151	,145	,739	1,353
	Age	,068	,147	,066	,463	,645	-,227	,364	,090	,064	,061	,835	1,197
	Gender	-,032	,252	-,018	-,129	,898	-,538	,473	-,005	-,018	-,017	,876	1,142
	Nationality	-,175	,186	-,164	-,941	,351	-,547	,198	-,192	-,129	-,123	,562	1,780
	Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the	,021	,098	,029	,212	,833	-,176	,217	,060	,029	,028	,904	1,107

average inhabitant of your home country?												
f you are/were a student what field of study?	-,024	,083	-,040	-,283	,778	-,190	,143	-,023	-,039	-,037	,877	1,140
Current Occupation	-,018	,047	-,057	-,380	,705	-,113	,077	-,100	-,053	-,050	,775	1,290
Which income group do you think would benefit the most from government spending of tax incomes?	,053	,155	,049	,344	,732	-,257	,363	-,036	,048	,045	,850	1,176
Highest level of education	,265	,308	,147	,860	,394	-,353	,883	-,028	,118	,113	,585	1,709

a Dependent Variable: Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:

Appendix b: One Sample Tests

Table 7: Frequency table for decisions on diesel taxes

Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Reduce diesel tax level	15	19,5	19,5	19,5
	Keep the current diesel tax level	22	28,6	28,6	48,1
	Benchmark response: Increase diesel tax level	37	48,1	48,1	96,1
	Do not know	3	3,9	3,9	100,0
	Total	77	100,0	100,0	

Table 8: One-Sample Test for decisions on diesel tax as compared to benchmark

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	-6,636	76	,000	-,636	-,83	-,45

Table 9: Frequency table for responses on effect of taxes on profitability

What does a per litre increase in taxes on diesel mean for profitability in the trucking industry?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Profitability will be reduced much	25	32,5	32,5	32,5
	Benchmark response: Profitability will be reduced a little	31	40,3	40,3	72,7
	Profitability will not change	11	14,3	14,3	87,0
	Profitability will increase a little	5	6,5	6,5	93,5
	Do not know	5	6,5	6,5	100,0
	Total	77	100,0	100,0	

Table 10: One-Sample Test for responses on effect of taxes on profitability

	Test Value = 2					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
What does a per litre increase in taxes on diesel mean for profitability in the trucking industry?	1,096	76	,277	,143	-,12	,40

Table 11. Frequency table for responses on effect of taxes on profits over time

How will the effect of a per litre increase in taxes on diesel influence trucking industry profits over time?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Benchmark response: Profitability will be reduced mostly in the first half year**	37	48,1	48,1	48,1
	Profitability will be reduced mostly in the long term	13	16,9	16,9	64,9
	Profitability will have the same effect in the short and long run	16	20,8	20,8	85,7
	Do not know	11	14,3	14,3	100,0
	Total	77	100,0	100,0	

Table 12. One-Sample T-Test for response on effect of taxes on profits over time

	Test Value = 1					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
How will the effect of a per litre increase in taxes on diesel influence trucking industry profits over time?	7,869	76	,000	1,013	,76	1,27

Table 13. One-Sample Test for misperception of costs involved in subsidizing fuel in oil producing countries hypothesis

In nations that produce and export oil, do you agree that oil consumers should pay fuel taxes?

	Test Value = 4					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
In nations that produce and export oil, do you agree that oil consumers should pay fuel taxes?	-1,455	76	,150	-,169	-,40	,06

Table 14. One-Sample Test for decision on tax level in Moxnes (2010)

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Avgifter kan benyttes til å redusere utslipp av klimagasser. Om du fikk bestemme avgiftsnivået på all diesel til transportformål, ville du:	-33.409	1002	.000	-1.061	-1.12	-1.00

Table 15. One-Sample Test for responses on size of the effect of taxes on profitability in the trucking industry

	Test Value = 2					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Hva betyr en økning på 2 kroner per liter i avgiftene på diesel for lønnsomheten i lastebilnæringen?	-3.519	1002	.000	-.156	-.24	-.07

Table 16. One-Sample Test for responses on timing of the effect of taxes on profitability in the trucking industry

	Test Value = 1					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Hvordan vil effekten av en økning på 2 kroner per liter i avgiftene på diesel fordele seg over tid?	38.336	1002	.000	1.391	1.32	1.46

Table 17. Frequency table for responses on effect of an increase in fuel taxes on their personal economy.

If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly negative effect	39	50,6	50,6	50,6
	Slightly negative effect	26	33,8	33,8	84,4
	No effect	8	10,4	10,4	94,8
	Slightly positive effect	4	5,2	5,2	100,0
	Total	77	100,0	100,0	

Appendix c: Chi-Square Tests

Table 18. Frequencies for responses on Question 1: Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:

	Observed N	Expected N	Residual
Reduce diesel tax level	15	31,8	-16,8
Keep the current diesel tax level	22	27,0	-5,0
Increase diesel tax level	37	8,9	28,1
Do not know	3	9,4	-6,4
Total	77		

```
NPAR TEST
  /CHISQUARE=Diesel_tax
  /EXPECTED=0.41 0.348 0.115 0.121
  /MISSING ANALYSIS.
```

Table 19. Chi-Square Test to compare the results of the survey on the decision of tax level in the survey to preliminary work undertaken by Moxnes (2010)

	Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:
Chi-Square(a)	102,673
df	3
Asymp. Sig.	,000

a 0 cells (,0%) have expected frequencies less than 5. The minimum expected cell frequency is 8,9.

Table 20. Frequencies for question 2: What does a per litre increase in taxes on diesel mean for profitability in the trucking industry?

	Observed N	Expected N	Residual
Profitability will be reduced much	25	50,1	-25,1
Profitability will be reduced a little	31	11,2	19,8
Profitability will not change	11	2,8	8,2
Profitability will increase a little	5	3,2	1,8
Do not know	5	9,7	-4,7
Total	77		

```
NPAR TEST
  /CHISQUARE=Trucking_profitability
  /EXPECTED=0.65 0.146 0.037 0.041 0.126
  /MISSING ANALYSIS.
```

Table 21. Chi-Square Test to compare the results of the survey on the perceived size of the effect of diesel taxes in the survey to preliminary work undertaken by Moxnes (2010)

	What does a per litre increase in taxes on diesel mean for profitability in the trucking industry?
Chi-Square(a)	73,937
df	4
Asymp. Sig.	,000

a 2 cells (40,0%) have expected frequencies less than 5. The minimum expected cell frequency is 2,8.

Table 22. Frequencies for question 3: How will the effect of a per litre increase in taxes on diesel influence trucking industry profits over time?

	Observed N	Expected N	Residual
Profitability will be reduced mostly in the first half year	37	25,3	11,7
Profitability will be reduced mostly in the long term	13	12,6	,4
Profitability will have the same effect in the short and long run	16	22,9	-6,9
Do not know	11	16,2	-5,2
Total	77		

```
NPAR TEST
  /CHISQUARE=Profits_overtime
  /EXPECTED=0.329 0.163 0.297 0.211
  /MISSING ANALYSIS.
```

Table 23. Chi-Square Test to compare the results of the survey on the timing of the effect of the tax in the survey to preliminary work undertaken by Moxnes (2010)

	How will the effect of a per litre increase in taxes on diesel influence trucking industry profits over time?
Chi-Square(a)	9,147
df	3
Asymp. Sig.	,027

a 0 cells (,0%) have expected frequencies less than 5. The minimum expected cell frequency is 12,6.

Appendix d: Independent Sample Tests

Table 24. Independent sample test for significant difference in the mean decisions on tax levels across nationality

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Upper	Lower
Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Equal variances assumed	7,413	,008	1,722	61	,090	,389	,226	-,063	,840
	Equal variances not assumed			2,037	51,582	,047	,389	,191	,006	,772

Table 25. Independent sample test for significant difference in the mean decisions on tax levels across age group 26-35 years and 36-45 years.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Upper	Lower
Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Equal variances assumed	1,414	,244	2,198	30	,036	1,080	,491	,077	2,084
	Equal variances not assumed			2,946	2,924	,062	1,080	,367	-,104	2,265

Table 26. Independent sample test for significant difference in the mean decisions on tax levels across age group 36-45 years and 46 years or older.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Upper	Lower
Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Equal variances assumed	,025	,881	-2,988	5	,031	-1,667	,558	-3,100	-,233
	Equal variances not assumed			-3,162	5,000	,025	-1,667	,527	-3,021	-,312

Table 27. Independent Sample T-test for significant difference in the mean trust of government use of incomes from fuel tax beneficially, across nationalities?

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Upper	Lower
Do you trust that your home government would use incomes from fuel taxes to the benefit of most people	Equal variances assumed	,830	,366	2,736	61	,008	,733	,268	,197	1,269
	Equal variances not assumed			2,570	29,919	,015	,733	,285	,150	1,316

Appendix e: Paired-Sample Tests

Table 28. Paired Samples Correlations comparing diesel tax level decisions in Q.1 to Q.13.

		N	Correlation	Sig.
Pair 1	Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you: & Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for transportation purposes would you:	73	,365	,002

Table 29..

