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The Political Economy of Private Transport Regulation in Costa Rica

by

Rebecca Eugenia Osakwe Amador

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SIGNERS:

Francisco Alpízar, Ph.D.
Major Advisor

Juan Robalino, Ph.D.
Advisory Committee Member

Allen Blackman, Ph.D.
Advisory Committee Member

Glenn Galloway, Ph.D.
Dean, Graduate School

Rebecca Eugenia Osakwe Amador
Candidate

True wisdom consists in not departing from nature
and in molding our conduct according to her laws and model.

— Seneca

To my parents

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BIOGRAPHY

The author was born in New Orleans, Louisiana, where she grew up and completed her basic education. In 2006, she graduated from Stanford University with a Bachelor of Arts in Economics and a Minor in Russian Language. Between 2006 and 2010 she lived in Costa Rica, where she engaged in various research and educational activities.

Her interest in environmental and resource economics is personal, as well as professional. A survivor of hurricane Katrina, she is conscious of the multiple environmental, economic and social effects of natural disasters associated with unsustainable development. Furthermore, multiple experiences in Costa Rica have increased her appreciation of nature and her awareness of the environmental problems associated with economic growth that developing countries often faced. She hopes that through her research, she may contribute to the attainment of sustainable development goals.

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SUMMARY

This thesis characterizes the political economy of private transport regulation in Costa Rica through an analysis of a set of five policies: a technical vehicular inspection, car import taxes, a circulation permit, fuel taxes, and a driving restriction. Qualitative and quantitative methods complement each other in an innovative combination of stakeholder and econometric analysis.

Through a stakeholder analysis, I develop a set of five stakeholder salience matrices, which I use to address the following questions: (i) What stakeholders were involved in the implementation of this set of policies, and in what ways were they involved?, (ii) On what grounds have these policies been justified, and what has been the role of environmental and fiscal concerns in this justification?, (iii) What environmental interest groups have been involved in the implementation process of these policies? How successful have they been in highlighting the potential environmental benefits of these policies? Results of this analysis suggest that Costa Rica's current regulatory approach for the transport sector is characterized by a set of policies that reflect a myopic response from policymakers whose primary objectives are the temporary resolution of fiscal problems, and not the long-term resolution of problems associated with the transport sector.

Through an econometric analysis, I measure the effects of a driving restriction policy implemented in the Metropolitan Area of San José, Costa Rica on national transport fuel sales. Based on models described by Sterner and Dahl (1992), I develop two fuel demand models which I use to assess the effects of the driving restriction on national sales of diesel, regular gasoline, premium gasoline and gasoline in general (regular and premium combined). Results of this analysis suggest that although San José's driving restriction was successful in reducing gasoline sales between July 2008 and April 2009, low-income drivers were likely disproportionately affected by the policy.

The development and implementation of transport policies involves a complex interplay of conflicting interests, which in turn complicates the regulation of the transport sector. The analyzed set of transport polices has the potential to reduce externalities associated with the transport sector, but current problems associated with the sector indicate that these policies have much room for improvement. My main policy recommendations include increasing

policymakers' access to relevant data and research, and improving the fluidity of communication among different sectors of society. With this research, I attempt to help construct a more complete understanding of the political economy of private transport regulation in Costa Rica, and in so doing I hope to contribute to the design of a more integrated regulatory approach for the country's transport sector.

RESUMEN

Esta tesis caracteriza la economía política de la regulación del sector transporte costarricense mediante el análisis de un conjunto de cinco políticas: una revisión técnica vehicular, impuestos de importación de vehículos, un permiso de circulación, impuestos a los combustibles, y un programa de restricción vehicular. Métodos cualitativos y cuantitativos se complementan en una innovadora combinación de un análisis de actores y un análisis econométrico.

Mediante un análisis de actores, desarrollo un conjunto de cinco matrices de notabilidad (*salience*), las cuales utilizo para abordar las siguientes preguntas: (i) ¿Cuáles actores estuvieron involucrados en la implementación del conjunto de políticas, y en qué manera estuvieron involucrados?, (ii) ¿Cómo han sido justificadas estas políticas, y cuál ha sido el rol de intereses ambientales y fiscales en esta justificación?, (iii) ¿Cuáles grupos de interés ambiental han estado involucrados en el proceso de implementación de estas políticas? ¿Qué tan exitosos han sido en subrayar la importancia de los potenciales beneficios ambientales de estas políticas? Los resultados del análisis sugieren que el enfoque actual de la regulación del sector transporte en Costa Rica se caracteriza por un conjunto de políticas que reflejan una respuesta miope de parte de los creadores de políticas cuyos objetivos principales son la resolución temporal de problemas fiscales, y no la resolución a largo plazo de problemas asociados con el sector transporte.

Mediante un análisis econométrico evalúo los efectos de la política de la restricción vehicular, la cual fue implementada en el Área Metropolitana de San José, Costa Rica, sobre las ventas nacionales de combustible utilizado para transporte. Con base en modelos descritos por Sterner y Dahl (1992), desarrollo dos modelos de demanda por combustibles, los cuales utilizo para medir el efecto de la restricción vehicular en las ventas nacionales de diesel, gasolina regular, gasolina premium, y gasolina en general (regular y premium combinadas). Los resultados del análisis sugieren que la restricción vehicular de San José sí logró reducir las ventas nacionales de gasolina entre julio de 2008 y abril de 2009, sin embargo es probable que los conductores de menores ingresos hayan sido desproporcionalmente afectados por esta política.

El desarrollo y la implementación de políticas de transporte involucran una compleja interacción de intereses conflictivos, lo cual a su vez complica la regulación del sector transporte. El conjunto de políticas de transporte analizado es capaz de reducir las externalidades asociadas con el sector transporte, sin embargo, los actuales problemas asociados con el sector indican que estas políticas tienen mucho campo para mejorar. Entre mis principales recomendaciones de política están aumentar el acceso que tienen los diseñadores de políticas a datos e investigaciones relevantes, y mejorar la fluidez de comunicación entre diferentes sectores de la sociedad. Mediante esta investigación, intento ayudar a construir un entendimiento más completo de la economía política de la regulación del transporte privado en Costa Rica, y en esta forma espero contribuir al diseño de un enfoque más integrado para el sector transporte del país.

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LIST OF ABBREVIATIONS AND ACCRONYMS

ACEC	Costa Rican Asociation of Fuel Providers (*Asociación Costarricense de Expendedores de Combustible*)
APREFLOFAS	Association for the Preservation of Wild Flora and Fauna (*Asociación Preservacionista de Flora y Fauna Silvestre)*
ARESEP	Public Services Regulatory Authority (*Autoridad Reguladora de Servicios Públicos*)
ASANA	Association of the Friends of Nature of the Central and Southern Pacific (*Asociación de Amigos de la Naturaleza del Pacífico Central y Sur)*
CANAECO	National Chamber of Ecotourism (*Cámara Nacional de Ecoturismo*)
CANATRAC	National Chamber of Cargo Transport (*Cámara Nacional de Transportistas de Carga)*
CANATRANS	National Chamber of Transport (*Cámara Nacional de Transportes)*
CATIE	Center for Tropical Agricultural Research and Higher Education (*Centro Agronómico Tropical de Investigación y Enseñanza*)
CCSS	Costa Rican Social Security Agency (*Caja Costarricense de Seguro Social*)
COMEX	Ministry of External Commerce (*Ministerio de Comercio Exterior)*
CONAGEBIO	National Commission for Biodiversity Management *(Comisión Nacional para la Gestión de la Biodiversidad)*
CONAVI	National Road Security Council (*Consejo Nacional de Vialidad*)
COSEVI	Road Security Council (*Consejo de Seguridad Vial*)
CTP	Public Transport Council (*Consejo de Transporte Público*)
DIGECA	Division of Environmental Quality Management (*Dirección de Gestión de Calidad Ambiental*)
DR	driving restriction (*restricción vehicular*)
DTCC	Division of Fuel Transport and Commercialization (*Dirección de Transporte y Comercialización de Combustibles)*
EU	European Union
FONAFIFO	National Forestry Finance Fund (*Fondo Nacional de Financiamiento Forestal*)

GMA	Greater Metropolitan Area (*Gran Área Metropolitana*)
GEF	Global Environment Fund
G-SEBSA	Research Program in Governance and Socioeconomics of Environmental Goods and Services
GTZ	German Technical Cooperation
ICT	Costa Rican Institute of Tourism (*Instituto Costarricense de Turismo*)
IDB	Investment Development Bank
IMN	National Meteorological Institute (*Instituto Meteorológico Nacional)*
INA	National Learning Institute (*Instituto Nacional de Aprendizaje*)
INEC	National Statistics and Census Bureau (*Instituto Nacional de Estadística y Censo*)
INS	National Insurance Institute (*Instituto Nacional de Seguros*)
IPS	Institute for Policies for Sustainability (*Instituto de Políticas para la Sostenibilidad)*
LAA	Laboratory of Environmental Analysis (*Laboratorio de Análisis Ambiental*)
LANAMME	National Laboratory of Structural Materials and Models (*Laboratorio Nacional de Materiales y Modelos Estructurales*,)
MAG	Ministry of Agriculture and Cattle Ranching (*Ministerio de Agricultura y Ganadería*)
MINAET	Ministry of Environment, Energy and Telecommunications (*Ministerio de Ambiente, Energía y Telecomunicaciones*)
MOPT	Ministry of Public Works and Transport (*Ministerio de Obras Públicas y Transporte*)
ProDUS	Research Program for Sustainable Urban Development of the School of Engineering, University of Costa Rica *(Programa de Investigación en Desarrollo Urbano Sostenible de la Escuela de Ingeniería Civil)*
PSE	Payment for Ecosystem Services (*Pago por Servicios Ecosystémicos*)
RECOPE	Costa Rican Petroleum Refinery (*Refinadora de Petróleo Costarricense*)
RTV	technical vehicular inspection (*revisión técnica vehicular*)
SETENA	National Environmental Technical Secretariat (*Secretaría Técnica*

	Nacional Ambiental)
SINAC	National System of Conservation Areas (*Sistema Nacional de Áreas de Conservación*)
SJMA	San José Metropolitan Area (*Área Metropolitana de San José*)
TAA	Environmental Administrative Tribunal (*Tribunal Ambiental Administrativo*)
TSP	total suspended particles
UCCAEP	Costa Rican Union of Private Sector Enterprises (*Unión Costarricense de Cámaras y Asociaciones de la Empresa Privada)*
UCR	University of Costa Rica (*Universidad de Costa Rica*)
UNA	National University of Costa Rica (*Universidad Nacional de Costa Rica*)
UNDP	United Nations Development Fund
VIDA	Association for Environmental Volunteering, Research and Development *(Asociación de Voluntariado, Investigación y Desarrollo Ambiental)*
WB	World Bank
WHO	World Health Organization

1. INTRODUCTION

Anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist.

— Kenneth Boulding

1.1. Background and Justification

The relationship between humans and the environment is complex, and in recent years this relationship has become increasingly tense due to the unsustainable approach to development adopted by human societies around the world. At its essence, this relationship is based on interactions among humans as they strive to fulfill individual as well as collective needs through the use of ecosystem goods and services. In 1987, the United Nations released the Brundtland Report, which defines sustainable development as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." The successful transition to this type of development depends largely on the implementation of policies that address the links among economic development, population growth and the use of environmental goods and services, thereby regulating human impact on ecosystems. It is imperative that policymakers be adequately informed both of the problems that can arise from a stressed human-environment relationship and of the tools that can be used to promote and maintain a balance in this relationship.

The regulation of energy consumption, especially of fossil fuels, has earned special attention in international and national attempts to improve the relationship between human societies and the environment. During the 1970s, a global energy crisis stimulated research on technologies for saving energy and for alternative methods of producing energy. Nevertheless, the technological development of the 70s was not enough to curb energy consumption in the subsequent decade. During the 1980s, human activities used about 40% of the primary energy transformation through photosynthesis, which is the basis of all life on Earth (Vitousek et al. 1986, 1997). A decade into the twenty-first century, energy consumption, especially of fossil fuels, poses threats at local and global levels. Its potential effects on climate and human health are topics of international concern.

A significant part of the energy consumption problem is associated with the transport sector, particularly private transportation. Since the 1970s, vehicle fleets in developing countries have grown at an average annual rate of 6%—double the rate for developed countries (Dargay et al. 2007). As the number of vehicles in these countries has increased, so have problems associated with private transportation, including air pollution, traffic congestion, and traffic accidents. Currently, cars, trucks and buses are a leading source of local air pollution in developing countries, and in some cases they contribute over 90% of emissions (Timilsina and Dulal 2009). Furthermore, they contribute to 13% of global emissions of greenhouse gases (Pachauri and Reisinger 2007).

A number of factors limit the ability of policymakers to reduce these problems using conventional direct regulatory instruments such as maintenance and inspection programs, fuel economy standards, driving restrictions, and technology mandates. Institutions often lack the staff and the funding to satisfactorily regulate mobile sources of pollution. These deficiencies are often aggravated by a lack of adequate political will (Sterner 2003; Russell and Vaughn 2003).

Many developed countries currently implement transport policies that have more or less succeeded in keeping transport problems under control. Conversely, in developing countries, problems associated with private transportation are getting worse, as evidenced by a rise in air pollution, traffic congestion and traffic accidents in the major cities of Latin America, Africa, and Asia. Moreover, annual deaths from accidents in developing countries average almost one per 100 vehicles, which exceeds the rate in industrialized countries by 300% (Sterner 2003). Policymakers in these countries must overcome several added challenges that their developed country counterparts do not have to face—inadequate infrastructure, a high population growth rate, insufficient funds, and corruption are just a few of these challenges.

Like other developing countries, Costa Rica has witnessed an aggravation of transport-related problems as the growth of its economy stimulates the expansion of urban areas in a disorderly manner (Hernandez, *Interview*). The capital city of San José is beset by the effects of local urban air pollution, traffic congestion, and traffic accidents. Policymakers have taken measures to address these problems, but with little success. Existing studies on the regulation of the private transport sector tend to focus on one or two specific policies, but they do not

address the interaction among various policies. I hope to fill this gap by conducting a more wholesome analysis of five policies that regulate Costa Rica's private transport sector.

1.2. Basic Definitions and Concepts

In order to design appropriate transportation policies, policymakers must understand the reasons behind the problems they hope to address. Fundamental to this understanding is the concept of market failure. *Market failure* refers to conditions under which the free market fails to generate optimal welfare, as compared to the abstract model of a perfect market economy. Some examples of market failure that are especially relevant to the transport sector include *externalities*, *public goods*, *incomplete property rights* and *asymmetric information*.

An *externality* refers to a nonmarket side effect of production or consumption, and it can be understood as the consequence of *incomplete property rights* (Sterner 2003). An externality can be negative or positive, depending on the consequences for the uncompensated person or firm. Air pollution, road congestion and traffic accidents are examples of negative externalities that result from the use of motor vehicles. They are unintended side effects of driving which affect city dwellers who, in the absence of regulation, are not compensated for the losses incurred as a result of these side effects. This occurs when property rights over the good in question are poorly defined. For example, in the absence of regulation, it is unclear who owns the property rights to clean air, and consequently it is not clear whether drivers have the right to pollute the air or whether city dwellers have the right to breathe clean air. In cases such as this one, it is ambiguous which actor is entitled to receive compensation and which actor is expected to pay for that compensation.

This is often the case with *public goods*—products or services enjoyed in common. The market tends to undersupply these goods, because it is difficult to exclude those who do not pay. For example, congestion-free roads are a public good that many individuals wish to enjoy, but few will voluntarily modify their behavior in order to keep traffic flowing. In an optimistic scenario, a few individuals will assume responsibility for keeping the roads congestion-free, perhaps by taking public transportation or engaging in carpooling activities, while those who do not modify their behavior will enjoy the benefits of less traffic without having invested time, effort or money in this beneficial outcome. In a pessimistic scenario, nobody will modify their transportation choices, and the result will be overly congested roads.

Asymmetric information is a particularly important concept for policymakers to understand, because they are often directly affected by this kind of market failure. The concept is defined as the condition in which at least some relevant information is known by some but not all affected parties. Information is costly, and policymakers often lack reliable data needed to make informed decisions. This in turn affects their ability to design policies that are efficient with respect to resource allocation and fair with respect to the distribution of costs (Sterner 2003). This thesis contributes to the organization and distribution of information that will potentially aid Costa Rican policymakers in designing a more integrated set of transport policies.

The term *political economy* has had several different connotations throughout history. Today, the concept lies somewhere along the boundary between political science and economics. In the words of Persson and Tabellini (2000), those who study the political economy of a country or economic sector strive to understand "how policy decisions are made, what shapes the incentives and constraints of the policymakers taking those decisions, and how conflicts over policy are resolved." (p.1) Political economy is an important component of research in economics, because it adds political relevance to quantitative results and thereby allows these results to have a significant and real impact on the wellbeing of members of society. In assessing a set of private transport policies from a political economy perspective, I aim to study the interactions between stakeholders by using qualitative and quantitative tools.

1.3. Objectives

In this section I define the general objective of this thesis and three specific objectives.

1.3.1. General Objective

The general objective of this thesis is to characterize the political economy of Costa Rica's private transport sector through an analysis of a set of five transport policies (a technical vehicular inspection, car import taxes, a circulation permit, fuel taxes, and a driving restriction) and to identify the main opportunities and challenges in designing a more integrated regulatory approach for the sector.