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Upper	Lower		Std. Deviation	Std. Error Mean
Pair 1	Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you: - Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the	-,096	,915	,107	-,309	,118	-,895	72	,374

	level of the diesel tax for transportation purposes would you:								

Appendix f: Multiple response tables

Table 30. Multiple Response Tables for decision on taxes and perceived size of effect on profitability

			What does a per litre increase in taxes on diesel mean for profitability in the trucking industry?				
			Profitability will be reduced much	Profitability will be reduced a little	Profitability will not change	Profitability will increase a little	Do not know
Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Reduce diesel tax level	Count	7	3	2	2	1
		Row %	46,7%	20,0%	13,3%	13,3%	6,7%
		Col %	28,0%	9,7%	18,2%	40,0%	20,0%
		Table %	9,1%	3,9%	2,6%	2,6%	1,3%
	Keep the current diesel tax level	Count	7	10	3	1	1
		Row %	31,8%	45,5%	13,6%	4,5%	4,5%
		Col %	28,0%	32,3%	27,3%	20,0%	20,0%
		Table %	9,1%	13,0%	3,9%	1,3%	1,3%
	Increase diesel tax level	Count	11	16	6	2	2
		Row %	29,7%	43,2%	16,2%	5,4%	5,4%
		Col %	44,0%	51,6%	54,5%	40,0%	40,0%
		Table %	14,3%	20,8%	7,8%	2,6%	2,6%
	Do not know	Count		2			1
		Row %		66,7%			33,3%
		Col %		6,5%			20,0%
		Table %		2,6%			1,3%

Table 31. Multiple Response Tables for decision on taxes and perceived effect on profitability over time

			Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:				
			Reduce diesel tax level	Keep the current diesel tax level	Increase diesel tax level	Do not know	Total
How will the effect of a per litre increase in taxes on diesel influence trucking industry profits over time?	Profitability will be reduced mostly in the first half year	Count	4	12	20	1	37
		Row %	10,8	32,4	54,1	2,7	100,0
		Column %	26,7	54,5	54,1	33,3	48,1
		Table %	5,2	15,6	26,0	1,3	48,1
	Profitability will be reduced mostly in the long term	Count	4	2	6	1	13
		Row %	30,8	15,4	46,2	7,7	100,0
		Column %	26,7	9,1	16,2	33,3	16,9
		Table %	5,2	2,6	7,8	1,3	16,9
	Profitability will have the same effect in the short and long run	Count	5	7	4		16
		Row %	31,3	43,8	25,0		100,0
		Column %	33,3	31,8	10,8		20,8
		Table %	6,5	9,1	5,2		20,8
	Do not know	Count	2	1	7	1	11
		Row %	18,2	9,1	63,6	9,1	100,0
		Column %	13,3	4,5	18,9	33,3	14,3
		Table %	2,6	1,3	9,1	1,3	14,3
Total	Count		15	22	37	3	77
	Row %		19,5	28,6	48,1	3,9	100,0
	Column %		100,0	100,0	100,0	100,0	100,0
	Table %		19,5	28,6	48,1	3,9	100,0

Table 32. Multiple Response Tables for size and timing of the effect of taxes on profitability

			What does a per litre increase in taxes on diesel mean for profitability in the trucking industry?					
			Profitability will be reduced much	Profitability will be reduced a little	Profitability will not change	Profitability will increase a little	Do not know	Total
How will the effect of a per litre increase in taxes on diesel influence trucking industry profits over time?	Profitability will be reduced mostly in the first half year	Count	11	19	5	1	1	37
		Row %	29.7	51.4	13.5	2.7	2.7	100.0
		Column %	44.0	61.3	45.5	20.0	20.0	48.1
		Table %	14.3	24.7	6.5	1.3	1.3	48.1
	Profitability will be reduced mostly in the long term	Count	6	3	2	2		13
		Row %	46.2	23.1	15.4	15.4		100.0
		Column %	24.0	9.7	18.2	40.0		16.9
		Table %	7.8	3.9	2.6	2.6		16.9
	Profitability will have the same effect in the short and long run	Count	5	7	2	1	1	16
		Row %	31.3	43.8	12.5	6.3	6.3	100.0
		Column %	20.0	22.6	18.2	20.0	20.0	20.8
		Table %	6.5	9.1	2.6	1.3	1.3	20.8
	Do not know	Count	3	2	2	1	3	11
		Row %	27.3	18.2	18.2	9.1	27.3	100.0
		Column %	12.0	6.5	18.2	20.0	60.0	14.3
		Table %	3.9	2.6	2.6	1.3	3.9	14.3
Total	Count		25	31	11	5	5	77
	Row %		32.5	40.3	14.3	6.5	6.5	100.0
	Column %		100.0	100.0	100.0	100.0	100.0	100.0
	Table %		32.5	40.3	14.3	6.5	6.5	100.0

Appendix g: Correlation Results

Table 33. Pearson Correlation for the relationship between the chosen options for decision on diesel taxes and which income group would benefit the most from government spending of tax incomes

		Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Which income group do you think would benefit the most from government spending of tax incomes?
Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Pearson Correlation	1	-,039
	Sig. (2-tailed)		,750
	N	68	68
Which income group do you think would benefit the most from government spending of tax incomes?	Pearson Correlation	-,039	1
	Sig. (2-tailed)	,750	
	N	68	68

Table 34. Spearman's Rank Order Correlation for the relationship between the chosen options for decision on diesel taxes and which income group would benefit the most from government spending of tax incomes

			Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Which income group do you think would benefit the most from government spending of tax incomes?
Spearman's rho	Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Correlation Coefficient	1,000	-,058
		Sig. (2-tailed)	.	,640
		N	68	68
	Which income group do you think would benefit the most from government spending of tax incomes?	Correlation Coefficient	-,058	1,000
		Sig. (2-tailed)	,640	.
		N	68	68

Table 35. Frequency table for responses on effect of an increase in fuel taxes on their personal economy.

If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly negative effect	39	50,6	50,6	50,6
	Slightly negative effect	26	33,8	33,8	84,4
	No effect	8	10,4	10,4	94,8
	Slightly positive effect	4	5,2	5,2	100,0
	Total	77	100,0	100,0	

Table 36. Spearman's Rank order Correlation to test if willingness to increase taxes is higher when people trust their government to use proceeds from fuel tax revenues to the benefit of most people

			Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Do you trust that your home government would use incomes from fuel taxes to the benefit of most people
Spearman's rho	Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Correlation Coefficient	1.000	.264(*)
		Sig. (2-tailed)	.	.034
		N	65	65
	Do you trust that your home government would use incomes from fuel taxes to the benefit of most people	Correlation Coefficient	.264(*)	1.000
		Sig. (2-tailed)	.034	.
		N	65	65

* Correlation is significant at the 0.05 level (2-tailed).

Table 37. Spearman's Rank order correlation for decision on tax level and perceived effect on personal economy

Correlations

			Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?
Spearman's rho	Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:	Correlation Coefficient	1.000	.284(*)
		Sig. (2-tailed)	.	.022
		N	65	65
	If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?	Correlation Coefficient	.284(*)	1.000
		Sig. (2-tailed)	.022	.
		N	65	65

Appendix h. Fuel Prices (November 2008) for 170 countries (Source GTZ International Fuel Prices 2008)

Country	Super Gasoline [US Cents/litre]	Diesel [US Cents/litre]	Country	Super Gasoline [US Cents/litre]	Diesel [US Cents/litre]
Afghanistan	105	96	Bulgaria	128	137
Albania	136	131	Burkina Faso	138	133
Algeria	34	20	Burundi	139	123
Andorra	124	106	Cambodia	94	89
Angola	53	39	Cameroon	114	104
Antigua and Barbuda	111	n/a	Canada	76	90
Argentina	78	58	Cape Verde	184	143
Armenia	108	111	Central African Republic	144	144
Australia	74	94	Chad	130	132
Austria	137	143	Chile	95	95
Azerbaijan	74	56	China	99	101
Bahrain	21	13	China, Hong Kong	195	116
Bangladesh	117	70	Colombia	104	73
Barbados	100	103	Congo, D.R. (Kinshasa)	123	121
Belarus	133	106	Congo, R. (Brazzaville)	81	57
Belgium	150	134	Costa Rica	124	110
Belize	70	53	Côte d'Ivoire	133	120
Benin	103	103	Croatia	127	137
Bhutan	91	n/a	Cuba	167	151
Bolivia	68	53	Cyprus, South	128	125
Bosnia and Herzegovina	113	118	Czech Republic	137	145
Botswana	88	102	Denmark	154	154
Brazil	126	103	Dominican Republic	104	94
Brunei	38	21	Ecuador	51	27

Country	Super Gasoline (US Cents/litre)	Diesel (US Cents/litre)	Country	Super Gasoline (US Cents/litre)	Diesel (US Cents/litre)
Egypt	49	20	Indonesia	50	42
El Salvador	78	81	Iran	10*	3
Eritrea	253	107	Ireland	156	164
Estonia	118	130	Israel	137	170
Ethiopia	92	89	Italy	157	163
Fiji	115	104	Jamaica	74	84
Finland	157	139	Japan	142	130
France	152	145	Jordan	61	61
Gabon	114	90	Kazakhstan	83	72
Gambia	79	75	Kenya	120	114
Georgia	109	116	Korea, North (D.R.)	76	95
Germany	156	156	Korea, South (R.)	151	140
Ghana	90	90	Kosovo	110	121
Greece	123	141	Kuwait	24	20
Grenada	128	134	Kyrgyzstan	80	88
Guadeloupe	181	154	Lao PDR	92	76
Guatemala	86	82	Latvia	112	123
Guinea	102	102	Lebanon	76	76
Guyana	84	85	Lesotho	79	93
Haiti	116	89	Liberia	77	103
Honduras	80	80	Libya	14	12
Hungary	127	138	Liechtenstein	130	152
Iceland	115	131	Lithuania	113	122
India	109	70	Luxembourg	140	133

Country	Super Gasoline [US Cents/litre]	Diesel [US Cents/litre]	Country	Super Gasoline [US Cents/litre]	Diesel [US Cents/litre]
Macedonia	115	112	Pakistan	84	77
Madagascar	155	143	Palestine (W. Bank and Gaza)	134	125
Malawi	178	167	Panama	67	68
Malaysia	53	53	Papua New Guinea	94	90
Mali	130	110	Paraguay	117	96
Malta	166	156	Peru	142	99
Mauritania	149	106	Philippines	91	81
Mexico	74	54	Poland	143	140
Moldova	120	104	Portugal	161	147
Monaco	164	155	Qatar	22	n/a
Mongolia	138	142	Romania	111	122
Montenegro	127	121	Russian Federation	89	86
Morocco	129	83	Rwanda	137	137
Mozambique	171	137	Saudi Arabia	16	9
Myanmar (Burma)	43	52	Senegal	135	126
Namibia	78	88	Serbia	129	114
Nepal	113	82	Sierra Leone	91	91
Netherlands	168	145	Singapore	107	90
New Zealand	109	85	Slovakia	157	168
Nicaragua	87	82	Slovenia	118	126
Niger	99	97	Somalia	112	115
Nigeria	59	113	South Africa	87	95
Norway	163	163	Spain	123	128
Oman	31	38	Sri Lanka	143	75

Country	Super Gasoline [US Cents/litre]	Diesel [US Cents/litre]
Sudan	65	45
Sudan, South	159	125
Suriname	91	n/a
Swaziland	86	93
Sweden	138	152
Switzerland	130	152
Syria	85	53
Tahiti (French Polynesia)	158	139
Taiwan (China)	64	69
Tajikistan	103	100
Tanzania	111	130
Thailand	87	64
Timor-Leste (East Timor)	122	135
Togo	89	88
Trinidad and Tobago	36	n/a
Tunisia	96	84
Turkey	187	163
Turkmenistan	22	20
Uganda	130	122
Ukraine	88	96
United Arab Emirates	45	62
United Kingdom	144	165
United States	56	78
Uruguay	118	117

Country	Super Gasoline [US Cents/litre]	Diesel [US Cents/litre]
Uzbekistan	135	75
Venezuela	2	1
Vietnam	80	77
Yemen	30	17
Zambia	170	161
Zimbabwe	130	105

Appendix i: Online Survey questionnaire

Questionnaire in Ghanaian currency (GHS)

1. Default Section

I am currently working on a research project at the University of Bergen, Norway. Your input on this questionnaire will be valued greatly.

Confidentiality and anonymity will be ensured, as the program does not register who the answers came from.

*** 1. Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:**

- ◯ Reduce diesel tax by 50Gp per liter
- ◯ Increase diesel tax by 50Gp per liter
- ◯ Keep the current diesel tax level
- ◯ Do not know

2.

*** 2. What does a 50Gp per litre increase in taxes on diesel mean for profitability in the trucking industry?**

- ◯ Profitability will be reduced a little
- ◯ Profitability will be reduced much
- ◯ Profitability will not change
- ◯ Profitability will increase a little
- ◯ Do not know

3.

*** 3. How will the effect of 50Gp per litre increase in taxes on diesel influence trucking industry profits over time?**

- ◯ Profitability will be reduced mostly in the first half year
- ◯ Profitability will be reduced mostly in the long term
- ◯ Profitability will have the same effect in the short and long run
- ◯ Do not know

4.

Page 1

Questionnaire in Ghanaian currency (GHS)

*4. Assume that there will be a significant tax on all uses of energy that leads to emissions of greenhouse gases. What consequences will such a tax have? Mention as many effects as you can think of.

Begin with those you consider most important and finish with the least important.

5.

*5. If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?

- ◯ Strongly negative effect
- ◯ Slightly negative effect
- ◯ No effect
- ◯ Slightly positive effect
- ◯ Strongly positive effect
- ◯ Do not know

6.

*6. Do you trust that your home government would use incomes from fuel taxes to the benefit of most people

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Do not know

7.

Questionnaire in Ghanaian currency (GHS)

*7. In nations that produce and export oil, do you agree that oil consumers should pay fuel taxes?

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree
- ◯ Do not know

8.

*8. What do you think the government will spend incomes from fuel taxes on? Start with the initiatives you think will receive the largest amounts of money.

9.

*9. What likely governmental uses of revenues from fuel taxes will be of most benefit to you?

10.

*10. Which income group do you think would benefit the most from government spending of tax incomes?

- ◯ Higher Incomes
- ◯ Middle Incomes
- ◯ Lower incomes
- ◯ Do not know

11.

Questionnaire in Ghanaian currency (GHS)

11. Would you accept a 50Gp per liter increase in fuel taxes if:

Tick off none or as many of the options that you like

- [ ] All resulting revenue is used to improve health facilities
- [ ] All resulting revenue is spent on improving educational facilities
- [ ] All resulting revenue is spent on increasing the nations military strength
- [ ] All resulting revenue is used for research and development to reduce dependence on oil
- [ ] All resulting revenue is used for certain combinations of the four purposes above
- [ ] All resulting revenue is split evenly amongst all inhabitants
- [ ] All resulting revenue is used to reduce VAT
- [ ] All resulting government revenue is used to reduce income taxes

12.

*** 12. Gasoline taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the gasoline tax for private car uses, would you:**

- ◯ Reduce gasoline tax by 50Gp per liter
- ◯ Increase gasoline tax by 50Gp per liter
- ◯ Keep the current gasoline tax level
- ◯ Do not know

13.

*** 13. Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for transportation purposes would you:**

- ◯ Reduce diesel tax by 50Gp per litre
- ◯ Increase diesel tax by 50Gp per litre
- ◯ Keep the current diesel tax level
- ◯ Do not know

14.

Questionnaire in Ghanaian currency (GHS)

*** 14. Kerosene taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the kerosene tax for household consumption, would you:**

- ◯ Reduce kerosene tax by 50Gp per litre
- ◯ Increase kerosene tax by 50Gp per litre
- ◯ Keep the current kerosene tax level
- ◯ Do not know

15. Personal Information

*** 15. Age**

- ◯ 25 or younger
- ◯ 26 to 35 years
- ◯ 36 to 45 years
- ◯ 46 years or older

*** 16. Gender**

- ◯ Male
- ◯ Female

*** 17. Nationality**

*** 18. Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?**

- ◯ Much more
- ◯ A little more
- ◯ The same
- ◯ A little less
- ◯ Much less
- ◯ Do not know

Questionnaire in Ghanaian currency (GHS)

*** 19. For each of the following transportation modes please indicate the estimated number of kilometers you have traveled for private purposes in the last 12 months.**

For example 5000 km for air, 600 km bus,...and so on)

Car/Taxi

Bus

Airplane

Train

Walking

Bicycling

Other

*** 20. Annual household income**

- ◯ Less than Gh 2000
- ◯ Gh 2000-Gh 5000
- ◯ Gh 5000-Gh 8000
- ◯ Gh 8000-Gh 10000
- ◯ Gh 10000-Gh 15000
- ◯ More than Gh 15000

*** 21. Highest level of education**

- ◯ Less than high school
- ◯ High School
- ◯ Some University
- ◯ Graduated from University

*** 22. If you are/were a student what field of study?**

*** 23. Current Occupation**

24. Please feel free to put down any further comments

Questionnaire in British currency (Pound)

1. Default Section

I am currently working on a research project at the University of Bergen, Norway. Your input on this questionnaire will be valued greatly.

Confidentiality and anonymity will be ensured, as the program does not register who the answers came from.

*** 1. Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:**

- ◯ Reduce diesel tax by 20p per liter
- ◯ Increase diesel tax by 20p per liter
- ◯ Keep the current diesel tax level
- ◯ Do not know

2.

*** 2. What does a 20p per litre increase in taxes on diesel mean for profitability in the trucking industry?**

- ◯ Profitability will be reduced a little
- ◯ Profitability will be reduced much
- ◯ Profitability will not change
- ◯ Profitability will increase a little
- ◯ Do not know

3.

*** 3. How will the effect of 20p per litre increase in taxes on diesel influence trucking industry profits over time?**

- ◯ Profitability will be reduced mostly in the first half year
- ◯ Profitability will be reduced mostly in the long term
- ◯ Profitability will have the same effect in the short and long run
- ◯ Do not know

4.

Questionnaire in British currency (Pound)

*4. Assume that there will be a significant tax on all uses of energy that leads to emissions of greenhouse gases. What consequences will such a tax have? Mention as many effects as you can think of.

Begin with those you consider most important and finish with the least important.

5.

*5. If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?

- ◯ Strongly negative effect
- ◯ Slightly negative effect
- ◯ No effect
- ◯ Slightly positive effect
- ◯ Strongly positive effect
- ◯ Do not know

6.

*6. Do you trust that your home government would use incomes from fuel taxes to the benefit of most people

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Do not know

7.

Questionnaire in British currency (Pound)

*7. In nations that produce and export oil, do you agree that oil consumers should pay fuel taxes?

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree
- ◯ Do not know

8.

*8. What do you think the government will spend incomes from fuel taxes on? Start with the initiatives you think will receive the largest amounts of money.

9.

*9. What likely governmental uses of revenues from fuel taxes will be of most benefit to you?

10.