1.3.2. Specific Objectives

The following specific objectives are defined:

1. To identify current and potential stakeholders associated with the relevant set of policies and analyze their role in current and future policymaking.
2. To assess the effects of the driving restriction program implemented in the Metropolitan Area of San José, Costa Rica on national fuel sales.
3. To identify the main shortcomings of the relevant set of transport policies and provide recommendations for policymakers.

1.4. Scope, Structure and Methods

The main geographical area of interest is defined by the San José Metropolitan Area (SJMA) of Costa Rica. Although the five policies analyzed are applicable to the entire country, transport externalities are most severe in the SJMA, and the effects of these policies are most visible in this area.[1] The SJMA includes the following counties[2], shown in Figure 1: San José, Escazú, Desamparados, Goicoechea, Santa Ana, Alajuelita, Coronado, Tibás, Moravia, Montes de Oca, and Curridabat, and La Unión.[3] The timeframe of analysis of this study is the period between 1999 and 2009. During this window of time, Costa Rican policymakers have either initiated or modified the relevant set of transport policies.

The structure of the thesis is as follows. Chapter 2 provides a context for transport policies in Costa Rica. Here I discuss relevant environmental, administrative and legal issues. Chapter 3 defines the relevant set of transport policies: a technical vehicular inspection, car import taxes, a circulation permit, fuel taxes, and a driving restriction. Here, I discuss reasons for implementation, terms and potential effects on the reduction of transport-related externalities of each policy. Chapter 4 addresses Specific Objective No. 1. Here I address the following questions: (i) What stakeholders were involved in the implementation of our set of policies, and in what ways were they involved?; (ii) On what grounds have these policies been justified,

[1] The driving restriction applies only to the SJMA, however one of its objectives was to reduce fuel sales nationwide. Fuel taxes, car taxes, the technical vehicular inspection (RTV) and the circulation permit (*marchamo*) apply to the entire country.
[2] The term in Costa Rica is *cantón*.
[3] La Unión administratively belongs to the province of Cartago, however it has close functional ties with the SJMA.

and what has been the role of environmental and fiscal concerns in this justification?; (iii) What environmental interest groups have been involved in the implementation process of these policies? How successful have they been in highlighting the potential environmental benefits of these policies? Chapter 5 addresses Specific Objective No. 2. Here I conduct an econometric analysis to measure the effects of Costa Rica's driving restriction policy on monthly fuel sales nationwide. Chapter 6 summarizes the results of the analysis conducted in chapters 4 and 5 (specific objectives 1 and 2, respectively). Here I also address Specific Objective No. 3 by pointing out shortcomings of the relevant set of policies and providing concrete recommendations intended to aid stakeholders and policymakers in designing a more integrated set of transport policies.

The methodology is a combination of qualitative and quantitative analysis. A qualitative stakeholder analysis (Chapter 4) is complemented by a quantitative econometric analysis (Chapter 5) to characterize the political economy of Costa Rica's private transport sector.

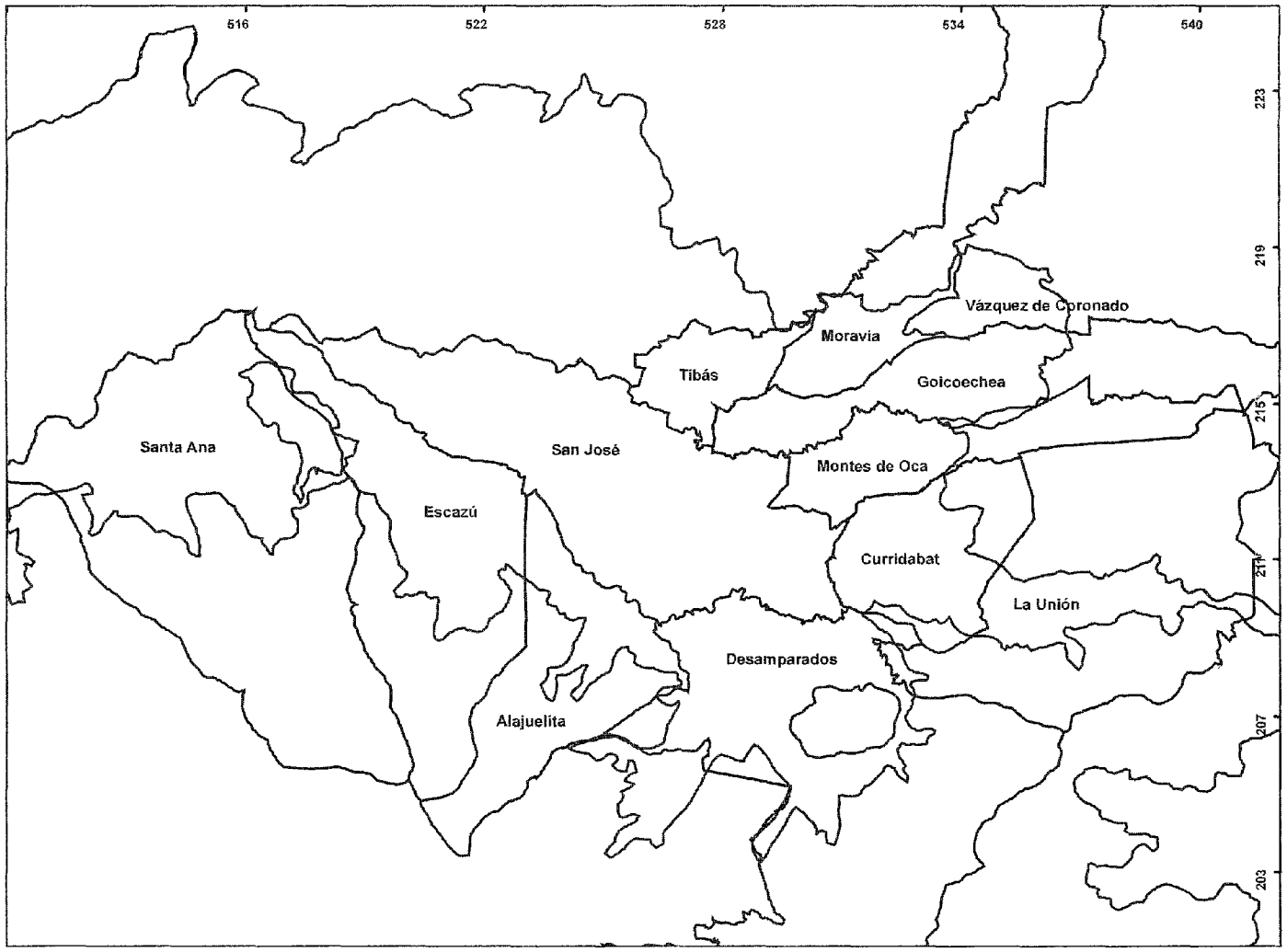

Figure 1. Map of the San José Metropolitan Area (SJMA)
Source: Pérez (2006), using data from ProDUS

2. A CONTEXT FOR TRANSPORT POLICIES IN COSTA RICA

If they'd lower the taxes and get rid of the smog and clean up the traffic mess,
I really believe I'd settle here until the next earthquake.

—Groucho Marx

2.1. A History of Environmental Policies in Costa Rica

Costa Rica's reputation as an "environmentally conscious" country traces its roots to the 1940s, when policymakers made a pronounced effort to promote the conservation of the country's natural resources. In 1942, Costa Rican policymakers signed the Washington Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere, and with this event they marked the beginning of a new environmental era for the country. This treaty was the first of many political measures that have contributed to Costa Rica's favorable environmental reputation (Fonseca, *Interview*; Umaña, *Interview*).

In 1955, the Costa Rican Institute of Tourism (*Intituto Costarricense de Turismo*, ICT) was created, and policymakers granted the institute the ability to create national parks (Law 1917, Chapter 3, Article 5, Section f). This was one of the first steps toward the development of strong ties between the tourism industry and environmental policy goals. Such ties have contributed to the development of national ecotourism, which, according to the National Chamber of Ecotourism (*Cámara Nacional de Ecoturismo*, CANAECO), can be defined as "tourism that promotes and supports the conservation of nature and the culture of tourist destinations, favors the socioeconomic improvement of local communities, and tries to raise environmental awareness among travelers by putting them in direct contact with nature and local culture."

Today, Costa Rica has a diverse array of conservation areas, including 24 national parks, 9 biological reserves, 31 protected zones, 12 forest reserves, 39 national wildlife refuges, and 14 wetland areas ("Qué es ecoturismo?"). These areas contribute to the country's rich biodiversity—although the country accounts for only 0.03% of the Earth's total land area, it holds 5% of the world's species ("Qué es ecoturismo?").

Efforts to conserve national forest land led to the enactment of the first Forestry Law (*Ley Forestal*, Law No. 4464) in 1969. This law was updated by a revised Forestry Law (Law No. 7575) in 1996, and soon thereafter the Payment for Ecosystem Services program (*Pago por Servicios Ecosystémicos,* PSE), which is considered the most successful program of its kind in the world (WB 2006), was established. In 1977, the National Parks Service (*Servicio de Parques Nacionales*) was created through the enactment of Law No. 6084 as a division of the Ministry of Agriculture and Cattle Ranching (*Ministerio de Agricultura y Ganadería*, MAG), and in 1998 the National System of Conservation Areas (Si*stema Nacional de Areas de Conservación*, SINAC) was officially established through the enactment of the Law of Biodiversity (*Ley de Biodiversidad*, Law No. 7788).

In 2005, former President Arias developed the Peace with Nature initiative (*Paz con la Naturaleza*) to promote environmental responsibility in the public and private sectors of countries around the world (Vargas 2007). In May 2007, Costa Rica received a $30 million loan from the WB and a donation of $10 million from the Global Environment Fund, both to be used toward the conservation of the environment (Ulett 2007). In June 2007, President Arias announced that Costa Rica would take measures to become carbon-neutral by 2021. If the goal is met, Costa Rica will become the first country in Central America to have neutral emissions of carbon dioxide and other greenhouse gases (Vargas 2007).

2.2. Main Externalities Associated with Costa Rica's Transport Sector

Despite a demonstrated interest in addressing environmental goals, Costa Rican policymakers have failed to address prominent environmental problems that affect the country's urban areas. This is evidenced by the deterioration of environmental quality in the GMA caused by a high concentration of productive activities, an increase in untreated waste, a rise in polluting and greenhouse gases, the absence of air quality monitoring, and inadequate inter-institutional coordination (MIDEPLAN 2007). The transport sector contributes to some of these problems, as transport policies have not adapted quickly enough to the rapidly changing transportation needs of Costa Rica's growing economy and population. Air pollution, vehicular congestion and traffic accidents are especially problematic.

2.2.1. Air Pollution

A well-accepted definition of air pollution is "the presence of gases, particles and vapors in the atmosphere that have been directly or indirectly incorporated to the air, either by anthropogenic or natural sources, in quantities that are sufficient to adversely affect animals, vegetation, materials and humans" (Herrera and Rodriguez 2005). According to studies conducted by the Laboratory of Environmental Analysis (*Laboratorio de Anlálisis Ambiental*, LAA) at the National University of Costa Rica (*Universidad Nacional de Costa Rica*, UNA), air quality in Costa Rica has deteriorated significantly in the past two decades (Herrera and Rodriguez 2005, 2006, 2007). Key factors that have contributed to urban air pollution in San José include an increase in the circulation of private vehicles, buses and trucks, an outdated public transport system that does not satisfy the needs of its users, the poor state of the national vehicle fleet, poor fuel quality, a lack of coordination among institutions responsible for regulating air quality, and a lack of urgency given to the issue (Herrera and Rodriguez 2005).

The problem of air pollution is most severe in Costa Rica's GMA. The GMA accounts for only 4% of the national territory (2084 km^2), but it holds 75% of the country's vehicle fleet, 70% of its industrial activity, and 60% of its population, according to data from the most recent population census (UNA et al. 2008). This concentration of commercial and industrial activities in such a small geographic area contributes to the deterioration of air quality. The capital city of San José, which is located within the GMA, has the highest levels of air pollution in the country, with levels that are above international standards (MIDEPLAN 2007). This can be explained by the fact that San José holds about 70% of the entire country's vehicle fleet and the emissions of these vehicles account for 75% of air pollution in the city (Herrera and Rodriguez 2005).

Another factor to consider in the deterioration of air quality is the rising trend in international fuel prices, which has motivated many Costa Ricans to prefer purchasing diesel-powered vehicles over gasoline-powered vehicles (Herrera and Rodriguez 2005). Table 1 shows that with the exception of 2002, national diesel sales have surpassed national sales of gasoline (regular and premium combined). This is noteworthy, because diesel-powered vehicles produce higher levels of particulate matter and sulfur oxides than do gasoline-powered

vehicles (Herrera and Rodriguez 2005). Consumption of both diesel and gasoline has risen consistently since 1990, and a main cause of this trend has been an increase in the circulation of motor vehicles (Herrera and Rodriguez 2005, 2006, 2007). As shown in Table 1, the national vehicle fleet has increased by an average of 3.42% per year since 1999, going from just over 612 thousand vehicles in 1999 to nearly 800 thousand in 2007.

Table 1. Fuel and transport statistics for Costa Rica, 1999 to 2008

Year	Vehicles[a]	Traffic accidents[b]			Price[c]				Sales[d]			
		Total	Injury/Death	No Injury	Diesel ('06 col. / liter)	Gasolines (regular + premium) ('06 col. / liter)	Regular gasoline ('06 col. / liter)	Premium gasoline ('06 col. / liter)	Diesel (barrels)	Gasolines (regular + premium) (barrels)	Regular gasoline (barrels)	Premium gasoline (barrels)
	(no.)	(no.)	(%)	(%)								
1999	612,300	48,983	30.49%	69.51%	-	-	-	-	-	-	-	-
2000	641,302	50,358	32.73%	67.27%	186.2	557.97	271.2	286.77	4,739,020	4,701,181	2,757,214	1,943,967
2001	664,563	53,208	32.99%	67.01%	193.66	572.44	278.98	293.45	5,079,054	4,954,048	3,021,676	1,932,372
2002	689,763	53,380	30.26%	69.74%	208.13	612.41	299.09	313.32	5,170,857	5,285,616	3,115,011	2,170,605
2003	728,421	53,668	33.04%	66.96%	260.73	752.18	366.89	385.3	5,324,680	5,276,425	3,093,147	2,183,278
2004	705,975	52,362	38.10%	61.90%	335.15	949.75	463.32	486.43	5,523,874	5,354,398	3,186,249	2,168,149
2005	705,546	57,127	36.77%	63.23%	441.59	1247.16	605.68	641.48	6,044,176	5,242,996	3,388,980	1,854,016
2006	729,487	68,627	27.17%	72.83%	518.14	1534.86	747.12	787.74	7,046,740	5,268,267	3,591,607	1,676,660
2007	797,902	69,761	29.02%	70.98%	621.97	1671.24	812.69	858.55	7,806,422	5,523,158	3,743,963	1,779,195
2008	-	-	-	-	928.85	1939.48	958.5	980.98	7,864,226	5,652,598	3,674,264	1,978,334
Avg. annual percent change	3.42%	4.82%	0.20%	0.46%	22.97%	17.25%	17.48%	17.03%	6.65%	2.37%	3.71%	0.61%

Sources: [a]Ministry of Public Works and Transport (MOPT), Division of Sectoral Planning; [b]Ministry of Public Works and Transport (MOPT), Division of Sectoral Planning, using data from the Road Security Council (COSEVI); [c]Costa Rican Petroleum Refinery (RECOPE); [d]Costa Rican Petroleum Refinery (RECOPE)

A study conducted by Alfaro and Ferrer (2001) on air quality in San José and surrounding areas shows that various points in the city of San José and in other cities in the provinces of Heredia and Alajuela exhibited worrisome levels of carbon monoxide. In San José, levels of carbon monoxide were found to be above the recommended 9 ppm as many as three times a day, and in the center of the city, some points exhibited up to 38 ppm during peak hours, especially between 7 and 8:30 AM. A study conducted by Vega et al. (2004) on air quality showed that the yearly average of total suspended particles (TSP) in the country was well above the recommended 75 micrograms per cubic meter. Table 2 compares mean annual concentrations of air pollutants in San José in 2000 to World Health Organization (WHO) and European Union (EU) guidelines. TSP and sulfur dioxide levels in San José are well above WHO and EU limits, while nitrogen dioxide levels are approaching the limit.

Table 2. Mean annual concentrations of air pollutants in San José, Costa Rica and World Health Organization and European Union guidelines

City	Pop. ('000)	TSP[a] (ug/m3)	PM10[b] (ug/m3)	SO2[c] (ug/m3)	NO2[d] (ug/m3)	Year
San José, CR	1,186	101	18	160	31	2000
WHO[e] guideline		60	--	50	40	
EU[f] limit		--	40	20	30	

[a]Total suspended particulate matter; [b]Particulate matter smaller than 10 microns; [c]Sulfur dioxide; [d]Nitrogen dioxide; [e]World Health Organization; [f]European Union.
Source: Baldasano et al. (2003)

When compared to urban areas in other Latin American countries, Costa Rica's GMA is relatively less contaminated. This is primarily due to favorable geographic and meteorological conditions that allow winds to disperse air pollutants (Alfaro 2002; Estado Nación 2002). It is possible that this has decreased the urgency of the problem as perceived by policymakers and citizens (Corrales, *Interview*). Policymakers have taken some measures to reduce air pollution, including the implementation of an emissions test in the mandatory vehicular technical inspection (Box 1). Nevertheless, air pollution in Costa Rica's GMA continues to be problematic.

Box 1. Principal measures to counteract air pollution in Costa Rica

- In 1998, the national government began the process of selecting a company to be in charge of supervising a nationwide technical revision of all motor vehicles in circulation. The company RITEVE SyC was selected, and in July 2002, the company began to implement the Technical Vehicular Inspection (RTV), which is still in effect today. The inspection includes an emissions test and thereby contributes to the regulation of air pollution.

- In 2003, the LAA at UNA joined efforts with the Municipality of the City of San José to establish a network of air pollution monitoring stations, with the purpose of generating data that could aid policymakers make informed decisions regarding policies that affect the regulation of air quality. In 2005, both parties signed the "Treaty for Cooperation between Universidad Nacional and the Municipality of San José" (*Convenio de Cooperación entre la Universidad Nacional y la Municipalidad de San José*), and they formally established the "San José Green Agenda Program" (*Programa Agenda Verde San José)*—a program intended to improve the environmental management of the Central County of San José. The Ministry of Health subsequently became a contributor to the program.

- In 2005, the government of Costa Rica and the German Technical Cooperation (GTZ) established the "San José Clean Air Project" (*Proyecto Aire Limpio San José*), a project intended to reduce the problem of air pollution in a planned, coordinated and participative way. The institutions involved include MOPT, the Ministry of Health, MINAET, the Ministry of Public Education, the Regulatory Authority of Public Services (ARESEP), the Costa Rican Social Security Council (CCSS), the National Learning Association (INA), the Municipality of San José, UNA, the University of Costa Rica (UCR), the National Confederation of Associations for Community Development (*Confederación Nacional de Asociaciones de Desarrollo Comunal*), the Association of Journalists (*Colegio de Periodistas*), RITEVE SyC and Swisscontact.

- In 2008, the "Program for the Improvement of Air Quality in the GMA of Costa Rica" (*Programa para mejorar la calidad de aire de la GAM de Costa Rica*) was implemented, and it is expected to be completed by 2013. Its main purpose is to reduce air pollution levels in the area in a gradual and sustainable manner, and thereby help to protect the health of inhabitants of the area. The program is led jointly by the LAA, at UNA, MOPT, and MINAET.

2.2.2. Vehicular Congestion

Vehicular congestion is another major problem that affects Costa Rica's urban areas, especially San José. According to a study conducted by Vega et al. (2004), on average in 2004, 110 buses entered San José every hour, and private vehicles completed a total of 1.1 million trips per day at an average speed of 7.5 kilometers per hour (less than five miles per hour).

Urban traffic congestion is influenced by several factors. An increase in the number of vehicles is one obvious factor, but the design of the road system is also important. In San José

and its surroundings, the road system is characterized by a concentric radial pattern (Vega et al. 2004). Consequently, communication among all the counties on the periphery of San José's metropolitan area is done on roads that lead to the center of the city. Trips via public and private transportation tend to cross the center of the city, even when that is not the final destination. Furthermore, commercial activity is concentrated in San José, so many individuals from the periphery travel to the center on a daily basis for work. The result is an overflow of traffic in the center of San José.

Since 2004, traffic congestion has worsened in the metropolitan area, but few measures have been taken to address the problem. Ronald Flores, while occupying the position of Sub-director of the Division of Sectoral Planning (*Planificación Sectorial*) at the Ministry of Public Works and Transport (*Ministerio de Obras Públicas y Transporte*, MOPT), made three principal suggestions to reduce traffic congestion. First, he recommended restricting the circulation of buses to the periphery of the city in order to reserve main roads for private transport. Second, he suggested prohibiting parking lots and loading and unloading zones in the center. Third, he emphasized the need to reinstall the train system for both passenger and cargo transportation (Flores 2004). Until present, little has been done to implement his suggestions. In 2005, the government initiated a national plan to reduce fuel consumption which includes a few measures that also have the potential to reduce traffic congestion. One such measure is earlier entrance and exit times for certain government agencies with offices within the SJMA (7 AM to 3 PM, as opposed to 8 AM to 4 PM). Another such measure is a driving restriction program that restricts the circulation of most private vehicles within a restricted zone of the SJMA on the basis of the last digit of the vehicle's license plate number (Loaiza 2005).

2.2.3. Traffic Accidents

Traffic accidents are yet another prominent externality associated with Costa Rica's private transport sector. In 2007, 20% of disability pensions administered by the CCSS were for victims of traffic accidents (Ávalos 2007). As shown in Table 1, traffic accidents have increased almost constantly between 1999 and 2007, reaching nearly 70 thousand in 2007. The distribution of accidents has remained relatively constant, with about 70% of accidents causing no injury, and the remaining 30% causing injury or death.

2.3. Administrative Issues

During the 1970s, Costa Rica's national economy was marked by elevated government expenditures, an anti-exportation policy that limited economic growth and thus limited the government's ability to maintain elevated expenditure levels, as well as external price changes—specifically, a sharp rise in the international price of oil and a fall in the international price of coffee (Fallas 1981). From 1979 to 1984, the country experienced an economic crisis, and between 1980 and 1982, at the peak of the crisis, GDP fell by around 15% (Fallas 1981). In response, the national government increased the price of government-regulated goods and services, most notably the price of electricity, water, and telephone services, as well as the tax on fuel (Fallas 1981). These higher prices generated government income and helped end the crisis. However, by the end of the 1990s, these sources of government revenue no longer fulfilled their purpose, because they had not been adequately adjusted to inflation (Fonseca, *Interview*; Castillo, *Interview*). In an attempt to reclaim the lost income, the government began to rely more heavily on income-generating policies. Policies that regulate the transport sector, particularly fuel and car taxes, were well-suited for this purpose. Today, these policies are justified on the grounds that they help reduce transport-related externalities, but their primary objective continues to be the generation of government revenue (Fonseca, *Interview*).

The income generated by all but one of these transport policies is collected and administered by the Ministry of Finance (*Ministerio de Hacienda*), and this ministry receives a significant portion of the funds generated by all five policies[4]. In addition to collecting and administering all public income, this ministry is responsible for the administration of public internal and external debt, and the minimization of fiscal deficit through the "rationalization of expenditures and flexibility in its assignment" ("Misión-Visión", Ministry of Finance). It should be noted that this ministry lacks an institutional mandate to reach environmental goals, and this is reflected in its prioritization of projects and assignment of funds.

[4] Circulation permit (*marchamo*) funds are administered by INS, but the Ministry of Finance receives 65% of funds.

2.3. Legal Issues

Before a policy becomes official, it must have a legitimate legal foundation. In Costa Rica, the process of creating or reforming a law or regulation is often slow and time consuming. Any Costa Rican citizen can create a bill, but he must find a representative, for example from his province or county, to present his bill before the Legislative Assembly (*Asamblea Legislativa*). Once this happens, the Secretary sends the file to the president of Congress, who assigns the file to a committee for study. If the committee approves the bill, it is debated yet again during a Congressional plenary session, and if a consensus is reached, it is sent to the President of the Republic for approval. The President can approve the bill or veto it, and in the latter case, Congress can override the veto with a two thirds majority vote.

Given that this process is often lengthy, it is noteworthy that certain bills intended to reform transport regulation have quickly become laws. For example, the proposal to create the Law of Tax Simplification and Efficiency passed in only six months—a speed that suggests the urgency of the need to raise government revenue and the influence of the Ministry of Finance over this particular policy implementation process. Agreement among stakeholders regarding the law's terms, especially with regard to the fuel tax, was not particularly high; since the law was approved, several proposals have been filed in response to shortcomings identified by stakeholders (Box 2). These proposals address distributional, environmental and fiscal concerns to varying degrees.

The role of the Constitutional Court (*Sala Constitucional*, *Sala IV*) is another important legal aspect that Costa Rican policymakers should consider when designing transport policies. In August 1989, the Constitutional Court was established through the enactment of Law 7128, which reforms articles 10, 48, 105 and 128 of the Political Constitutional, and the enactment of the Law of Constitutional Jurisdiction (*Ley de la Jurisdicción Constitucional*, Law No. 7135), which regulates all constitutional processes supervised by the Constitutional Court. Since its creation, the court has had an important impact on the policymaking process, particularly because it facilitates the process of issuing a claim of unconstitutionality (Mora et al. 2009). By reducing the formal requirements needed to issue such claims, it has increased their likelihood. This has had a mixed effect on Costa Rica's judicial system (Mora et al.

2009). On one hand, it has increased citizens' awareness of their constitutional rights and it has granted them greater power in defending these rights. On the other hand, it has generated an overwhelming number of cases, and this has negatively affected the quality of the court's decisions. In some cases, decisions are contradictory, which can generate confusion (Solano 2009). For this reason, it has been described as an attack on judicial security.

As a case in point, the Constitutional Court played an important role in the implementation of the driving restriction policy (Mora et al. 2009), which has been the object of more than one claim of unconstitutionality. One such claim had the effect of stopping the restriction altogether, only for policymakers to reinstate the restriction about a month later. This on-and-off game has led to confusion regarding the policy's enforcement and terms, which has possibly had a negative effect on compliance rates. Furthermore, it has likely had an undesirable effect on the public's perception of the ability of policymakers to implement well-designed policies (Rodriguez, Beatriz, *Interview*).

Box 2. Summary of relevant legislature

	Proposal to create the Law of Tax Simplification and Efficiency (*Proyecto de ley de simplificación y eficiencia tributaria*)
File No.	14189
Date Filed	December 2000
Status	Approved in June 2001 as Law 8114
Proponent(s)	Several representatives
Main points	Chapter 1 of the law sets taxes on fuel. Article 1 of that chapter sets a fixed tax rate for fuel, thereby replacing the percent rate tax that was previously in effect. It specifies that the Ministry of Finance is responsible for modifying the amount of the tax, which varies by fuel type, on a trimesterly basis to account for fluctuations in the CPI, as defined by INEC. Furthermore, the trimesterly adjustment cannot be greater than 3% and must be published in an Executive Decree within the first five business days of each trimester. Within two business days of the publication of the Executive Decree, ARESEP must adjust fuel prices accordingly, and *La Gaceta*, the national press, has two business days to publish the new prices set by ARESEP. Once these new prices have been published, RECOPE is responsible for adjusting fuel prices at its service stations the day following publication. Thus, fuel prices at the pump should be adjusted within a maximum of 10 business days after the start of a new trimester.
	Exemption of the payment of the diesel tax for electricity production (*Exoneración del pago del impuesto al diésel para la producción de electricidad*)
File No.	16759
Date Filed	September 2007
Status	under study
Proponent(s)	Several representatives
Main points	Proposes to exempt ICE and rural electricity cooperatives from paying the tax on diesel for the production of electric energy. Does not focus on any particular income group. It does not de-stimulate the use of diesel in electricity production. Does not take into account fiscal effects.
	Law to contain the inflation of fuel prices (*Ley para contener el efecto inflacionario del precio de los combustibles*)
File No.	16924
Date Filed	January 2008
Status	under study
Proponent(s)	Rep. Jorge Eduardo Sánchez S.
Main points	Proposes a 20% reduction in the tax on regular and super gasoline and a 50% reduction in the tax on diesel. These reductions should be kept in place during 3 years. Does not focus on lower-income groups. Does not take into account the reduction in fiscal revenue.
	Reform of Article 1 of Law 8114 (*Reforma del artículo 1 de la Ley 8114*)
File No.	16966
Date Filed	March 2008
Status	under study
Proponent(s)	Rep. Oscar López

Main points	Expands the exoneration of the fuel tax to taxis and public buses. Has the potential to reduce fuel consumption if more individuals switch to using public buses, but not if they switch to using taxis. Does not take into account fiscal effects.
	Modification of the unique tax on fuel and the creation of an additional fee on the ownership of diesel vehicles (*Modificación del impuesto único a los combustibles y creación de una carga impositiva adicional a la propiedad de vehículos diésel*)
File No.	17067
Date Filed	June 2008
Status	under study
Proponent(s)	Several representatives
Main points	Changes the fuel tax level in order to keep the same real value as when the tax was initially created (i.e., same revenue-GDP ratio), because the Law's adjustment method is limited. Proposes to eliminate the diesel tax and increase the property tax on privately-owned diesel vehicles. Tries to be fiscally neutral, but does not specify whether the increase in the property tax on diesel vehicles will compensate the loss in revenues that will result from the elimination of the diesel tax. Tries to favor lower income groups. Administratively complex. Does not directly attempt to reduce fuel consumption.
	Law to reduce the impact of the rise in fuel prices on public transport (*Ley para reducir el impacto del alza del precio de los combustibles en el transporte público*)
File No.	17132
Date Filed	August 2008
Status	under study
Proponent(s)	Executive Branch
Main points	Claims wide agreement among representatives of Congress. Exempts public transport from paying fuel taxes (diesel and regular gas). Administratively complex. Proposes the creation of "fuel debit cards" for purposes of administrative control.
	Reform of Law 8114 of Tax Simplification and Efficiency (*Reforma de la Ley 8114 de Simplificación y Eficiencia Tributaria*)
File No.	16808
Date Filed	October 2008
Status	under study
Proponent(s)	Rep. Oscar López
Main points	Expands the exoneration of the fuel tax to vehicles that belong to hospitals affiliated with the Costa Rican Social Security Council (*Caja Costarricense de Seguro Social*, CCSS), the Ministry of Public Security (*Ministerio de Seguridad Pública*), the Ministry of Government and Police (*Ministerio de Gobernación y Policía*) and the National Insurance Institute (*Instituto Nacional de Seguros*, INS). Does not focus on lower income groups. Does not reduce the consumption of fuel. Does not take into account fiscal effects.

Source: Proposals 14189; 16759; 16966; 17067; 17132; 16808

3. DEFINING OUR SET OF TRANSPORT POLICIES

[T]he one who adapts his policy to the times prospers,
and likewise … the one whose policy clashes with the demands of the times does not.
— Niccolò Machiavelli, *The Prince*

3.1. Five Individual Transport Policies

In this section, I define a set of five policies that regulate private transportation in Costa Rica: a technical vehicular inspection, car import taxes, a circulation permit, fuel taxes, and a driving restriction. I selected these policies because of their relevance to the reduction of common transport externalities in Costa Rica.

3.1.1. Technical Vehicular Inspection (RTV)

A technical vehicular inspection (*revisión técnica vehicular*, RTV) was first established in March 1994 through Executive Decree 23025-MOPT. It was originally intended to reduce traffic accidents by forcing drivers to keep their vehicle in good condition, while at the same time generating government income. Vehicle owners could have their car revised at any privately owned service station. In 1996, the Ecomarchamo program was approved in response to rising urban air pollution caused by an increase in the importation of used vehicles that occurred in the 1990s. The program made an emissions test a mandatory part of the vehicular inspection, but because the service stations that provided the inspections were not adequately supervised or regulated, the vehicular inspection became an outlet for corruption (Fonseca, *Interview*). Although it was successful in generating government income, it did little to reduce vehicular emissions or improve the quality of the vehicles on the road.

By 1998, policymakers demonstrated an interest in regulating the service stations that conducted the technical inspection, and the selection process for a single private company to supervise the inspections began. In May 2001, the Spanish company Riteve SyC signed a contract by which it became entirely responsible for the quality of the technical inspections nationwide, and it began to operate in June 2002.

Currently, inspections are conducted at specially approved facilities supervised by Riteve SyC. Cars less than five years old are subject to inspection every two years, and cars five years or older must be inspected annually. The inspection month depends on the last digit of the vehicle's license plate, and the average cost per inspection is between $20 and $30.

3.1.2. Car Import Taxes

The current form of this policy dates to 1995. Costa Rica's car import tax is best described as a tax package that must be paid in order to get an imported vehicle out of customs. It includes the following components: a sales tax[5] equal to 13%; a duty tax[6] equal to 1% of the vehicle's CIF[7] value; a presumptive profit tax[8] equal to 25%, which applies regardless of whether the imported car will be resold for a profit; and a selective consumption tax[9] which varies, depending on the vehicle model, between 30% (newer cars) and 53% (older cars). The selective consumption tax is the most prominent and controversial component of the tax package. Since 1995 it has been lowered in response to complaints from car dealers and potential car owners who argue that the tax makes private vehicles unaffordable.

The current car import tax scheme reflects policymakers' efforts to address environmental problems associated with private transportation. However, prior to 1995, this tax package was clearly motivated by fiscal interests. Furthermore, it did nothing to promote the renewal of the vehicle fleet, as newer cars were taxed more heavily than were older cars. This tax scheme was justified on distributional grounds: richer individuals are more likely to buy newer cars, and they are also more capable of paying higher taxes (Godines V., *Interview*). Though this may have increased government revenue and satisfied distributional concerns, it did little to reduce vehicular emissions, as more used cars were imported (Godines V., *Interview*).

In November 1995, two principal aspects of the car import tax changed when Proposal 2361 was approved. First, the selective consumption tax component of the tax package was reduced (Villalobos 1995). Second, the base value for calculating the tax was changed to the vehicle's

[5] *impuesto sobre las ventas*
[6] This tax was established by Law No. 6946.
[7] Acronym for *Cost, Insurance and Freight*—an international trade term of sale in which, for the quoted price, the seller/exporter/manufacturer clears the goods past the ship's rail at the port of shipment (not destination).
[8] *ganancia presuntiva*
[9] *impuesto selectivo de consumo*

market value (it was previously the vehicle's value when new minus a specific percentage that was supposed to reflect the vehicle's depreciation over time) (Villalobos 1995). The new base value significantly reduced the gap in import taxes of new and used vehicles and created an incentive to buy new cars (Villalobos 1995). Policymakers are aware that newer vehicles are generally more fuel efficient and generate fewer emissions than older vehicles (Herrera and Rodriguez 2005), and this proposal is evidence of their interest in reducing vehicular emissions.