*10. Which income group do you think would benefit the most from government spending of tax incomes?

- ◯ Higher Incomes
- ◯ Middle Incomes
- ◯ Lower incomes
- ◯ Do not know

11.

Questionnaire in British currency (Pound)

11. Would you accept a 20p per liter increase in fuel taxes if:

Tick off none or as many of the options that you like

- [ ] All resulting revenue is used to improve health facilities
- [ ] All resulting revenue is spent on improving educational facilities
- [ ] All resulting revenue is spent on increasing the nations military strength
- [ ] All resulting revenue is used for research and development to reduce dependence on oil
- [ ] All resulting revenue is used for certain combinations of the four purposes above
- [ ] All resulting revenue is split evenly amongst all inhabitants
- [ ] All resulting revenue is used to reduce VAT
- [ ] All resulting government revenue is used to reduce income taxes

12.

*** 12. Gasoline taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the gasoline tax for private car uses, would you:**

- ◯ Reduce gasoline tax by 20p per litre
- ◯ Increase gasoline tax by 20p per litre
- ◯ Keep the current gasoline tax level
- ◯ Do not know

13.

*** 13. Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for transportation purposes would you:**

- ◯ Reduce diesel tax by 20p per litre
- ◯ Increase diesel tax by 20p per litre
- ◯ Keep the current diesel tax level
- ◯ Do not know

14.

Questionnaire in British currency (Pound)

*** 14. Kerosene taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the kerosene tax for household consumption, would you:**

- ◯ Reduce kerosene tax by 20p per litre
- ◯ Increase kerosene tax by 20p per litre
- ◯ Keep the current kerosene tax level
- ◯ Do not know

15. Personal Information

*** 15. Age**

- ◯ 25 or younger
- ◯ 26 to 35 years
- ◯ 36 to 45 years
- ◯ 46 years or older

*** 16. Gender**

- ◯ Male
- ◯ Female

*** 17. Nationality**

*** 18. Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?**

- ◯ Much more
- ◯ A little more
- ◯ The same
- ◯ A little less
- ◯ Much less
- ◯ Do not know

Page 5

Questionnaire in British currency (Pound)

*** 19. For each of the following transportation modes please indicate the estimated number of kilometers you have traveled for private purposes in the last 12 months.**

For example 5000 km for air, 600 km bus,...and so on)

Car/Taxi	
Bus	
Airplane	
Train	
Walking	
Bicycling	
Other	

*** 20. Annual household income**

- ◯ Less than £50000
- ◯ £50000-£100000
- ◯ £100000-£200000
- ◯ £200000-£400000
- ◯ £400000-£600000
- ◯ £600000-£800000
- ◯ More than £800000

*** 21. Highest level of education**

- ◯ Less than high school
- ◯ High School
- ◯ Some University
- ◯ Graduated from University

*** 22. If you are/were a student what field of study?**

*** 23. Current Occupation**

24. Please feel free to put down any further comments

Questionnaire in American Dollar

1. Default Section

I am currently working on a research project at the University of Bergen, Norway. Your input on this questionnaire will be valued greatly.

Confidentiality and anonymity will be ensured, as the program does not register who the answers came from.

*** 1. Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:**

- ◯ Reduce diesel tax by 50 US cents per liter
- ◯ Increase diesel tax by 50 US cents per liter
- ◯ Keep the current diesel tax level
- ◯ Do not know

2.

*** 2. What does a 50 US cents per liter increase in taxes on diesel mean for profitability in the trucking industry?**

- ◯ Profitability will be reduced a little
- ◯ Profitability will be reduced much
- ◯ Profitability will not change
- ◯ Profitability will increase a little
- ◯ Do not know

3.

*** 3. How will the effect of 50 US cents per liter increase in taxes on diesel influence trucking industry profits over time?**

- ◯ Profitability will be reduced mostly in the first half year
- ◯ Profitability will be reduced mostly in the long term
- ◯ Profitability will have the same effect in the short and long run
- ◯ Do not know

4.

Questionnaire in American Dollar

*4. Assume that there will be a significant tax on all uses of energy that leads to emissions of greenhouse gases. What consequences will such a tax have? Mention as many effects as you can think of.

Begin with those you consider most important and finish with the least important.

5.

*5. If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?

- ◯ Strongly negative effect
- ◯ Slightly negative effect
- ◯ No effect
- ◯ Slightly positive effect
- ◯ Strongly positive effect
- ◯ Do not know

6.

*6. Do you trust that your home government would use incomes from fuel taxes to the benefit of most people

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Do not know

7.

Questionnaire in American Dollar

*7. In nations that produce and export oil, do you agree that oil consumers should pay fuel taxes?

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree
- ◯ Do not know

8.

*8. What do you think the government will spend incomes from fuel taxes on? Start with the initiatives you think will receive the largest amounts of money.

9.

*9. What likely governmental uses of revenues from fuel taxes will be of most benefit to you?

10.

*10. Which income group do you think would benefit the most from government spending of tax incomes?

- ◯ Higher Incomes
- ◯ Middle Incomes
- ◯ Lower incomes
- ◯ Do not know

11.

Questionnaire in American Dollar

11. Would you accept a 50 US cents per liter increase in fuel taxes if:

Tick off none or as many of the options that you like

- [ ] All resulting revenue is used to improve health facilities
- [ ] All resulting revenue is spent on improving educational facilities
- [ ] All resulting revenue is spent on increasing the nations military strength
- [ ] All resulting revenue is used for research and development to reduce dependence on oil
- [ ] All resulting revenue is used for certain combinations of the four purposes above
- [ ] All resulting revenue is split evenly amongst all inhabitants
- [ ] All resulting revenue is used to reduce VAT
- [ ] All resulting government revenue is used to reduce income taxes

12.

*** 12. Gasoline taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the gasoline tax for private car uses, would you:**

- ◯ Reduce gasoline tax by 50 US cents per litre
- ◯ Increase gasoline tax by 50 US cents per litre
- ◯ Keep the current gasoline tax level
- ◯ Do not know

13.

*** 13. Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for transportation purposes would you:**

- ◯ Reduce diesel tax by 50 US cents per litre
- ◯ Increase diesel tax by 50 US cents per litre
- ◯ Keep the current diesel tax level
- ◯ Do not know

14.

Questionnaire in American Dollar

*** 14. Kerosene taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the kerosene tax for household consumption, would you:**

- ◯ Reduce kerosene tax by 50 US cents per litre
- ◯ Increase kerosene tax by 50 US cents per litre
- ◯ Keep the current kerosene tax level
- ◯ Do not know

15. Personal Information

*** 15. Age**

- ◯ 25 or younger
- ◯ 26 to 35 years
- ◯ 36 to 45 years
- ◯ 46 years or older

*** 16. Gender**

- ◯ Male
- ◯ Female

*** 17. Nationality**

*** 18. Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?**

- ◯ Much more
- ◯ A little more
- ◯ The same
- ◯ A little less
- ◯ Much less
- ◯ Do not know

Questionnaire in American Dollar

*** 19. For each of the following transportation modes please indicate the estimated number of kilometers you have traveled for private purposes in the last 12 months.**

For example 5000 km for air, 600 km bus,...and so on)

Car/Taxi	
Bus	
Airplane	
Train	
Walking	
Bicycling	
Other	

*** 20. Annual household income**

- ◯ Less than $100000
- ◯ $100000-$150000
- ◯ $150000-$200000
- ◯ $200000-$250000
- ◯ $250000-$300000
- ◯ $350000-$400000
- ◯ $400000-$500000
- ◯ More than $500000

*** 21. Highest level of education**

- ◯ Less than high school
- ◯ High School
- ◯ Some University
- ◯ Graduated from University

*** 22. If you are/were a student what field of study?**

*** 23. Current Occupation**

Questionnaire in American Dollar

24. Please feel free to put down any further comments

Questionnaire in Norwegian currency (Kroner)

1. Default Section

I am currently working on a research project at the University of Bergen, Norway. Your input on this questionnaire will be valued greatly.

Confidentiality and anonymity will be ensured, as the program does not register who the answers came from.

*** 1. Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for all uses in transportation, would you:**

- ◯ Reduce diesel tax by 2 Kroner per liter
- ◯ Increase diesel tax by 2 Kroner per liter
- ◯ Keep the current diesel tax level
- ◯ Do not know

2.

*** 2. What does a 2 Kroner per liter increase in taxes on diesel mean for profitability in the trucking industry?**

- ◯ Profitability will be reduced a little
- ◯ Profitability will be reduced much
- ◯ Profitability will not change
- ◯ Profitability will increase a little
- ◯ Do not know

3.

*** 3. How will the effect of 2 Kroner per liter increase in taxes on diesel influence trucking industry profits over time?**

- ◯ Profitability will be reduced mostly in the first half year
- ◯ Profitability will be reduced mostly in the long term
- ◯ Profitability will have the same effect in the short and long run
- ◯ Do not know

4.

Questionnaire in Norwegian currency (Kroner)

*4. Assume that there will be a significant tax on all uses of energy that leads to emissions of greenhouse gases. What consequences will such a tax have? Mention as many effects as you can think of.

Begin with those you consider most important and finish with the least important.

5.

*5. If all fuel prices increase by 20 % due to new fuel taxes, how do you think this will influence your personal economy?

- ◯ Strongly negative effect
- ◯ Slightly negative effect
- ◯ No effect
- ◯ Slightly positive effect
- ◯ Strongly positive effect
- ◯ Do not know

6.