In March 2001, the tax package was modified once again through Executive Decree 29265-H, which reduced the selective consumption tax component of the tax package by 10 percentage points (Delgado and Barquero 2001). This translated into lower taxes across the board for vehicles of all ages, and the tax scheme continued to favor new vehicles. Currently, the tax rate for vehicles three years of age or less is 52.29%; 63.91% for those between the ages of four and five; and 79.03% for those six years and older (Delgado and Barquero 2001).

The reduced tax rates allow consumers to consider factors aside from price, such as fuel efficiency, and in theory they create incentives to buy higher-quality vehicles. Nevertheless, Costa Rica's current car import tax rates are among the highest in Central America, where the average import tax is around 30% (Delgado and Barquero 2001). It is noteworthy that reductions in the import tax have been compensated by increases in other transport-related taxes to prevent a reduction in government income (Fonseca, *Interview*). This is evidence that fiscal goals remain a concern for policymakers, despite any interest in addressing environmental problems.

The tax is an important source of government income: in 2002, import tax funds totaled $51 million, and by 2006 they had reached $65 million—an increase of about 26% (Rojas 2007). Of the $65 million generated in 2006, $40 million were traced to new vehicles (Rojas 2007). Figure 6 shows car import tax funds attributable to new and used vehicles between 2002 and 2006.

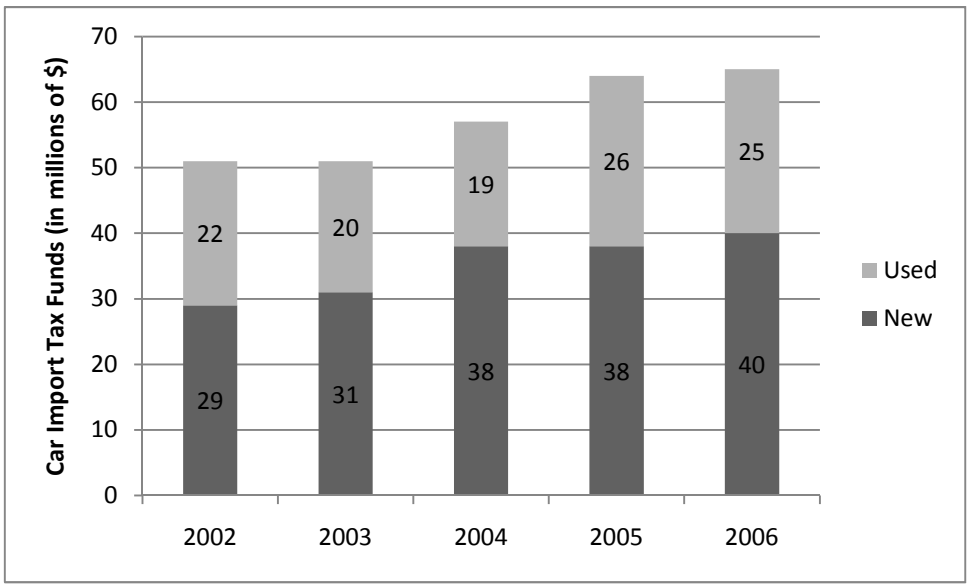

Figure 2. Car import tax funds attributable to new and used vehicles, 2002 to 2006
Source: Ministry of Finance

Despite the undeniable presence of fiscal concerns, the car import tax policy continues to move in the direction of emissions reductions, though perhaps not quickly enough. As of 2004, 60% of the national vehicle fleet was over 12 years old (Oviedo 2004). In May 2005, the Minister of Finance pledged to elaborate an executive decree to ban the importation of vehicles older than seven years of age in an attempt to lower the average age of the national vehicle fleet and thus contribute to the reduction of vehicular emissions (Oviedo 2005). He also promised to reduce taxes for clean technology vehicles, such as hybrid vehicles (Oviedo 2005). So far, these good intentions have not produced concrete results.

3.1.3. Circulation Permit (marchamo)

The current form of this policy was approved in 1998. Every year between November 1 and December 31, vehicle owners must pay a circulation fee (*marchamo*). The fee is collected and administered by the National Insurance Institute (*Instituto Nacional de Seguros*, INS), and it is distributed among a variety of institutions (Figure 3). The Ministry of Finance receives a significant portion of the tax funds (65.46%) for car property taxes (as established by Law 7088), and INS receives 19.78% of the funds for mandatory car insurance, which covers the cost of vehicle accidents regardless of who was at fault (as established by Law 7331).

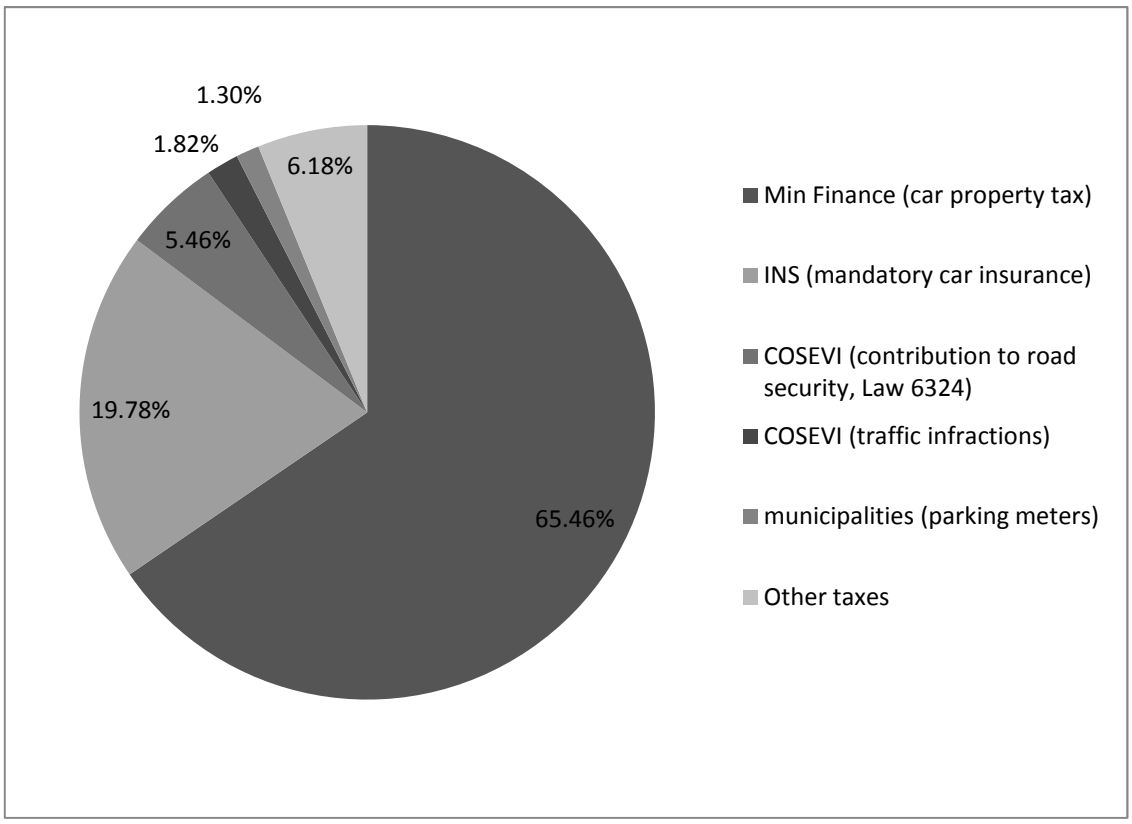

Figure 3. Distribution of circulation permit funds (marchamo)
Source: INS

The circulation permit will not be issued without proof of an updated vehicular inspection (RTV), and it will be refused if any traffic tickets issued on the vehicle have not been paid. Car owners may pay the *marchamo* at MOPT or other designated locations, including many public and private banks, and since 2006 payments can also be made online. The cost depends on the vehicle model and make. Table 3 shows the minimum cost of the *marchamo*, paid by vehicles valued at 500,000 colones ($1000) or less for the period 2008 to 2010.

Table 3. Cost of marchamo for vehicles valued at 500,000 colones or less, 2008-2010

Year	Cost
2008	16,800 colones ($33.60)
2009	19,500 colones ($39)
2010	20,400 colones ($40.50)

Source: INS

Objections to the *marchamo* have focused on the car property tax component, which is the seventh highest tax in the country (Thompson 2008), and on the continuously poor state of the national road system. Since 1996, vehicle owners have complained that the circulation permit is unfair—in order to pass RTV and obtain an updated *marchamo*, most car owners must first invest in costly car repairs that they argue could be avoided if roads were in better condition. MOPT's response to this has been that CONAVI does not have sufficient funds to fulfill all of its responsibilities (Araya, *Interview*).

Since 2008, 180 traffic police are responsible for verifying that drivers have paid their circulation permit (Oviedo 2008). Violators lose their license plate and are fined 13,000 colones ($26). In order to recover their license plates, which remain in custody of the Road Security Council (*Consejo de Seguridad Vial*, COSEVI), violators must pay all pending fines.

3.1.4. Fuel Taxes

The current form of this policy was approved in 2001, but the history of fuel taxation in Costa Rica dates back to the early 1980s, when the national government took measures to address the economic crisis that lasted between 1979 and 1984. Fuel taxes were originally justified on fiscal grounds, because they were considered a secure way to generate government revenue and help reduce the national deficit. During the late 1990s, the justification of fuel taxes began to shift, at least superficially. In light of an upward trend in the international price of fuel, policymakers began to underline the importance of reducing national expenditures on fuel and suggested that the fuel tax would contribute to a reduction in fuel consumption.

In July 2001, the government passed the Law of Tax Simplification and Efficiency (*Ley de Simplificación y Eficiencia Tributaria*, Law 8114). Article 1, Chapter 1 of the law sets a fixed fuel tax that replaced five taxes (Box 3). The Ministry of Finance is responsible for modifying the amount of the tax, which varies by fuel type, on a trimesterly basis to account for fluctuations in the CPI, as defined by the National Statistics and Census Bureau (*Instituto Nacional de Estadística y Censo*, INEC). Furthermore, the trimesterly adjustment cannot be greater than 3% and must be published in an executive decree within the first five business days of each trimester. Within two business days of the publication of the executive decree, the Public Services Regulatory Authority (*Autoridad Reguladora de Servicios Públicos*,

ARESEP) must adjust fuel prices accordingly, and *La Gaceta*, the national press, has two business days to publish the new prices set by ARESEP. Once these new prices have been published, the Costa Rican Petroleum Refinery (*Refinadora Costarricense de Petroleo*, RECOPE) is responsible for adjusting fuel prices at its service stations the day following publication. Thus, fuel prices at the pump should be adjusted within a maximum of 10 business days after the start of a new trimester.

Article 5, Chapter 1 of the law stipulates that tax funds should be distributed in the following manner: 29% is assigned to the National Road Security Council (*Consejo Nacional de Vialidad*, CONAVI), 75% of which should be spent on the maintenance of existing roads and the remaining 25% on the construction of new roads; 3.5% is assigned to FONAFIFO for the payment of environmental services; 0.1% is assigned to MAG for the payment of environmental services for the organic production of agricultural goods; 1% is assigned to the National Laboratory of Structural Materials and Models (*Laboratorio Nacional de Materiales y Modelos Estructurales*, LANAMME) at the UCR, for the purpose of supervising the use of funds used to maintain the quality of the highway system. Table 4 and Figure 4 illustrate this distribution.

Table 4. Assignment of fuel tax funds among receiving institutions

Institution	% of fuel tax funds assigned
Min. Finance	66.4%
CONAVI	29.0%
FONAFIFO	3.5%
UCR, LANAMME	1.0%
MAG	0.1%

Source: Author, based on Art. 5, Ch. 1, Law No. 8114

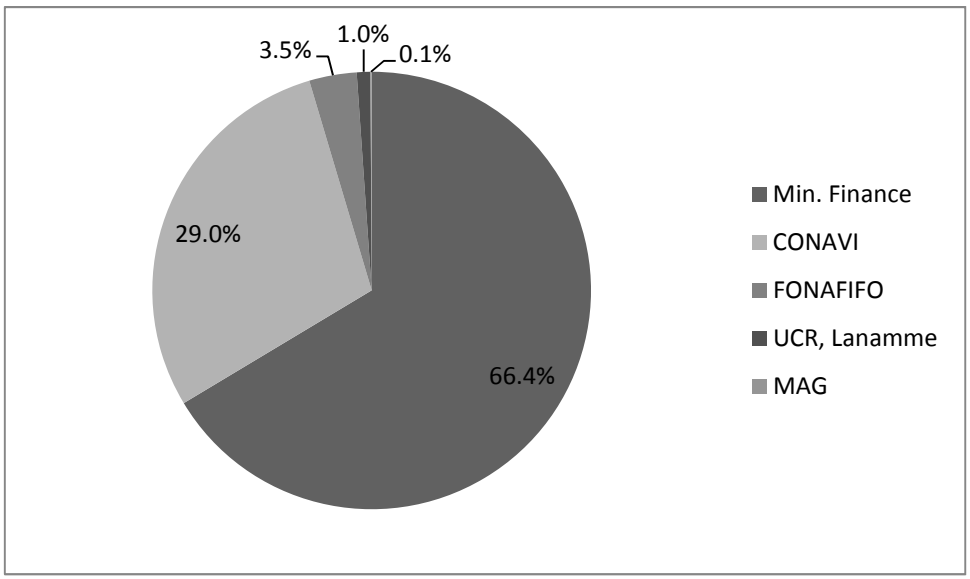

Figure 4. Assignment of fuel tax funds among receiving institutions
Source: Author, based on Art. 5, Ch. 1, Law No. 8114

Box 3. Taxes replaced by the unique tax on fuel, established by Law No. 8114

- **A selective consumption tax**, established by Annexes 1, 2 and 3 of Law No. 4961, Mar. 10, 1972.
- **A 1% tax on the customs import value**, established in Article 1 of Law No. 6946, Jan. 13, 1984, and its subsequent reforms.
- **A sales tax**, established in the Law of sales taxes (*Ley de impuestos sobre las ventas*), Law No. 6826, Nov. 8, 1982.
- **Customs import rights**, defined by Annex A, Law No. 7017, Dec. 16, 1985, of the Central American Agreement Regarding Customs Rules (*Convenio sobre el Régimen Arancelario Centroamericano*), Law No. 6986, May 3, 1985.
- **A Special Contribution in favor of the National Road Service Council (CONAVI)**, established in index a) of Article 20 and in Article 32 of Law No. 7798, Apr. 30, 1998.

Source: Author, using data from González (2003)

This tax sparked debate among stakeholders, particularly direct and indirect consumers of fuel, government agencies, environmental interest groups and bus and taxi drivers. Those who favor the tax base their position on fiscal concerns, arguing that fuel taxes are a simple and efficient way to generate government revenue. Those who oppose the tax base their position on distributional concerns, arguing that fuel taxes disproportionately affect the poor. In an analysis on the incidence of fuel taxes in Costa Rica, Blackman et al. (2010) measure the effect of a hypothetical 10% increase in fuel prices spurred by an increased tax. The results of their analysis suggest that the distribution of fuel taxes should not be a major concern for Costa Rican policymakers (Box 4). Neither proponents nor opponents of the tax have paid much attention to the potential environmental benefits of the tax.

Box 4. Main results of the incidence analysis conducted by Blackman et al. (2010)

Background of the study

The authors measure the effect of a 10% fuel price hike, which they measure through different kinds of spending: *first-order effects* (i.e., larger effects), which include (a) direct spending on gasoline, (b) direct spending on diesel, (c) indirect (via bus transportation) spending on diesel, (d) combined direct and indirect spending on diesel, (e) combined direct and indirect spending on all types of fuel; and *second-order effects* (i.e., smaller effects), which include spending on six categories of goods other than fuel and bus transportation (housing, recreation, food, clothing, health, education); and (f) *total effects*, which include combined direct and indirect spending on all types of goods (fuel and non-fuel).

Main results

First-order effects

(a) direct spending on gasoline: progressive. Households in the highest economic strata would be most affected, and the Suits index is positive (0.091). The largest impact is in the 9th decile, where a 10% increase in gasoline prices spurs slightly less than a one-third of 1% increase in total spending ($5.61 per month).

(b) direct spending on diesel: progressive. The largest impact is in the fourth decile, where a 10% increase in diesel prices spurs a slightly more than one tenth of 1% increase in total spending ($0.48 per month), and the Suits index is positive (0.103).

(c) indirect spending on diesel (via bus transportation): regressive. The increase in the share of total spending devoted to bus diesel is higher in poorer deciles than in richer ones, and the Suits index for this increase is negative (-0.272). In most deciles, the magnitude of this effect is larger than for direct spending on either gasoline or diesel. The largest impact is in the fourth decile, where a 10% increase in diesel prices spurs more than a half of 1% increase in total spending ($2.27 per month). Presumably, this result reflects poorer Costa Rican households' heavy reliance on the country's extensive, quasi-public system of bus transportation.

(d) combined direct and indirect (via bus transportation) spending on diesel: regressive. The increase in the share of total spending devoted to diesel due to a price hike is higher in poorer deciles than in richer ones, and the Suits index is negative (-0.188).

(e) combined direct and indirect spending on all fuel types (gasoline and diesel): neutral. The progressivity of gasoline and the regressivity of bus diesel offset each other so that the overall effect of the tax is more or less neutral. The increase in the share of total spending due to all three first-order effects is highest in the middle deciles, and the Suits index approaches zero (-0.010). The largest effect is in the

seventh decile, where a 10% increase in fuel prices spurs slightly less than a three quarters of 1% increase in total spending ($6.73 per month).

Second-order effects (i.e., smaller effect)

(f) spending on goods other than fuel and bus transportation: regressive. The effect of a price hike through four of the six second-order effects—food, housing, clothing, and recreation—would be regressive. Only in the case of health and education would they be progressive. Of the six effects, the largest are for spending on housing and food. The remaining four effects are an order of magnitude smaller than the first-order effects. Given that the two largest second-order effects are regressive, it is not surprising that when all six second-order effects are aggregated, they are also regressive, with a Suits index equal to -0.160.

Total effects (combined first- and second-order effects)

(g) direct and indirect spending on all goods: neutral. The overall effect would be neutral, and middle income deciles devote the greatest proportion of their spending to fuel. The Suits index for this increase is close to zero (-0.011). On average, for all deciles, fully half of this total effect is due to spending on bus diesel. The total effect of a 10% fuel price hike is modest, even in the socioeconomic strata that would be most affected. The largest total effect is in the fourth decile, where a 10% fuel price increase spurs a 0.86% increase in total spending ($1.07 per month). On average, for all deciles, a 10% tax hike raises spending by three quarters of 1%.

Main conclusions

- In Costa Rica, increases in gasoline taxes would not exacerbate income inequality, since wealthier strata would bear most of the burden of the increase.
- The same is not true of increases in diesel taxes, which have the greatest effect on lower and middle income strata, mostly because they would spur increased spending on bus travel.
- If gasoline and diesel taxes can be differentiated, distributional concerns need not rule out using fuel taxes to address pressing public health and safety problems.

Source: Blackman et al. 2010

In Costa Rica, the retail price of fuel is determined by a formula devised by ARESEP: consumer price equals the sum of the import price of fuel, the refining costs incurred by RECOPE, commercialization costs and fuel taxes. Of these components, the fuel tax accounts for the largest share in the retail price of fuel. Figure 5 compares the share of fuel taxes in the retail price of premium gasoline across Mexico, Chile, Colombia and Costa Rica, between 2002 and 2008. Costa Rica's fuel tax share ranks third or fourth in this comparison, which

suggests that although public discourse on the topic of fuel taxes tends to focus on how high these taxes are, they are within the standard of other Latin American countries.

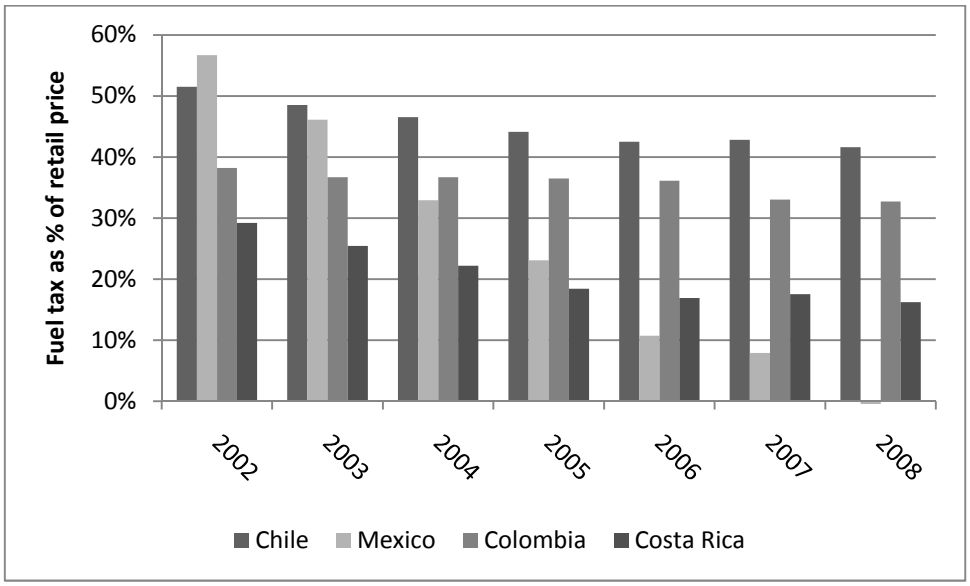

Figure 5. Fuel tax as a share of retail price of premium gasoline for Costa Rica, Chile, Colombia and Mexico, 2000 to 2008
Sources: CEPAL and Costa Rican Ministry of Finance

Motives behind the implementation of fuel taxes also vary among these countries. For example, Costa Rican policymakers are motivated by fiscal concerns, while Mexican policymakers have focused on reducing environmental problems, as evidenced by the Program for the Improvement of Air Quality in the Mexican Valley Metropolitan Area 2002-2010 (*Programa para mejorar la calidad de aire en la zona metropolitana del Valle de Mexico*) (SEMARNAT 2003). Figure 6, which compares the share of total government revenue attributable to fuel tax funds versus that attributable to income tax funds, highlights the importance of fuel taxes for the government of Costa Rica. Between 2002 and 2008, fuel tax funds represented between 11% and 15% of total government revenue, while income tax funds represented between 20% and 27% of total government revenue. In 2001, fuel tax funds represented only 5% of total government revenue. The abrupt increase in the fuel tax share from 2001 to 2002 (about 10 percentage points) illustrates the strong fiscal motives behind the implementation of the fuel tax as established by Law 8114, which passed in mid 2001.

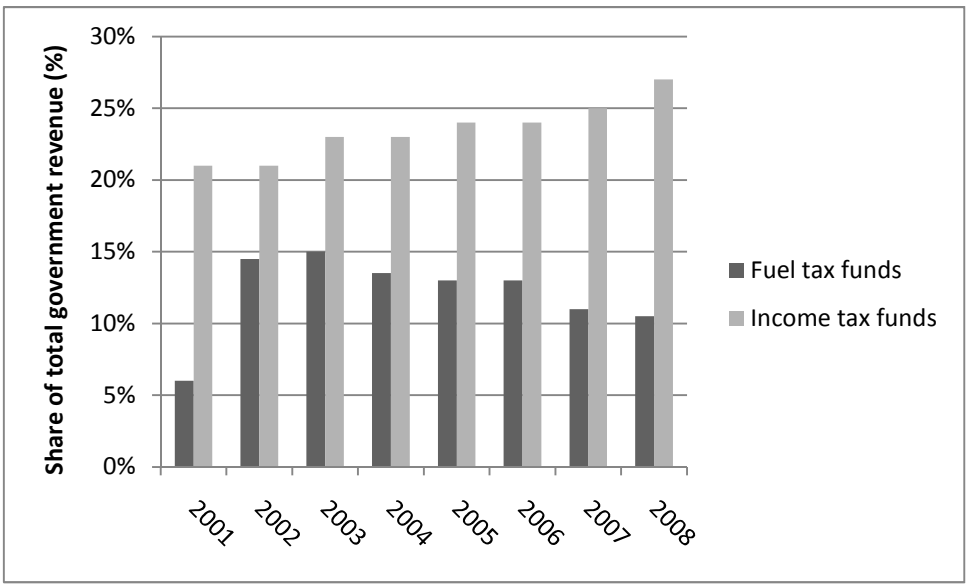

Figure 6. Share of fuel tax and income tax funds in total government revenue for Costa Rica, 2001 to 2008
Source: Costa Rican Ministry of Finance

3.1.5. Driving Restriction

Costa Rica's driving restriction program was first implemented on August 5, 2005. The program's terms and objectives have changed since its initial implementation, as have its levels of enforcement and compliance. It was originally part of policymakers' response to the increase in the international price of fuel that occurred during the late 1990s and the resulting increase in national expenditures on fuel, which increased from $225 million in 1990 to over $998 million in 2005 (MIDEPLAN 2007). In June 2008, prices rose even more, reaching a record high of $143 per barrel of crude oil. In November 2008, the price of crude per barrel fell by almost $100, and by July 2009 the program's main justification shifted to the reduction of vehicular congestion and traffic accidents.

The restriction bans most drivers from using their vehicles within a restricted zone of San José on weekdays, during certain hours on the basis of the last digit of the vehicle's license plate. For example, vehicles whose license plate number ends in 1 or 2 cannot enter the restricted zone on Mondays during restricted hours. The original restricted zone was limited to the central part of San José (*casco central*), and the restricted times included only peak hours—7 AM to 8:30 AM and 4 PM to 5:30 PM. When the restriction was first implemented, an

insufficient 25 traffic police monitored its enforcement. By April 2006, the program was virtually ignored and violators were only sporadically fined (Cantero 2008).

In 2008, fuel prices began to rise again, and this renewed interest in the driving restriction which was still officially in effect but in reality was not enforced. The program was enforced with new vigor on July 10, 2008, and shortly thereafter, enforcement was bolstered by 75 transit police (Cantero 2008). The restricted zone was extended to the area within and including the *Circunvalación* Highway (*Carretera de Circunvalación*), which includes a larger area within the SJMA. Restricted hours were increased to 13 hours a day—from 6 AM to 7 PM. The fine for violating the restriction is currently 6,500 colones ($12.50), and drivers can be fined multiple times in a single day. Figure 7 shows the current restricted zone.

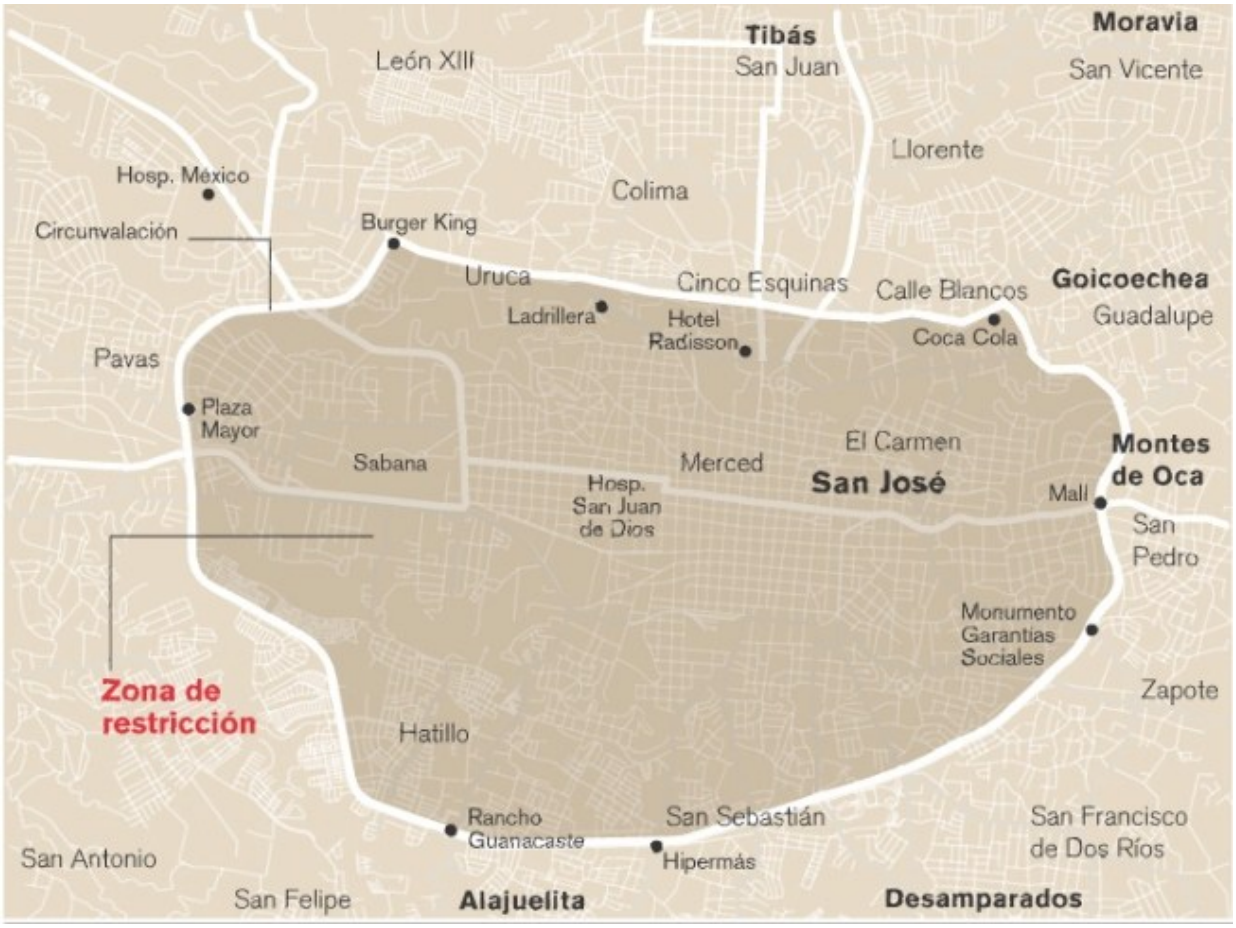

Figure 7. Zone restricted by the driving restriction as of July 10, 2008
Source: Circular DRH-036-2008

In deciding whether to comply with the driving restriction, drivers compare the cost of two options: (a) compliance and (b) non-compliance. Equations (a) and (b) roughly estimate the cost of these two alternatives; values for the variables are based on estimates given by taxi drivers[10].

$$C_{compliance} = C_{alternative\ transport\ fare} + C_{lost\ time} + C_{lost\ convenience} \quad (a)$$

where:

$C_{alternative\ transport\ fare}$ is the cost of alternative transportation, which can be either bus or taxi. Round trip bus fares may cost between 600 colones and 2000 colones ($1.20 to $4) a day depending on the route and the number of transfers. Taxi fares vary significantly depending on distance and traffic, and fares can increase by up to 40% with heavy traffic (Murillo, *Interview*). The taxi fare for a 20 kilometer round trip during peak hours in San José is approximately 10,000 colones ($20).

$C_{lost\ time}$ is the opportunity cost of time.

$C_{lost\ convenience}$ is the cost of lost convenience. This might be relatively high, considering that in Costa Rica it rains heavily during six months of the year and sidewalks are not designed for the convenience of pedestrians.

Assuming that both the opportunity cost of time and the cost of lost convenience equal zero, the minimum cost of compliance varies between 600 colones and 10,000 colones ($1.20 to $20), depending on choice of public transportation mode (bus or taxi).

$$C_{non\text{-}compliance} = C_{fuel} + C_{parking} + C_{fine} * tickets \quad (b)$$

where:

C_{fuel} is the cost of fuel for private transportation. The fuel cost of a 20 kilometer round trip during peak hours in San José is approximately 5,000 colones ($10).

$C_{parking}$ is the cost of parking in San José. This is normally between 600 and 700 colones ($1.20 to $1.40) per hour, or about 4,800 colones ($9.60) for a period of 8

[10] Data obtained during personal interviews with E. Murillo and B. Blanco.

hours. Parking lots sometimes offer discounts to regular customers; a regular customer might pay between 2,000 colones and 3,000 colones per day ($4 to $6). [11]

C_{fine} is the cost of the fine: 6,500 colones ($12.50).

tickets is the number of tickets issued to a violator in a single day. In an optimistic scenario, the violator would not be caught, and tickets would equal 0; he would therefore not pay any fine at all. In a pessimistic scenario, the violator would be caught more than once, perhaps once on the way to work and once on the way back home (*tickets* = 2), in which case he would be fined 13,000 colones ($26) in a single day.

Assuming that the cost of fuel for a round trip within San José during peak hours is 5,000 colones ($10), and that the cost of a day's parking for a regular customer is 3,000 colones ($6), a violator who is issued zero tickets would pay 8,000 colones ($16); a violator who is issued one ticket would pay 14,500 colones ($28.50); a violator who is issued two tickets would pay 21,000 colones ($42).

According to these estimates, the smallest difference between the cost of compliance and non-compliance is 200 colones ($0.40), and non-compliance is less expensive.[12] This is noteworthy, because if drivers do not expect to be caught, they stand to gain up to 200 colones by violating the restriction. The largest difference between the cost of compliance and non-compliance is 20,400 colones ($40.80), and non-compliance is more expensive.[13] This implies that those who violate the restriction and expect to receive two tickets place a value of 20,400 colones ($40.80) on their time and convenience.

The program has met significant disapproval among drivers who feel it has disrupted their transportation activities. The main complaint among drivers has been that the alternatives to private transportation (bus and taxi) are not appealing (Rodriguez, Beatriz, *Interview*). In November 2008, the program's constitutionality was questioned, and the payment of fines for violations was temporarily halted while the Constitutional Court reached a decision (Loaiza

[11] Public institutions (ex., banks, government offices) sometimes offer their senior employees free parking.
[12] This is the difference between taking a taxi and violating the restriction but receiving no ticket.
[13] This is the difference between taking the bus and violating the restriction and receiving two tickets.

2008). By the end of that month, the restriction's constitutionality was approved, and violators who had received a ticket during the Court's review process were instructed to pay pending fines.

According to a study conducted by MOPT, as of November 28, 2008, the restriction had reduced the number of vehicles that entered the SJMA by 100,000, which implied a reduction of at least 10% in transit times (González 2008). Table 5 shows transit volumes for the city of San José before and after the restriction.