*6. Do you trust that your home government would use incomes from fuel taxes to the benefit of most people

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Do not know

7.

Questionnaire in Norwegian currency (Kroner)

*7. In nations that produce and export oil, do you agree that oil consumers should pay fuel taxes?

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree
- ◯ Do not know

8.

*8. What do you think the government will spend incomes from fuel taxes on? Start with the initiatives you think will receive the largest amounts of money.

9.

*9. What likely governmental uses of revenues from fuel taxes will be of most benefit to you?

10.

*10. Which income group do you think would benefit the most from government spending of tax incomes?

- ◯ Higher Incomes
- ◯ Middle Incomes
- ◯ Lower incomes
- ◯ Do not know

11.

Questionnaire in Norwegian currency (Kroner)

11. Would you accept a 2 Kroner per liter increase in fuel taxes if:

Tick off none or as many of the options that you like

- ☐ All resulting revenue is used to improve health facilities
- ☐ All resulting revenue is spent on improving educational facilities
- ☐ All resulting revenue is spent on increasing the nations military strength
- ☐ All resulting revenue is used for research and development to reduce dependence on oil
- ☐ All resulting revenue is used for certain combinations of the four purposes above
- ☐ All resulting revenue is split evenly amongst all inhabitants
- ☐ All resulting revenue is used to reduce VAT (MOMS)
- ☐ All resulting government revenue is used to reduce income taxes

12.

*** 12. Gasoline taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the gasoline tax for private car uses, would you:**

- ◯ Reduce gasoline tax by 2 Kroner per liter
- ◯ Increase gasoline tax by 2 Kroner per liter
- ◯ Keep the current gasoline tax level
- ◯ Do not know

13.

*** 13. Diesel taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the diesel tax for transportation purposes would you:**

- ◯ Reduce diesel tax by 2 Kroner per liter
- ◯ Increase diesel tax by 2 Kroner per liter
- ◯ Keep the current diesel tax level
- ◯ Do not know

14.

Questionnaire in Norwegian currency (Kroner)

*** 14. Kerosene (Olje og Parafin) taxes can be used to reduce emissions of greenhouse gases. If you were to decide the level of the kerosene tax for household consumption, would you:**

- ◯ Reduce kerosene tax by 2 Kroner per liter
- ◯ Increase kerosene tax by 2 Kroner per liter
- ◯ Keep the current kerosene tax level
- ◯ Do not know

15. Personal Information

*** 15. Age**

- ◯ 25 or younger
- ◯ 26 to 35 years
- ◯ 36 to 45 years
- ◯ 46 years or older

*** 16. Gender**

- ◯ Male
- ◯ Female

*** 17. Nationality**

*** 18. Consider your own energy consumption for private use. How much energy do you think you use compared to the energy use of the average inhabitant of your home country?**

- ◯ Much more
- ◯ A little more
- ◯ The same
- ◯ A little less
- ◯ Much less
- ◯ Do not know

Questionnaire in Norwegian currency (Kroner)

*** 19. For each of the following transportation modes please indicate the estimated number of kilometers you have traveled for private purposes in the last 12 months.**

For example 5000 km for air, 600 km bus,...and so on)

Car/Taxi	
Bus	
Airplane	
Train	
Walking	
Bicycling	
Other	

*** 20. Annual household income**

- ◯ Less than 80000 Kroner
- ◯ 80000 Kroner - 100000 Kroner
- ◯ 100000 Kroner - 200000 Kroner
- ◯ 200000 Kroner - 300000 Kroner
- ◯ 300000 Kroner - 400000 Kroner
- ◯ 400000 Kroner - 500000 Kroner
- ◯ 500000 Kroner - 600000 Kroner
- ◯ 600000 Kroner - 700000 Kroner
- ◯ 700000 Kroner - 800000 Kroner
- ◯ More than 800000 Kroner

*** 21. Highest level of education**

- ◯ Less than high school
- ◯ High School
- ◯ Some University
- ◯ Graduated from University

*** 22. If you are/were a student what field of study?**

Questionnaire in Norwegian currency (Kroner)

* 23. Current Occupation

24. Please feel free to put down any further comments

Appendix j: Tutorials for use of Survey Monkey Software

Creating a New Survey Form

Step 1:

Click the [**Create Survey**] button located on the top left of all of the pages in your account to open the create survey page.

Step 2:

There are 3 different options you can use to create a new survey. Select one of those options to apply to your new survey form.

1. Create a new survey from scratch – will create a blank survey form that you can use to add your own questions
2. Copy an existing survey – can be used to create a copy of a survey form you have already created
3. Use a Survey Template – will allow you to select from our list of pre-designed survey forms that you can customize to fit your needs *Only available for Professional Accounts.

Add Questions

Click the [A**dd Question Here**] button in the location on the page you want your question to display. When the Question Editor window opens, select which Question Type you want from the drop-down menu at the top of the page. This will display all of the appropriate text fields where you can customize the question text, answer choices, etc. to format your question.

Any time you click the [**Save**] button it saves your questions and survey design up to that point. If you leave your account and login later, your survey is saved under the **My Surveys** section. You can then pick up where you left off.

For more information on how to add a question to your survey click here.

For more information on what types of questions we offer click here.

Optional Question Formatting

In addition to being able to customize your question type, text and answer choices, you also have options to customize how each question looks and behaves for respondents. You can find these options listed in the Edit Question window by using the Scroll bar on the left hand side.

Click on any of the options below for more details about how each feature works.

- Sort/Randomize answer choices
- Add Comment Field
- Validate Text
- Require Answer to Question
- Change Question Size and Placement

You can use the following editing options within your main Survey Edit page, click on them for more details about how each edit option works:

- Move Question
- Copy Question
- Delete Question
- Restore Question

Add Pages

When you create a survey, the default Edit Survey page opens to page #1. Click the [**Add Page Before/After**] button to add a new page to your survey. In this page you can choose to insert a title for your page and include text for an introduction or description of the page. Click the [Split Page Here] button before any question to create a page break in your survey and divide the questions onto separate pages.

For more information on how to add a page to your survey click here.

For more information on how to insert a page break or split a page in your survey click here.

A. Edit Pages

You can use the following editing options within your main Survey Edit page, click on them for more details about how each edit option works:

- Move Page

- Copy Page
- Delete Page

B. Previewing Pages

You can look over you survey design in a few different ways to make sure it meets all of your specifications. Click on the options below for more details on how to review your design.

- Viewing Pages
- Preview your Survey
- Print your Survey Design

Customize Your Design

A. Survey Design Options

In addition to being able to customize your questions and pages, you also have options to customize specific design options for the whole survey. You can find these settings listed in the [**Survey Options**] section of the Design page.

You can use the following editing options within your main Survey Edit page, click on them for more details about how each edit option works:

- Edit Page and Question Numbering
- Add a Logo
- Progress Bar
- Hide/Display Survey and Page Titles
- Edit Navigation Links (Prev, Next, Done, Exit Survey)
- Required Questions

B. Themes

You can also customize the colors and fonts in your survey to help further brand your survey form and associate it with your own business colors and style templates.

We offer a number of pre-created themes to select from (all of which are 508 compliant) or you can select a theme and then edit it to customize all of the colors and fonts to meet your specifications.

 For more information on how to insert a page break or split a page in your survey click here.

 For more information on how to Edit your survey Theme, click here.

Creating a Question:

1. Click the **[Add Question Here]** button to open the Question Editor.
2. Choose the **question type** from the drop-down menu.
3. Create your question and click **[Save Changes]**.

* *Clicking the* **[save changes]** *button automatically updates your survey with the new question.*

Example: To create a single menu of drop-down choices, select Multiple Choice (Only One Answer) for the question type and choose *Drop-down Menu* for the display format.

- Multiple Choice (Only One Answer)
- Display Choices as a Drop-down Menu

Optional Formatting

- Sort/Randomize answer choices
- Add Comment Field
- Validate Text
- Require Answer to Question
- Change Question Size and Placement

After creating your question and selecting the desired options for the question, click the [**Save Changes**] button to add the question to your survey.

NOTE: What do I do if I receive an error when trying to save a question?

Please scroll through the question settings to see if you have omitted part of the question text or error message text.

Editing a Question:

You may edit questions any time by clicking the [**Edit Question**] button above the question. To Edit a Question after saving it, click the [Edit Question] button from the Design Editor. Note: Editing is limited for questions with results.

Can I edit the survey after collecting responses?
How to add page breaks and modify page description.

Creating a Ranking Question:

To rank respondent choices, you can use the Rating Scale question-type.

NOTE: SurveyMonkey allows up to a 16 point rating scale.

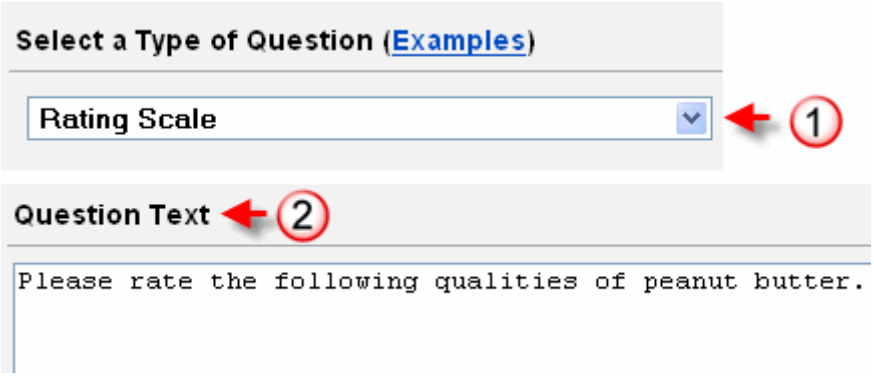
When creating this question, you assign a "weight" or value to each column choice to produce a Rating Average in your results. In addition to the weighted columns, you can select to "force" respondents to chose only one selection per column (forced ranking).