Table 5. Transit volumes for the city of San José, 2008

Total vol. before the restriction	Total vol. after the restriction	Difference	
		Volume	%
874,251	771,764	102,486	12%

Source: MOPT

According to a study by UNA, the restriction also reduced air pollution in the restricted zone (Villegas 2009). Figure 8 shows the yearly average of PM-10 concentrations at the *Catedral Metropolitana*, located in a highly transited area of downtown San José, from 2004 to 2008. The sharp fall in average particulate matter concentrations from 2007 to 2008 can be partially attributed to the driving restriction, which began in July 2008. One of the main limitations to measuring the effect of the restriction is the lack of air quality data. The LAA at UNA is the only research center that routinely carries out air quality measurements in the GMA, mainly in San José and Heredia, and they publish data for just a few measurement stations. Figure 9 shows PM-10 concentrations in 2008 at four different points of measurement: at Catedral-SJ and Junta de Educación-SJ (both within the restricted zone) concentrations are beneath the national norm of 50 micrograms per cubic meter and the EU standard of 40 micrograms per cubic meter. This is also the case for Fortín-Heredia, but not for Rectoría UNA-Heredia (outside the restricted area). Herrera and Rodriguez (2005) suggest that although the driving restriction has decreased air pollution within the restricted zone, it has increased air pollution outside the restricted area.

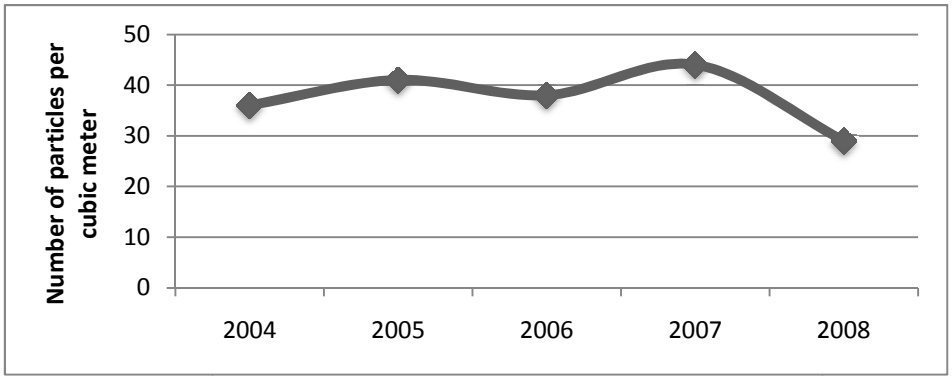

Figure 8. Yearly average of PM-10 concentrations, Catedral Metropolitana, San José, 2004 to 2008
Source: UNA

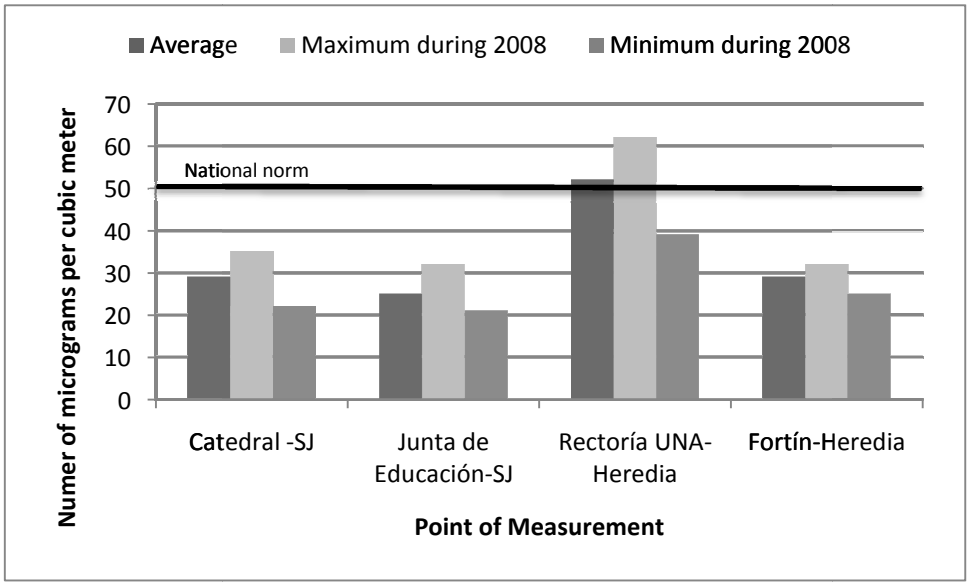

Figure 9. Yearly average of PM-10 concentrations, San José and Heredia, 2008
Source: UNA

By November 2008, fuel prices fell to $45 a barrel, and many argued that the restriction was no longer necessary given that its main objective was to decrease fuel expenditures (Corrales 2009). In response to these criticisms, the restriction was stopped on June 12, 2009. Among the more notable consequences of this decision was a sharp rise in levels of traffic congestion in the SJMA. A study conducted by MOPT's Division of Transit Engineering (*División de Ingeniería de Tránsito*) determined that without the restriction, transport times within the

center of San José increased by 16% (Murillo 2009). In response to the chaos that resulted from the absence of the driving restriction, the program was reinstated on July 21, 2009, and it has remained in effect since that date. After its reimplementation, proponents have touted the program's beneficial effects on vehicular congestion, air pollution and traffic accidents within the restricted zone. Its effects outside the restricted area have not been formally studied, but they are suspected to be unfavorable. Congestion has increased in the outskirts of the restricted zone, which suggests that some drivers have adopted longer alternative routes in order to avoid the restriction (Murillo, *Interview*). If this is the case, it is possible that air pollution and traffic accidents in the outskirts of the restricted zone have increased as well. It is important to emphasize that the effect of the driving restriction is confounded by the effect of a trend in rising fuel prices, which coincides with the implementation of the program (Table 1, Figure 12). This confounding effect justifies the econometric analysis conducted in Chapter 5.

3.2. Understanding Our Policies as a Set

The policies included in this set have the potential to reduce common externalities associated with private transportation, particularly environmental issues. In some cases, environmental concerns were a part of the policy design process (particularly concerns for reducing air pollution), however overall fiscal concerns were given much greater weight (Fonseca, *Interview*; Umaña, *Interview*; Corrales, *Interview*; Merino, *Interview*). As a set, these policies reflect a myopic response from policymakers whose primary objectives are the temporary resolution of fiscal problems, and not the long-term resolution of problems associated with the transport sector. Government expenditures on health problems associated with urban air pollution are evidence of policymakers' shortsightedness. In 2007 the national government spent $280 million to address illnesses associated with excess air pollution in the SJMA (ACAN-EFE 2007). Although a reduction in expenditures on health and safety problems associated with the transport sector may require an initial investment, in the long term it would likely reduce total government expenditures (Fonseca, *Interview*).

Costa Rican policymakers have expressed an interest in addressing environmental problems associated with the transport sector, as evidenced by policies such as RTV (which focuses on the reduction of vehicle fuel emissions), the creation of dedicated bus lanes in some urban areas, and the implementation of an intelligent street lighting system in San José. Although

several of the policies in our set are by nature fiscal instruments[14], all have the potential to reduce environmental problems. Given their interest in addressing problems associated with private transportation, it is surprising that Costa Rican policymakers have not paid greater attention to the potential environmental effects of the policies in our set. This is especially true for fuel and car taxes and the circulation permit—although these policies are traditionally considered fiscal instruments due to their revenue-raising capacities, they also have the capacity to reduce common environmental externalities associated with transportation. There is no reason to believe that emphasizing the environmental benefits of these policies should reduce their fiscal benefits. Thus, policymakers interested in raising revenue should not have to compromise their fiscal objectives in order to address environmental objectives.

Table 6 summarizes the cost of compliance and the cost of non-compliance (when applicable) for each policy in our set. The timeline shown in Box 5 highlights relevant events that influenced policymakers' objectives in designing this set of policies.

Table 6. Policy set summary: Cost of compliance, frequency of payment, cost of non-compliance

	Fuel Tax	**Car Import Tax**	**RTV**	**Marchamo**	**Driving Restriction**
Cost of Compliance	diesel: 150 c/liter (03-2009) regular: 179 c/liter (03-2009) premium: 187 c/liter (03-2009)	<3 yrs: 52.29% 4 or 5 yrs: 63.91% 6+ yrs: 79.03%	10,000c to 15,000c ($20 to $30)	min: 20,400c ($41)	C (alternative transport fare) + C (lost time) + C (lost convenience) = 600c to 10,000c ($1.20 to $20)
Frequency of Payment	each time fuel is purchased	one-time payment, when imported car is released from customs	cars less than 5 yrs: biannual cars 5 yrs+: annual	annual	each plate is restricted one weekday per week
Cost of Non-compliance	n/a (included in fuel price at gas stations)	n/a (prerequisite for getting car out of customs)	n/a (prerequisite for *marchamo*)	13,000c ($26)	C (fuel) + C (parking) + C (fine)*tickets 8,000c to 20,400c ($16 to $40.80)

[14] Fuel and car taxes as well as the circulation permit are often used by governments to generate income, and although they may also reduce environmental problems, their main purpose is usually fiscal.

Box 5. Timeline: August 1989 to July 2009

1989		
	August	Constitutional Court (*Sala Constitucional*, *Sala Cuarta*) is created.
1992		
	June	Earth Summit, Rio de Janeiro
	July	Costa Rican policymakers begin to pay greater attention to emissions reductions. They develop a plan to reduce emissions in three phases: 1) Ecomarchamo, 2) Transit Law, 3) Technical Vehicular Inspection (RTV)
1993		
	April	Transit Law (*Ley de Tránsito*, Law No. 7331) is approved.
1994		
	January	Swisscontact appears in Costa Rica.
	March	RTV is established.
	May	Law of Hydrocarbons (*Ley de hidrocarburos*, Law No. 7399), establishes the rules for exploration and extraction of hydrocarbons in Costa Rica.
	June	Art. 50 of the Constitution is revised to grant all citizens the right to a clean and ecologically balanced environment (Law No. 7412).
	December	Emissions Control Regulation is approved, thereby establishing emissions standards (Executive Decree No. 23831-MIRENEM-MOPT-S). Regulation for the rational use of energy (*Regulación del uso racional de la energía*, Law No. 7447)
1995		
	November	Car import taxes are modified to favor new vehicles.
1996		
	June	Ecomarchamo program is approved. All vehicles must pass this emissions test in order to pass RTV.
	October	Environment Law is approved (*Ley Orgánica del Ambiente*, Law No. 7554).
1998		
	January	Revisions to RTV are proposed. The selection process for a single private company to supervise the inspections begins. Marchamo is approved.
1999		
	December	Emissions Control Regulation is modified, making emissions standards stricter.

2001		
	March	Car import taxes are lowered for both new and used vehicles.
	May	Riteve SyC signs a contract making it entirely responsible for the supervision of RTV nationwide.
	June	Fuel taxes are modified (Law No. 8114). It is now a fixed tax (not percentual) that is modified on a trimesterly basis according to inflation.
2002		
	July	Riteve SyC begins to operate.
2005		
	August	Driving restriction is established. Restricted zone is limited to the central part of San José (*casco central*). Restricted times include only morning and afternoon peak hours.
2006		
	April	Enforcement of driving restriction starts to wane and violations increase but are not fined.
2008		
	April	Driving restriction is practically not enforced.
	June	Fuel prices peak at $138 a barrel.
	July	Driving restriction is modified: restricted zone is expanded and restricted hours are increased. Enforcement is bolstered with 50 additional traffic police.
	November	Constitutionality of driving restriction is questioned, and the payment of fines is temporarily halted. Fuel prices drop to $45 a barrel.
2009		
	June	Driving restriction is stopped on grounds that low fuel prices no longer justify the restriction.
	July	Driving restriction is reestablished on grounds that traffic congestion must be reduced.

Costa Rica's energy consumption is traced mainly to the consumption of hydrocarbons, most of which are imported: between 2003 and 2007, about 70% of diesel fuel was imported (RECOPE database). Furthermore, about 65% of total national energy consumption is used by the transport sector (Herrero 2008) (Figure 10), thus any attempt to reduce fuel consumption, or energy consumption in general, must involve the transport sector. It is therefore no surprise that policymakers have turned to transport policies in their attempt to limit the effects of rising fuel prices on Costa Rica's economy.

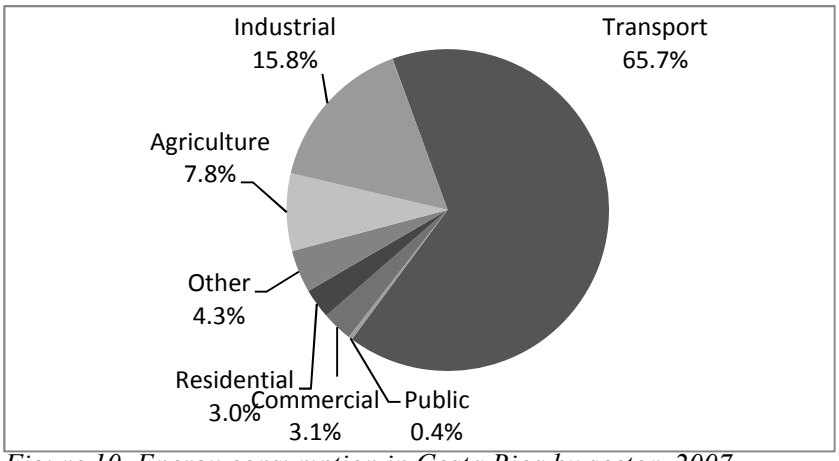

Figure 10. Energy consumption in Costa Rica by sector, 2007
Source: Herrero (2008)

In the past decade, the international price of crude oil increased almost continuously, reaching a record high by June 2008. Figure 11 shows the trend in international fuel prices from 1861 to 2008. Three major recent price shocks are associated with geopolitical events: the Arab oil embargo of 1973, increased political instability between 1978 and 1980 in Iran and Iraq, and the invasion of Kuwait in 1990. Since 2000, oil prices have been affected by an increase in fuel demand (especially in China and India), a slowdown in production, and the devaluation of the US dollar.

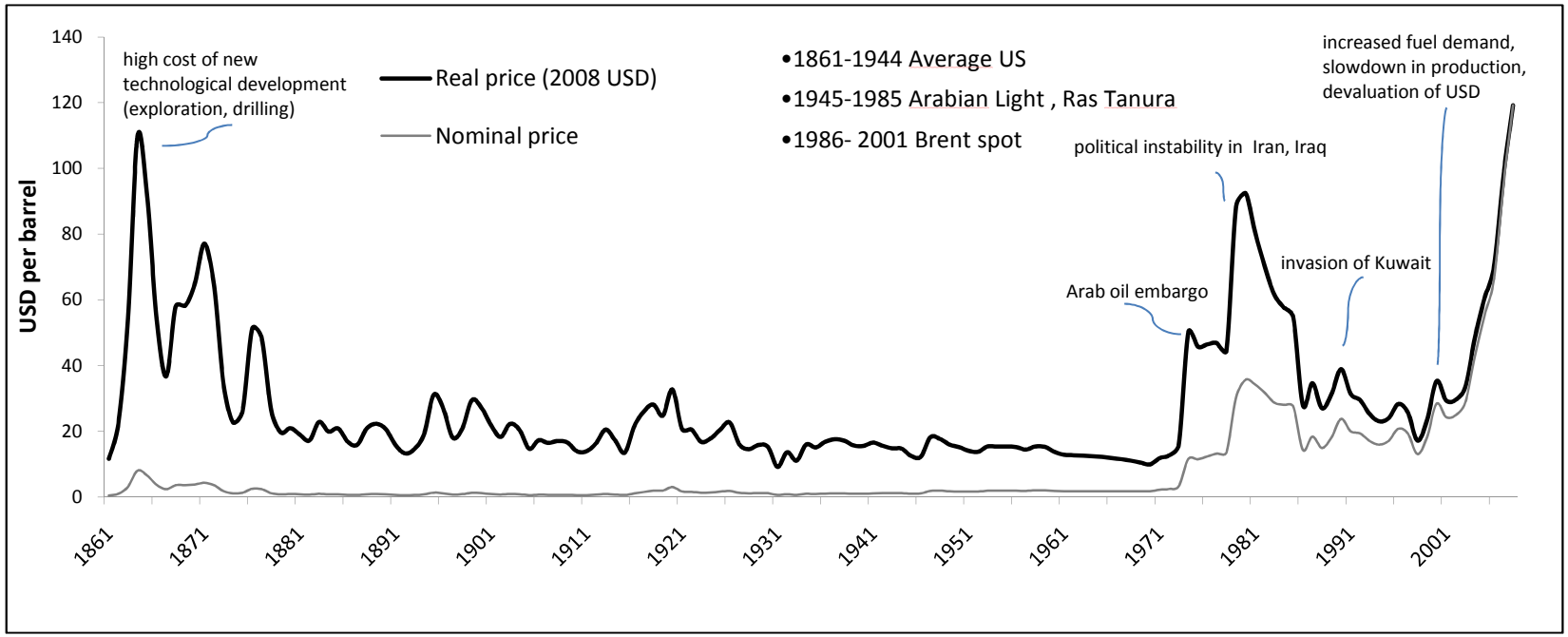

Figure 11. Price of crude oil, 1861 to June 2008
Source: Herrero (2008) with author's modifications

This set of transport policies can be described as a reactive response to events that have affected Costa Rica's national economy—specifically, a rise in fuel prices, an increase in government expenditures on fuel and a fall in government income. Policymakers have focused on fiscal goals and have not paid adequate attention to the reduction of transport externalities such as air pollution, vehicular congestion and traffic accidents. This response promises to bring more negative consequences for the economy if it is not corrected soon.