Take a quick survey to see how this question type calculates results.

Watch the video demo

Example: How to create a Rating Scale.

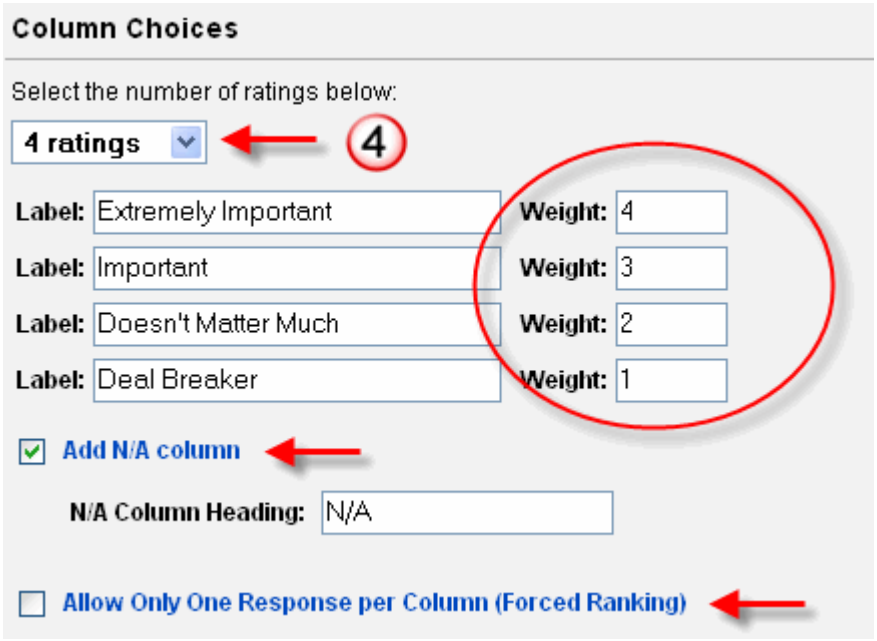
Step 1: Select the Rating Scale Question from the question menu.



Step 2: Enter the question text.

Step 3: Enter each Row Choice on a separate line.

Step 4: Select the number or ratings from the drop-down



A. Labels and Weight

Enter the label for the columns in each Label field and assign a "weight" to each label ("1" for the lowest ranking and so on.) If you select the N/A column, it will automatically be assigned a value of "0" so that it will not affect your results. (This question type allows 16 ratings or column choices. It is not possible to add additional column choices to this question type.)

B. Add N/A column

The N/A or "Other" option is given a value of "0" so that it does not affect the response average. It is not calculated in the response average because the system assigns a zero value to that column choice and automatically subtracts any responses submitted to the N/A choice when calculating the response average. (See example rating average below)

C. Forced Ranking

If you check 'Allow Only One Response per Column (Forced Ranking)' under the column name field, respondents will "be forced" to order the row choices by importance.

Matrix of Choices vs. Rating Questions

Rating questions allow you to assign weighted values to the column choices. This tabluates a Rating Average in the Analyze portion of the survey. Matrix of Choices questions do not have this functionality. However, you can apply the forced ranking option to both types.

To view examples and the data presentation in the Analyze page, please take a look over the following survey:

Matrix/Rating Survey

How to distribute your survey through collectors

Have you finished your survey design? Now you can decide how you would like to send out your survey to collect responses!

Sending your survey via email? Putting a link on your blog? Collecting responses is as simple as copying and pasting a link to your survey into an outgoing email message or into a page on a website. We even give you the option to stop collection automatically when you reach a date or response count that you specify. You can send a survey invitation to your own email list using our simple list management tool. Track who responds to your survey, and send follow-up reminders to those who don't. We'll even manage opt-outs automatically for you.

Instructional Video About Collectors

The Collector type you create determines the type of link and how you'll administer or send the survey.

Click to watch the Collector in action!

Get started now by reviewing all of the different ways you can send out your survey!

1. What is a Collector?
2. Creating a Web Link Collector
3. Creating an Email Invitation Collector
4. Creating a Popup Window Collector
5. Collector Setting Options
6. Additional Data Collection Options

What is a Collector?

After designing a survey, you are ready to distribute it through a link. A Collector is what generates that link to send to an audience. There are three types of collectors we offer, each with different properties and setting options. Select one or more of these options to generate a link that will give recipients direct access to your survey form:

- The Web Link: Collect anonymous surveys by posting a link on a website, or email it using your own email.

-  The Email Invitation: Track respondents through "unique" links delivered by our mail server.

-  The Popup Window: Have a survey or invitation open when people visit your website and collect anonymous responses.

 For more information on what defines a collector, click here.

NOTE: As soon as you create your survey link it is active! Simply distribute your survey link and any recipient clicking on it will be taken to the first page of your survey! After they respond, the response is returned automatically into your SurveyMonkey account. It will be available for analysis under the Analyze section of the survey.

Creating a Web Link Collector

The link you can send in your own email or post on your Web Page is called the (Web Link) Collector. This collector type generates a single, anonymous survey link that you will be able to distribute yourself.

 For more information on how to create a Web Link collector click here.

Creating an Email Invitation Collector

With the Email Invitation collector, you upload your email addresses into our system and we distribute a unique, tracking link to each recipient on your list when you send out your customized invitation message. You will also have other benefits such as tracking who responded, sending out reminder messages to those who didn't yet respond and being able to organize your email list by status.

 For more information on how to create an Email Invitation collector click here.

Creating a Popup Window Collector

If you want your respondents to access the survey via a Popup window within your website then you can use the Popup Window Collector. You can specify the popup configuration that you want and we generate a link that includes all of the back end code to make your popup behave according to your settings. All you need to do is copy and paste this into your web page code.

 For more information on how to create a Popup Window collector click here.

Collector Setting Options

Once you have created a collector, you can customize how it behaves with a number of setting options found in the left tool bar of your Collector Details/Get Survey Link page.

A. Change Settings

Click the [**Change Settings**] in the left tool bar to view the list of settings you can customize and change how your link and survey access will work for respondents.

Click on any of the options below for more details about how Collector Settings work.

- Allow Multiple Responses
- Allow Responses to be Edited
- Display a "Thank You" Page
- Survey Completion
- Save IP Address/Email Address in Results

 For more information on the Collector Settings click here.

B. Change Restrictions

Click the [**Change Restrictions**] in the left tool bar to view the list of restriction options you can customize and change how your link and survey access will work for respondents.

Click on any of the options below for more details about how Collector Restriction settings work.

- Set a Cutoff Date & Time
- Set a Max Response Count
- Enable Password Protection
- Enable IP Blocking

 For more information on the Collector Restrictions click here.

Additional Data Collection Options

In the Collector page there are additional options that you can use to manage access to your links or to use to manually enter in responses to the online survey form from another source.

- Manual Data Entry

- Close Collector Now

 You can use multiple collectors to reach different audiences with one survey. For extra tips about how to use multiple collectors to more effectively manage your data collection click here.

How to analyze survey responses

View your results anytime as they are being collected in real-time. Watch live graphs and charts, and then dig down to get individual responses. Securely share your survey results with others. Powerful filtering and cross tabulation allows you to display only the responses you're interested in. With one click, you can download a summary of your results in multiple formats. If you're a statistics nut, you can download all of the raw data you've collected as a spreadsheet. As a reminder, all the data you collect remains absolutely private.

Get started now by reviewing all of the different ways you can analyze your survey data!

1. Viewing Survey Responses
2. Filter Survey Responses
3. CrossTab Survey Responses
4. Download Responses
5. Share Responses

Viewing Survey Responses

The responses for each page are saved and displayed in the analyze section after respondents click the navigation button and successfully advance to the next survey page.

A. Response Summary:

The Response Summary is the default Analyze page, but can also be accessed by clicking on the [**View Summary**] button in the left tool bar in the Analyze section. This page provides the Summary View of your survey results and displays information such as the number of

respondents that answered each question, the percentages each answer option received and basic graphs among other data.

NOTE: Open-ended responses will not be visible directly on the Summary page. Please click the [**show replies**] button in the space where the open-ended question would be to see all of your respondents' comments.

B. Browse Individual Responses:

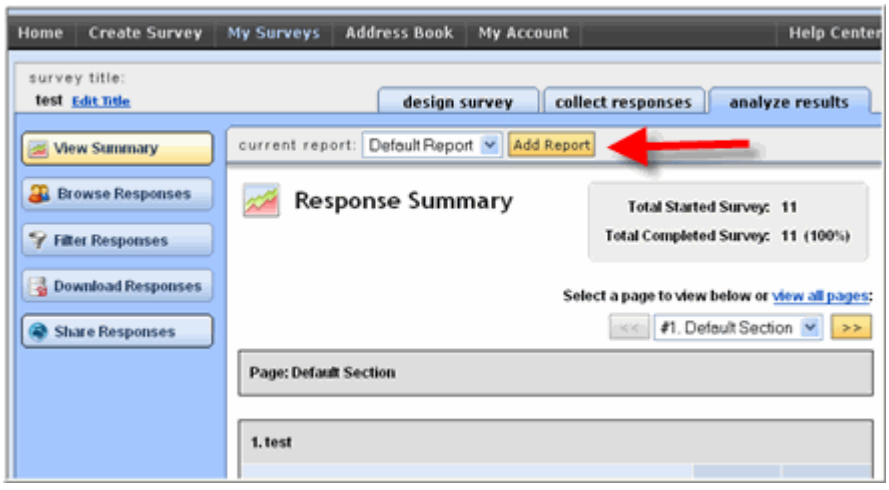
To view individual responses, click the [**Browse Responses**] button in the left tool bar in the Analyze section. The Browse Responses page will open to the most recently submitted response and will allow you to page through a full responses one by one. You can view collection information about each response in the header and can also *Edit* or *Delete* individual responses here.