4. A STAKEHOLDER ANALYSIS OF OUR SET OF TRANSPORT POLICIES

The truth is, policies are formed by the interplay of conflicting political and economic interests, and a thorough understanding of the political economy of policymaking is required to analyze any set of instruments used in a specific context.

—Thomas Sterner,
Environmental Policy Instruments for Environment and Natural Resource Management

4.1. Background

The set of policies defined in Chapter 3 addresses negative externalities associated with the transport sector to some extent, but the pervasiveness of air pollution, vehicular congestion and traffic accidents indicates that this set of policies could be improved. In this chapter, I conduct a stakeholder analysis in order to identify actors that have participated in the implementation process of the relevant set of transport policies, or who have the potential to do so, and analyze their main motivations.

4.2. Methods

Stakeholder analysis (SA), as defined by Grimble and Chan (1995), can be thought of as "an approach and procedure for gaining an understanding of a system by means of identifying the key actors or stakeholders in the system, and assessing their respective interests in that system". In this context, *stakeholders* are defined as actors who affect and/or are affected by the policies, decisions and actions of a system (Grimble and Chan 1995). These actors can be individuals, organizations, individuals within an organization, and networks of individuals and/or organizations (Varvasovszky and Brugha 2000b). SA became increasingly popular during the 1990s in the fields of management, development and health policy, reflecting the fact that managers, policymakers and researchers were increasingly recognizing the fundamental role stakeholders play in the definition of objectives, the successful development of projects and the adoption and implementation of policies (Varvasovszky and Brugha 2000a). More recently, SA has been influenced by developments in political economy,

decision theory and environmental studies, and it has become a popular tool for managing conflicts over natural resources.

SA is ideal for assessing the political economy of our set of transport policies for two main reasons. First, this is a complex topic in which many actors with different and sometimes conflicting interests are involved. SA facilitates the identification of relevant actors, and it provides a simple method for assessing their different interests in a given policy. Such an analysis can lead to a better understanding of who is affected by and who can influence the way natural resources, such as fuel, are managed (Buckles 1999). Second, this topic, like most political economy issues, is difficult to assess quantitatively. SA is one of the few methods that allow economists to answer complex research questions without resorting to quantitative methods of analysis.

SA is still a relatively new method, and consequently it draws on methods that vary considerably in rigor, such as qualitative matrices of stakeholder interests, relations, and participation levels. One of the main arguments against the use of SA is that it lacks mathematical rigor, and critics argue that this methodology does not allow policymakers to make "confident judgments about policy recommendations" (WB 2004), because it is subjective and intuitive. In response to this criticism, quantitative approaches have been developed to complement the use of qualitative matrices, which are the most common product of stakeholder analysis. One notable example of a quantitative complementary tool is the *Expected Utility Stakeholder Model*, a game theoretic approach to analyzing reform issues (WB 2004). As described in "Operationalizing political analysis: the Expected Utility Stakeholder Model and governance reforms" (WB 2004), "for a given reform issue, the model uses expected utility forecasting techniques to simulate round-by-round negotiations among stakeholders with different interests in and varying influence over the reform process. The model is able to predict—with considerable accuracy—how these bargaining dynamics play out over time." Essentially, it is an "empirical assessment of the likely extent of reform and the degree of stakeholder support for that outcome" (WB 2004). Since this is a predictive model, its main timeframe is the future. Given that the main objective of this thesis is to understand the decision-making processes that have led to the adoption of current (2001-2009) transport policies in Costa Rica, the timeframe of interest focuses on the recent past and

present. The focus and timeframe of this study detract from the usefulness of predictive modeling techniques such as the Expected Utility Stakeholder Model, and for this reason, such techniques are not used in this analysis.

In response to the criticism that stakeholder analysis is subjective and intuitive, I argue that this is true to the extent to which all methods for qualitative data analysis are so. Furthermore, certain topics are best analyzed using qualitative, instead of quantitative, methods of analysis. This depends on the type of data to be analyzed and on the lack of alternative methods of analysis. In some cases, stakeholder analysis is complemented by the quantitative analysis of a specific aspect of the policy or system under consideration. In this thesis, I complement a qualitative SA (Chapter 4) with a quantitative econometric analysis of the driving restriction policy (Chapter 5).

The process of conducting a stakeholder analysis to evaluate a policy reform can be divided into the following three steps (Varvasovszky and Brugha 2000b; Nash et al. 2003):

Step 1. Identify different components of the policy reform, including a timeframe for analysis and the stakeholders involved, and hypothesize regarding their relation to the issue as well as to each other in the specified timeframe.

Step 2. Collect data

a) Primary sources: face-to-face interviews using checklists, semi-structured interviews and structured questionnaires
b) Secondary sources: published and unpublished documents and reports, policy statements, internal regulations of organizations

Step 3. Organize and analyze data. This may include the use of matrices, tables, and/or maps constructed to quantify stakeholder interests in an issue, the resources and/or influence they can bear on the adoption of a particular policy or group of policies, and their support or opposition to moving in a particular direction.

I use SA to identify current and potential stakeholders associated with our set of transport policies and analyze their role in current and future policymaking. This chapter characterizes the political economy of our set of transport policies by addressing the following questions:

i. What stakeholders were involved in the implementation of this set of policies, and in what ways were they involved?
ii. On what grounds have these policies been justified, and what has been the role of environmental and fiscal concerns in this justification?
iii. What environmental interest groups have been involved in the implementation process of these policies? How successful have they been in highlighting the potential environmental benefits of these policies?

4.3. Data

Data for this paper were collected following the three steps described in Section 2.1.1. First, I did background reading on the topic of transport regulation in Costa Rica in order to place each policy in an appropriate context (Step 1). Most of this contextual reading was of newspaper articles published online by *La Nación*, a reputable Costa Rican newspaper. Then, I conducted personal interviews with stakeholders (Step 2). Each interview followed the same general structure: six questions served as a starting point to begin the dialogue[15]; in some cases, questions tailored to the specific stakeholder were developed beforehand, and other questions based on the interviewee's responses were developed during the interview. Between February 2009 and November 2009, I conducted 43 personal interviews, each lasting between 30 minutes and two hours.

4.4. Results

Stakeholders in our set of transport policies belong to various societal groups, including the government/public sector, civil society/private sector and research institutions. Box 4 provides a list of stakeholders relevant to our set of policies and a description of their main activities.

As proposed by Mitchell et al. (1997), stakeholders can be classified on the basis of their possession of one or more of three attributes: power, legitimacy and urgency. Based on definitions by Dahl (1957), Pfeffer (1981) and Weber (1947), the authors define *power* as "a relationship among social actors in which one social actor, A, can get another social actor, B,

[15] For a list of these six questions, see Annex 1.

to do something that B would not have otherwise done." Based on definitions from Suchman (1995) and Weber (1947), the authors loosely define *legitimacy* as "a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, or beliefs." They note that legitimacy is often linked to power, but point out that one does not necessarily accompany the other. Moreover, they accept Weber's (1947) proposal that "*legitimacy* and *power* are distinct attributes that can combine to create *authority*", defined by Weber as the legitimate use of power, "but that can exist independently as well." Based on the definition found in the Merriam-Webster Dictionary, the authors define *urgency* as "the degree to which stakeholder claims call for immediate attention." They state that urgency "exists only when two conditions are met: (1) when a relationship or claim is of a time-sensitive nature and (2) when that relationship or claim is important or critical to the stakeholder."

The stakeholders included in Box 6 possess at least one of the attributes identified by Mitchell et al. (1997)[16] with respect to at least one of the policies in our set[17].

Box 6. List of stakeholders for our set of transport policies

GOVERNMENT / PUBLIC SECTOR

Public Services Regulatory Authority (*Autoridad Reguladora de Servicios Públicos,* ARESEP). Regulates and sets the prices for public services nationwide, including electricity, water, fuel, and public transportation (bus and taxi fares). Aims to establish fair prices.

Costa Rican Social Security Agency (*Caja Costarricense de Seguro Social*, CCSS). Provides social security to citizens and foreign residents. Coordinates and executes preventive and curative medical programs; administers disability pensions.

Ministry of Environment, Energy and Telecommunications (*Ministerio de Ambiente, Energía y Telecomunicaciones*, MINAET). The institution in charge of natural resource management nationwide. Its many responsibilities are distributed among the following subdivisions:

> **National System of Conservation Areas** (*Sistema Nacional de Áreas de Conservación*, SINAC). Main goal is to develop, plan and execute policies geared toward the sustainable management of natural resources.

[16] Power, legitimacy, or urgency.

[17] The technical vehicular inspection (RTV), car import taxes, the circulation permit (*marchamo*), fuel taxes, or the driving restriction.

National Environmental Technical Secretariat (*Secretaría Técnica Nacional Ambiental*, SETENA). Defines and regulates the evaluation of environmental impact.

Environmental Administrative Tribunal (*Tribunal Ambiental Administrativo*, TAA). Reviews claims filed against people and companies that violate environmental legislation.

Division of Fuel Transport and Commercialization (*Dirección de Transporte y Comercialización de Combustibles*, DTCC) and **General Division of Hydrocarbons** (*Dirección General de Hidrocarburos*, DGH). Both divisions work together to regulate and supervise the exploration and extraction of hydrocarbons. Aim to address society's needs with respect to the provision of fuel in compliance with environmental, health and infrastructure norms.

National Forestry Finance Fund (*Fondo Nacional de Financiamiento Forestal*, FONAFIFO). Main goal is to provide financing to small and medium enterprises for reforestation, forestation, agro-forestry, and similar activities. Administers the Payment for Ecosystem Services program; receives 3.5% of fuel tax funds for this purpose.

National Commission for Biodiversity Management (*Comisión Nacional para la Gestión de la Biodiversidad*, CONAGEBIO). Regulates the access to genetic and biochemical biodiversity resources. Aims to do so in such a way as to promote the fair and equal use of these resources and the sustainable management of biodiversity.

National Meteorological Institute (*Instituto Meteorológico Nacional*, IMN). Collects and analyzes climate information used in the fields of agro-meteorology, climatology, climate variability, atmospheric pollution, global warming, climate change and related fields.

Division of Environmental Quality Management (*Dirección de Gestión de Calidad Aimbiental*, DIGECA). Design and implement conceptual, technical and judicial techniques for the development of public policies related to environmental quality. Aim to prevent, mitigate and revert the degradation of water, air and soil resources.

Ministry of Agriculture and Cattle Ranching (*Ministerio de Agricultura y Ganadería*, MAG). Aims to promote the development of agricultural activities nationwide. Receives 0.1% of fuel tax funds for the payment for environmental services for organic production of agricultural goods.

Ministry of Health (*Ministerio de Salud*). Aims to protect and improve the health of the population. Participates in some projects geared toward the improvement of urban air quality.

Municipality of San José. Aims to supervise and carry out the sustainable development of the Central County of San José, with a focus on geopolitical, economic, social and cultural issues. Participates in some projects geared toward the improvement of urban air quality.

Ministry of Finance (*Ministerio de Hacienda*). Responsible for the administration of government revenue and expenditures. Collects and administers fuel tax funds. Adjusts fuel taxes every 3 months to correct for inflation. By law, is entitled to 65% of fuel tax funds to be administered as best deemed appropriate in fulfillment of the government's fiscal needs.

National Insurance Institute (*Instituto Nacional de Seguros*, INS). Offers different types of insurance. Collects and administers circulation permit (*marchamo*) funds.

Costa Rican Tourism Institute (*Instituto Costarricense de Turismo*, ICT). Aims to promote national tourism sector in a sustainable manner.

Ministry of Public Works and Transport (*Ministerio de Obras Públicas y Transporte*, MOPT). The institution in charge of public works and transport projects nationwide. Its many responsibilities are distributed among the following subdivisions:

> **Road Security Council** (*Consejo de Seguridad Vial*, COSEVI). Aims to develop and oversee policies that guarantee the security of the national road system.
>
> **National Road Council** (*Consejo Nacional de Vialidad*, CONAVI). Aims to develop and maintain national road infrastructure. Receives 29% of fuel tax funds, 75% of which goes to the maintenance of existing roads, and 25% of which goes to the construction of new roads.
>
> **Public Transport Council** (*Consejo de Transporte Público*, CTP). Aims to design and optimize the country's public transport system.
>
> **General Division of Transport Police** (*Dirección General Policía de Tránsito*). Aims to establish and implement controls and procedures that promote safety and free traffic flow on highways, with the goal of reducing vehicular accidents. 75 officers are currently dedicated to enforcing the driving restriction.

Ministry of External Commerce (*Ministerio de Comercio Exterior*, COMEX). Promotes international commercial activities.

CIVIL SOCIETY / PRIVATE SECTOR

Costa Rican Petroleum Refinery (*Refinadora Costarricense de Petróleo*, RECOPE). Main objectives are to refine, transport and commercialize crude oil and its derivatives. It is a private monopoly.

RTV SyC. Responsible for supervising the technical vehicular inspection nationwide. It is a private monopoly with Costa Rican owners and Spanish supervisors. Initially invested more than $23 million in training over 350 mechanics, engineers and administrative personnel.

National Chamber of Ecoturism (*Cámara Nacional de Ecoturismo*, CANAECO). Aims to promote ecotourism through the measurement of the environmental impact of tourism activities through the use of sustainable tourism indicators and certification programs, participation in public policy formation, and contributions to environmental education.

National Chamber of Transport (*Cámara Nacional de Transportes*, CANATRANS). Represents the interests of ground transport companies. Members are the shareholders/owners of private bus and taxi companies.

National Chamber of Cargo Transport (*Cámara Nacional de Transportistas de Carga*, CANATRAC). Represents the interests of ground cargo transport companies and various industrial and commercial businesses associated with these transport companies. Maintain a close relationship with the Ministry of Finance, MOPT, and COMEX.

German Technical Cooperation (GTZ). Aims to promote international cooperation in a way as to contribute to sustainable development throughout the world. Implements commissions for the German federal government and other national and international, public and private-sector clients. Involved in political, economic, ecological and social development worldwide.

Swisscontact. A Swiss private sector organization that aims to contribute to sustainable development in developing countries. Between 1993 and 2003, supervised the Clean Air Program (*Programa Aire Puro*) in Costa Rica, Guatemala, Honduras, El Salvador, Nicaragua and Panamá. Accomplished the following three major activities: established a legal framework for vehicular emissions; banned the use of leaded gasoline; implemented systems of vehicular inspection and maintenance.

World Bank (WB). Fund various projects worldwide. In 2007 offered a $30 million loan to Costa Rica to be used toward the conservation of the environment.

Global Environment Fund (GEF). A global asset management firm that invests in the domain of energy and the environment. Has invested in sustainable energy projects administered by the Costa Rican government. In 2007, donated $10 million to Costa Rica to be used toward the conservation of the environment.

United Nations Development Fund (UNDP).The United Nation's development network. Helps developing countries attract and use aid effectively. Focuses on several development goals, including environment and energy.

Costa Rican Union of Private Sector Enterprises (*Unión Costarricense de Cámaras y Asociaciones de la Empresa Privada*, UCCAEP). Represents the private sector, including agricultural, commercial, industrial, service and tourism activities. Aims to promote competitiveness in the private sector.

Costa Rican Association of Fuel Providers (*Asociación Costarricense de Expendedores de Combustible*, ACEC). Represents the interests of fuel providers and aims to improve communication between associates and institutions linked to the fuel sector, especially ARESEP, MINAET and RECOPE.

Institute for Policies for Sustainability (*Instituto de Políticas para la Sostenibilidad*, IPS). A non-profit organization that promotes the development of policies for sustainability. Provides consulting services and aids research activities of leading research institutes and government agencies in topics related to environmental policies.

Investment Development Bank (IDB). Aims to reduce the normative, institutional and financial barriers for the research and development of renewable and efficient energy sources, and to identify and promote normative reforms and political instruments toward the improvement of policies that can increase investment in the sector.

Principal Environmental Associations:

Association for Environmental Volunteering, Research and Development (*Asociación de Voluntariado, Investigación y Desarrollo Ambiental*, VIDA). A non-governmental association that designs, promotes and executes programs that promote civilian participation in sustainable development goals. Focuses on environmental education, conservation and volunteer activities.

BUN-CA Fundación Red de Energía. A non-governmental association with offices in Costa Rica, Belize, Guatemala, Honduras, Nicaragua and Panamá that promotes the use and development of renewable energy and the conservation of energy. Focuses on three thematic areas: renewable energy, energy efficiency and climate change.

Direct and indirect consumers of fuel.

Consumers of private and public transportation.

Civilians affected by transport externalities, especially city dwellers affected by air pollution, vehicular congestion and traffic accidents.

Potential vehicle owners.

Car dealers.

RESEARCH INSTITUTIONS

National University of Costa Rica (*Universidad Nacional de Costa Rica*, UNA). One of the leading public universities in the country.

Environmental Analysis Laboratory (*Laboratorio de Análisis Ambiental de la Escuela de Ciencias Ambientales*, LAA). Measures levels of air pollution in the GMA and provides data to DIGECA. Measurement stations are located in the cities of San José, Heredia and Belén. Measurements include: PM10 particles, sulfur dioxide (SO2), nitrogen dioxide (NO2), acidic anions (chloride, nitrate and sulfate) in PM10 particles, and heavy metals in PM10 particles.