Click on the options below for more details about how to use the Editing Features in the Browse Responses page:

- Delete Individual Responses
- Edit Individual Responses

C. Custom Reports:

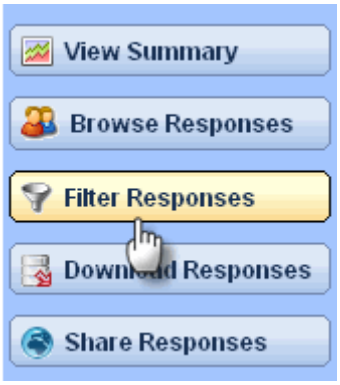
Create a Custom Report by selecting the [**Add Report**] button next to the 'current report' drop-down menu at the top of the Response Summary page.



Custom Reports give customers an opportunity to create a new report and specify which questions or pages they would like to view in the Analyze page. Creating a custom 'view' of your survey data allows you to examine a set of correlated questions in one page instead of scrolling through the entire report to find and compare these questions.

- You can also hide sensitive data/questions from being viewed in a Shared Report. Click here to learn more.
- For more information on how to use a custom report click here.

Filter Survey Responses



Create and manage filters for your data by clicking on the [**Filter Responses**] button in the left tool bar of the Analyze section.

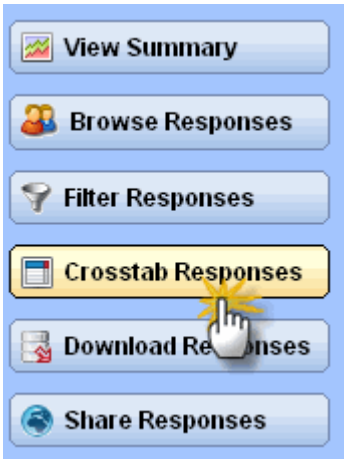
Filtering allows you to organize and view subsets of data for advanced analysis. Filtered data will display only the set of full responses that match your filter criteria, allowing you to find patterns in your data more easily.

For more information on what a Filter is click here.

Types of Filters Offered:
There are three types of filters we offer. Select one or more of these options in the Filter Response page to specify the criteria you wish to view in your survey results.

1. Filter by Response: Based on questions in the survey, you can pick specific answer choices to build a response-based filter. You can add multiple filters and combine them with a logical expression.
2. Filter by Properties: Based on specific properties recorded on the back-end by our system. These include Response Dates, Response Status, Email Address, First Name, Last Name, Custom Value, and IP Address.
3. Filter by Collector: Only active if you have multiple collectors created for the survey. Select the collectors whose responses you want to include in the results analysis.

CrossTab Survey Responses

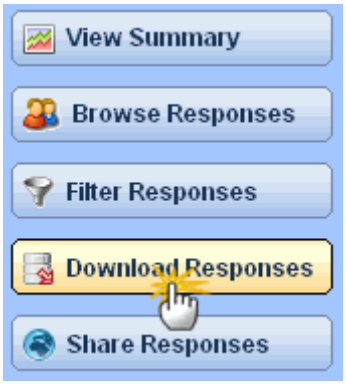


Create and manage crosstabs for your data by clicking on the [**Crosstab Responses**] button in the left tool bar of the Analyze section.

Cross-tabulated data is useful for showing a side by side comparison of how respondents answered a particular question compared to the remaining questions they answered and determine how they are interrelated. The result is a table of the results, each column representing the group of respondents who selected a particular answer choice for the comparison question you selected.

For more information on how the Crosstab function works click here.

Download Responses



You can download the responses you've collected at any time (yes, even while you are still receiving responses) with a Professional subscription. We simply take a snapshot of your current responses, without disrupting your survey.

We offer download reports in PDF, HTML, CSV and Excel formats.

A. Downloading Individual Questions:

If you need to export one specific question rather than the entire survey, you have the ability to single it out and download only that question's results. This option is handy if you need to export open ended comments into a PDF format.

You can download an individual question by clicking on the 'Download' link in the top right corner of your question on the Response Summary page.

For more information on how to download results to an individual question click here.

B. Charting Individual Questions:

You are able to export a visual graph/chart that represents the data of an individual question directly from the Analyze, Response Summary page. This feature is available for most question types and will present your graph/chart in a PNG file type that you can save on your computer.

You can chart an individual question by clicking on the 'Create Chart' link in the top right corner of your question on the Response Summary page.

For more information on how to chart the results to an individual question click here.

C. Summary Download:

Summary Downloads can be accessed by clicking the [Download Responses] button in the Analyze section. This type of download will display the summarized version of all the responses you have collected. This will appear similar to the data you see in the View Summary page in the account. Each summary download format will display the same data set in a slightly different way.

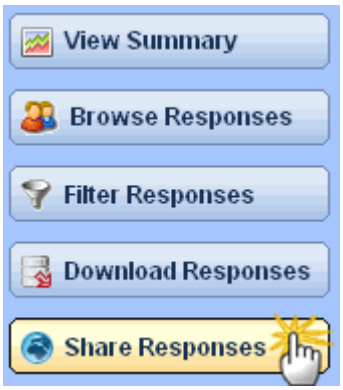
For more information on how to create Summary Download click here.

D. All Responses Collected:

The All Responses Collected download can be accessed by clicking the [Download Responses] button in the Analyze section. This type of download includes all of the full individual survey responses listed out in a single Excel Spreadsheet. Every row in the spreadsheet contains the full set of survey answers for one respondent.

For more information on how to create an All Responses Collected download click here.

Share Responses



Sharing Responses enables you to provide direct access to a specific set of survey results without giving access to your account. With this feature, you can control how much detail to share by choosing between a variety of access level settings.

Create a share link by clicking on the [**Share Responses**] button in the left tool bar in the Analyze section.

For more information on how to set up the Share Link click here.

How to open your exports

We offer six different export formats to Professional subscribers. All data is delivered to your computer in a compressed or zipped format. You will need decompression software installed on your browser to open these files.

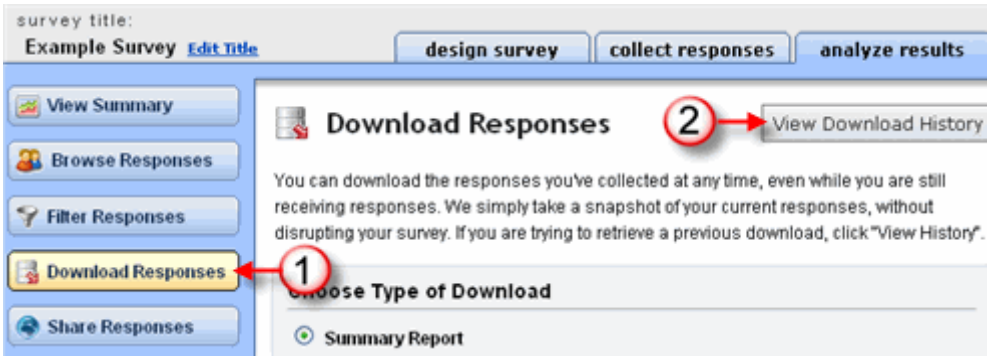
To get started in opening your exports, review the following sections:

1. Excel Formats
2. HTML Formats
3. Viewing Comments, Times, or Dates in Export

Excel Formats:

Step 1:

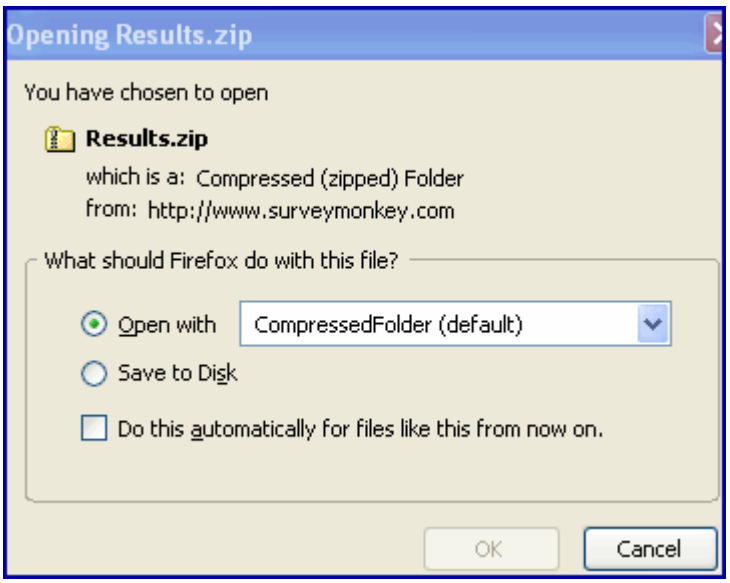
Open the Download History page for the results by clicking the **[View Download History]** button from the **Download Responses** page.



Step 2:

Click the **[Download]** button for the requested Export from the **Export History** page to open the compressed file with your decompression software.

Select to open the compressed files:



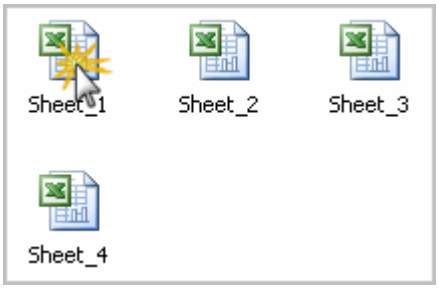
Step 3:

Double click or select the Excel file to open the exports formatted for Excel.

(Select CSV file if using Unicode Characters or time and date questions types in survey.)

Step 4:

Double click or select the export file, Sheet_1, to open in Excel.



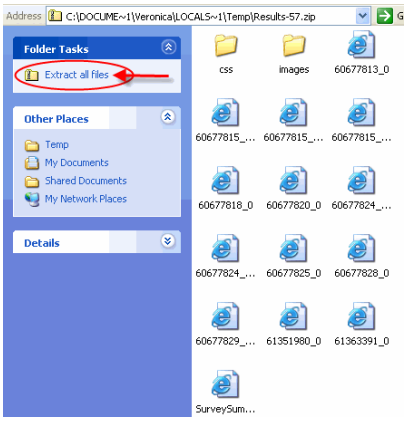
HTML Formats

Step 1:

Click **[Download]** from the Download History Page for the export.

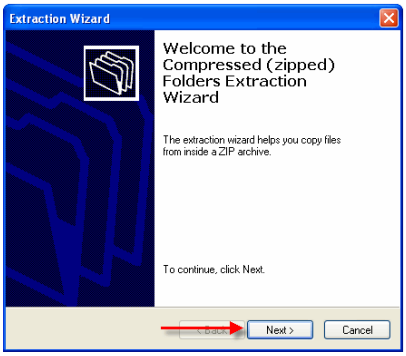
Step 2:

Click Extract all files:

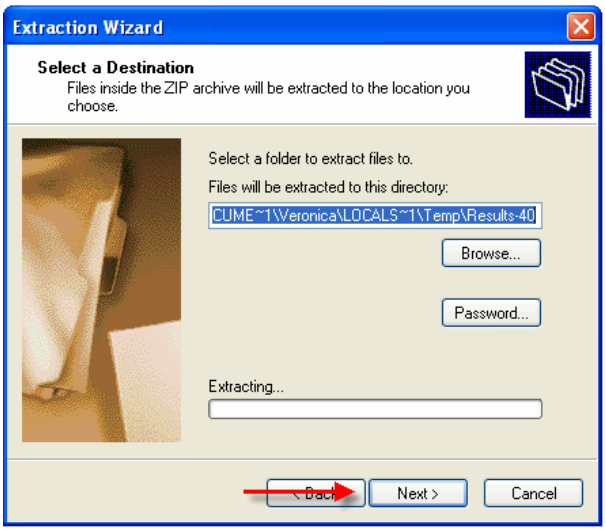


Step 3:

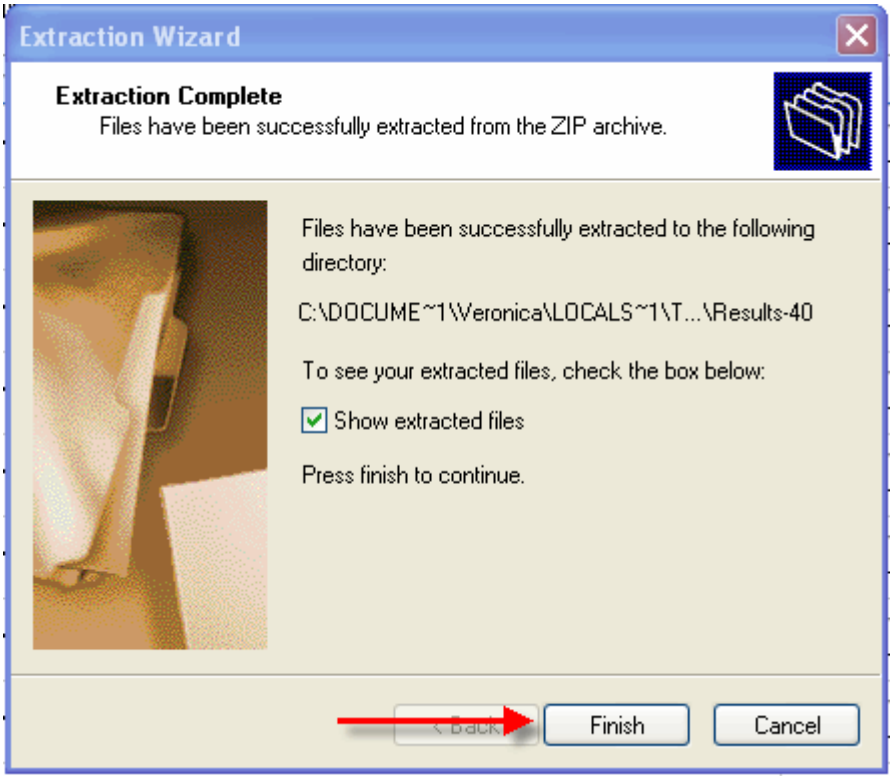
Click [Next] to open the compressed files with the Extraction Wizard.



Step 4: Click [Next] to extract the files.

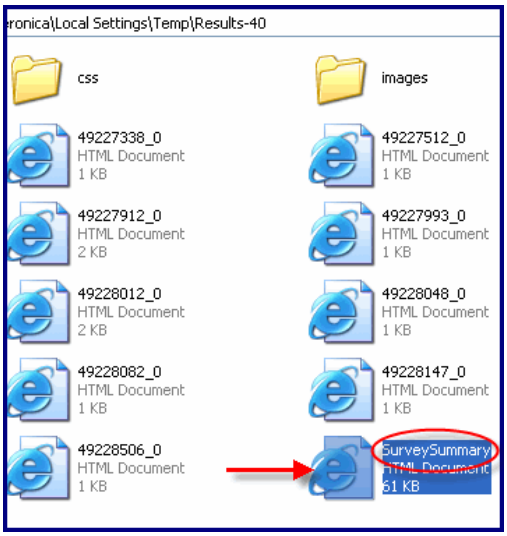


Step 5: Click [Finish] to continue and open the folder containing the extracted files.



Step 6:

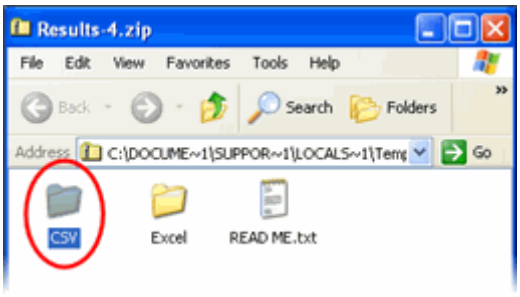
Select the HTML file titled **SurveySummary** to open the Results Summary of your export. You can then click the [View] button to see the open ended questions if you have selected to export them with your summary results.



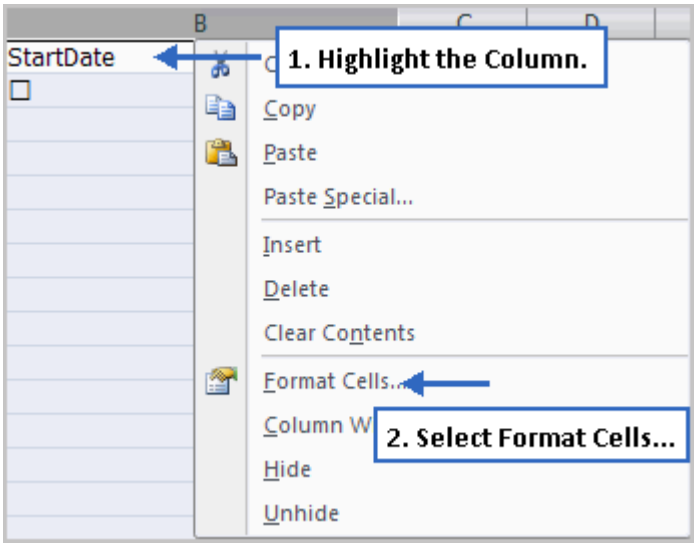
The best way to open the survey to display open-ended responses, time and date formatting correctly is to use the .CSV format.

Viewing Comments, Times, or Dates in Export

How to open CSV file in excel



When using the Excel exports, you must format the columns to display the data correctly for time and date question types. Please format the start and end date to see the minutes and seconds in results. To do so, select the column and format cells.



Viewing Minutes and Seconds with Start and End Dates:

To view the time with the start and end date, right click the column and select Format Cells; then select the "Date" Category. From the type selection, select the type that includes the time and click OK. The column will then be formatted to include the time the survey had been taken. To view the seconds, select Time from the Category menu when formatting the cells.

NOTE: Start and End Dates Don't Match!

We store all start and stop dates and times in **UTC** (Universal Coordinated Time) (aka GMT) within the database. So, all results export in UTC which may be different than the dates and times you see when browsing responses in your account. The start date and time when browsing responses displays the local time you have set for your account, but the data exports in UTC.

For more information and to register please visit the website:

http://www.surveymonkey.com/