University of Costa Rica (*Universidad de Costa Rica*, UCR). One of the leading public universities in the country.

Research Program for Sustainable Urban Development of the School of Engineering, University of Costa Rica (*Programa de Investigación en Desarrollo Urbano Sostenible de la Escuela de Ingeniería Civil, Universidad de Costa Rica*, ProDUS-UCR). Conducts research related to the following themes: evolution and impact of urban growth, territorial planning, environmental impact, solid waste management, recovery of urban rivers, traffic accidents, and transport system planning.

National Laboratory of Structural Materials and Models (*Laboratorio Nacional de Materiales y Modelos Estructurales*, LANAMME). A research center of the Civil Engineering School at UCR. Specializes in teaching and the transfer of knowledge related to the protection of civil infrastructure, especially roads. Receives 1% of fuel tax funds to supervise the quality of the national highway system.

Center for Tropical Agricultural Research and Higher Education (CATIE). Aims to reduce poverty through the integrated management of agriculture and environmental conservation. Research is divided into several groups, including G-SEBSA.

Research Program in Governance and Socioeconomics of Environmental Goods and Services (G-SEBSA). A program that focuses on research in the field of environmental economics.

Mitchell et al. (1997) highlight the dynamic quality of SA and identify three features of stakeholder attributes that create a framework for understanding how stakeholders can gain or lose *salience* within the policy implementation process, where *salience* is defined as "the degree to which priority is given to competing stakeholder claims". The three features are the following: (i) stakeholder attributes have a variable, not a steady state; (ii) stakeholder attributes are a socially constructed, not an objective, reality; (iii) consciousness and willful exercise may or may not be present. The categories in Box 7 are arranged by level of salience, from least to greatest with respect to either a current policy (maintaining the status quo) or policy proposal (modifying an existent policy or establishing a new one); levels of salience are

in parentheses. Stakeholders with only one attribute have low salience (levels 1 through 3); these include dormant, discretionary and demanding stakeholders. Stakeholders with two attributes have moderate salience (levels 4 through 6); these include dangerous, dependant and dominant stakeholders. Stakeholders with all three attributes have high salience (level 7); these are called definitive stakeholders. The Venn diagram shown in Figure 12 illustrates the various levels of salience, and helps to demonstrate how a stakeholder in one category can move into another category by acquiring or losing possession of one of the three attributes.

Box 7. Model stakeholder salience policy matrix

(0) Non-stakeholders: They possess none of the three attributes.

Latent stakeholders:
Stakeholders with only one attribute have low salience, and they generally take a passive stance. Latent stakeholders are further categorized into dormant, discretionary and demanding stakeholders.

> **(1) Dormant stakeholders**: They possess the power to impose their will, but by not having a legitimate relationship or an urgent claim, their power remains unused. Examples: those who can spend a lot of money, or those who can command the attention of the news media.
>
> **(2) Discretionary stakeholders**: They possess the attribute of legitimacy, but they have no power to influence the decisions and no urgent claims.
>
> **(3) Demanding stakeholders**: Their only attribute is urgency. They have urgent claims but without power or legitimacy, they are bothersome, but not warranting more than passing attention, if any at all.

Expectant Stakeholders:
Stakeholders with two of the three attributes have moderate salience. These stakeholders are generally "expecting something", because a combination of two attributes generally leads them to take an active, rather than a passive stance. Expectant stakeholders are further categorized into dangerous, dependent or dominant stakeholders.

> **(4) Dangerous stakeholders**: Where urgency and power characterize a stakeholder who lacks legitimacy, that stakeholder will be coercive and possibly violent, making the stakeholder "dangerous." The use of coercive power often accompanies illegitimate status. Examples of unlawful, yet common, attempts at using coercive means to advance stakeholder claims (which may or may not be legitimate) include wildcat strikes, employee sabotage, and terrorism.
>
> **(5) Dependent stakeholders**: They lack power but have urgent and legitimate claims. These attributes make them dependent upon others to carry out their will.
>
> **(6) Dominant stakeholders**: Possessing both power and legitimacy, the influence of these stakeholders is assured. They are dominant in the decision-making process, in that they have legitimate claims and also the ability to act on these claims.

(7) Definitive Stakeholders: They possess all three attributes, and their salience is high. Any expectant stakeholder can become a definitive stakeholder by acquiring the missing attribute, but the most common occurrence is likely to be the movement of a dominant stakeholder into the "definitive" category.

Source: Based on Mitchell et al. (1997).
Note: Level of salience is shown in parentheses.

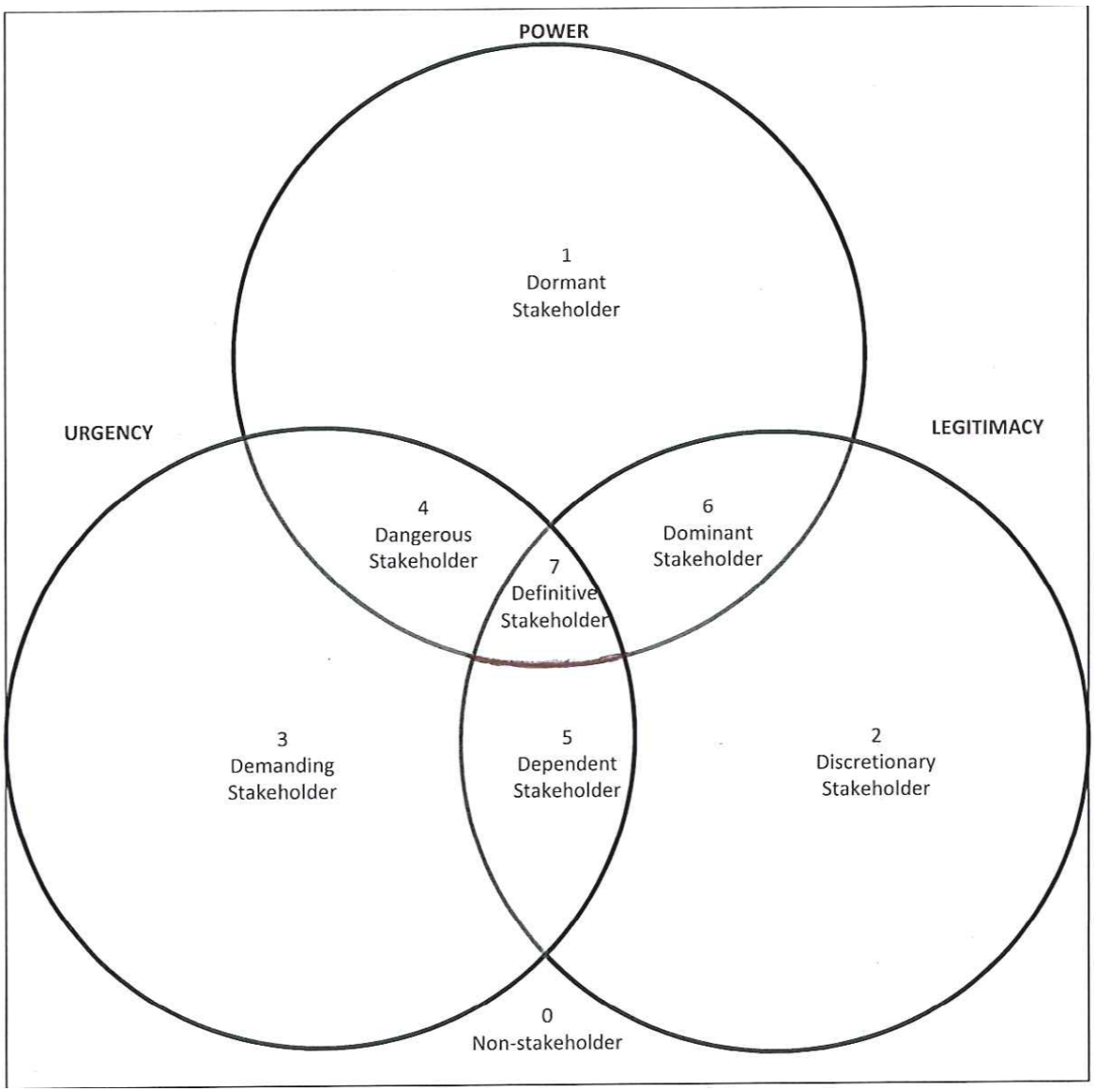

Figure 12. Classification of stakeholders based on presence of three attributes
Source: Based on Mitchell et al. (1997), Figure 2. Stakeholder Typology: One, Two or Three Attributes Present, p. 874.

The stakeholders identified in Box 6 are assigned to one of the seven stakeholder categories defined by Mitchell et al. (1997) for each of the policies in our set. This categorization is shown in Boxes 7 through 11. The number in parentheses indicates the stakeholder's level of salience. I have enhanced the basic model designed by Mitchell et al. (1997) to include indications for societal group and political position (denoted by subscripts and superscripts, respectively). Subscripts indicate different societal groups: "Gov" denotes Government/Public Sector, "Civ" denotes Civil Society/Private Sector, and "Res" denotes Research Institutions.

Superscripts indicate the stakeholder's position with respect to the policy: "+" denotes in favor, "-" denotes against and "0" denotes neutral. Discretionary and dominant stakeholders are by definition neutral, because they lack the attribute of urgency; consequently, they have not expressed a clear position with respect to the policy. If the attribute of urgency were acquired, their neutrality could shift. The symbol "→" followed by "+" or "-" denotes their potential position regarding the policy if the attribute of urgency were acquired.

Box 8. Stakeholder salience matrix for the fuel tax policy

Latent stakeholders

1. Dormant stakeholders: None identified.

2. Discretionary stakeholders: $ICT_{Gov}^{0\rightarrow+}$ $CCSS_{Gov}^{0\rightarrow+}$ $INS_{Gov}^{0\rightarrow+}$ $MINAET: TAA_{Gov}^{0}$ $MOPT: COSEVI_{Gov}^{0}$ / $Transport\ Police_{Gov}^{0}$ / $CTP_{Gov}^{0\rightarrow+}$ $CANAECO_{Civ}^{0\rightarrow+}$ GTZ_{Civ}^{0} $Swisscontact_{Civ}^{0}$ WB_{Civ}^{0} GEF_{Civ}^{0} $IPS_{Civ}^{0\rightarrow+}$ $BUN-CA_{Civ}^{0\rightarrow+}$ $RTV\ SyC_{Civ}^{0}$ $CANATRANS_{Civ}^{0}$ $IDB_{Civ}^{0\rightarrow+}$ $CATIE: G-SEBSA_{Res}^{0}$ $UNA: LAA_{Res}^{0}$ $UCR: ProDUS_{Res}^{0}$

3. Demanding stakeholders: None identified.

Expectant Stakeholders

4. Dangerous stakeholders: None identified.

5. Dependent stakeholders: $Municipality\ of\ S.J._{Gov}^{+}$ $UCCAEP_{Civ}^{-}$ $CANATRAC_{Civ}^{-}$ $consumers\ of\ transportation: public_{Civ}^{-}$ /$private_{Civ}^{+}$ $civilians\ affected\ by\ transport\ externalities_{Civ}^{+}$ $potential\ vehicle\ owners_{Civ}^{-}$ $car\ dealers_{Civ}^{-}$ $UCR: LANAMME_{Res}^{+}$

6. Dominant stakeholders. $ARESEP_{Gov}^{0}$ $Min\ Health_{Gov}^{0\rightarrow+}$ $MINAET: SINAC_{Gov}^{0\rightarrow+}$ / $SETENA_{Gov}^{0\rightarrow+}$ / $CONAGEBIO_{Gov}^{0\rightarrow+}$ / $IMN_{Gov}^{0\rightarrow+}$ / $DIGECA_{Gov}^{0\rightarrow+}$ / $DTCC_{Gov}^{0\rightarrow+}$ / $DGH_{Gov}^{0\rightarrow+}$ / $FONAFIFO_{Gov}^{0\rightarrow+}$ $RECOPE_{Gov}^{0}$ $MAG_{Gov}^{0\rightarrow+}$ $MAG_{Gov}^{0\rightarrow+}$ $COMEX_{Civ}^{0\rightarrow+}$

7. Definitive Stakeholders: $Min\ Finance_{Gov}^{-}$ $MOPT: CONAVI_{Gov}^{-}$

Source: Author

Note: Stakeholder position is with respect to raising the amount of fuel tax funds assigned to address externalities associated with private transportation, especially air pollution.

Box 9. Stakeholder salience matrix for the car import tax policy

Latent stakeholders

1. Dormant stakeholders: None identified.

2. Discretionary stakeholders: $ICT_{Gov}^{0\rightarrow+}$ $CCSS_{Gov}^{0\rightarrow+}$ INS_{Gov}^{0} $RECOPE_{Gov}^{0}$ $MINAET: TAA_{Gov}^{0}$ $MOPT: CONAVI_{Gov}^{0}$ / $Transport\ Police_{Gov}^{0}$ / CTP_{Gov}^{0} $CANAECO_{Civ}^{0\rightarrow+}$ GTZ_{Civ}^{0} $RECOPE_{Civ}^{0}$ $Swisscontact_{Civ}^{0}$ WB_{Civ}^{0} GEF_{Civ}^{0} $BUN-CA_{Civ}^{0\rightarrow+}$ $VIDA_{Civ}^{0\rightarrow+}$ $ACEC_{Civ}^{0\rightarrow+}$ $UNDP_{Civ}^{0\rightarrow+}$ $IPS_{Civ}^{0\rightarrow+}$ $UCCAEP_{Civ}^{0}$ $CANATRANS_{Civ}^{0}$ $COMEX_{Civ}^{0}$ $IDB_{Civ}^{0\rightarrow+}$ $consumers\ of\ public\ transportation_{Civ}^{0}$ $CATIE: G-SEBSA_{Res}^{0}$ $UNA: LAA_{Res}^{0}$ $UCR: ProDUS_{Res}^{0}$ / $LANAMME_{Res}^{0}$

3. Demanding stakeholders: None identified.

Expectant Stakeholders

4. Dangerous stakeholders: None identified.

5. Dependent stakeholders: $CANATRAC_{Civ}^{-}$ $consumers\ of\ private\ transportation_{Civ}^{-}$ $civilians\ affected\ by\ transport\ externalitites_{Civ}^{+}$ $potential\ vehicle\ owners_{Civ}^{-,+}$

6. Dominant stakeholders: $ARESEP_{Gov}^{0}$ $Min\ Health_{Gov}^{0\rightarrow+}$ $MINAET: DTCC_{Gov}^{0}$ / $SINAC_{Gov}^{0\rightarrow+}$ / $SETENA_{Gov}^{0\rightarrow+}$ / $CONAGEBIO_{Gov}^{0\rightarrow+}$ / $IMN_{Gov}^{0\rightarrow+}$ / $DIGECA_{Gov}^{0\rightarrow+}$ / $FONAFIFO_{Gov}^{0\rightarrow+}$ $MOPT: COSEVI_{Gov}^{0\rightarrow+}$ $MAG_{Gov}^{0\rightarrow+}$ $car\ dealers_{Civ}^{0\rightarrow-}$

7. Definitive Stakeholders: $Min\ Finance_{Gov}^{-}$ $RTV\ SyC_{Civ}^{+}$

Source: Author

Note: Stakeholder position is with respect to raising import taxes for old vehicles while reducing import taxes for new and fuel-efficient vehicles.

Box 10. Stakeholder salience matrix for the technical vehicular inspection (RTV) policy

Latent stakeholders

1. Dormant stakeholders: None identified.

2. Discretionary stakeholders: $ICT_{Gov}^{0\rightarrow+}$ $CCSS_{Gov}^{0\rightarrow+}$ $Municipality\ of\ S.J._{Gov}^{0\rightarrow+}$ INS_{Gov}^{0} $MINAET: TAA_{Gov}^{0}$ $CANAECO_{Civ}^{0\rightarrow+}$ GTZ_{Civ}^{0} $Swisscontact_{Civ}^{0}$ WB_{Civ}^{0} GEF_{Civ}^{0} $BUN-CA_{Civ}^{0\rightarrow+}$ $VIDA_{Civ}^{0\rightarrow+}$ $ACEC_{Civ}^{0}$ $UNDP_{Civ}^{0}$ $IPS_{Civ}^{0\rightarrow+}$ $UCCAEP_{Civ}^{0}$ $CANATRANS_{Civ}^{0}$ $CANATRAC_{Civ}^{0}$ $IDB_{Civ}^{0\rightarrow+}$ $consumers\ of\ public\ transportation_{Civ}^{0}$ $CATIE: G-SEBSA_{Res}^{0}$ $UNA: LAA_{Res}^{0}$ $UCR: Produs_{Res}^{0}$ / $LANAMME_{Res}^{0}$

3. Demanding stakeholders: None identified.

Expectant Stakeholders

4. Dangerous stakeholders: None identified.

5. Dependent stakeholders: $consumers\ of\ private\ transportation_{Civ}^{-}$ $civilians\ affected\ by\ transport\ externalitites_{Civ}^{+}$ $potential\ vehicle\ owners_{Civ}^{-}$

6. Dominant stakeholders.
$ARESEP_{Gov}^{0}$ $Min\ Health_{Gov}^{0\rightarrow+}$ $MINAET: DTCC_{Gov}^{0}$ / $SINAC_{Gov}^{0\rightarrow+}$ / $SETENA_{Gov}^{0\rightarrow+}$ / $CONAGEBIO_{Gov}^{0\rightarrow+}$ / $IMN_{Gov}^{0\rightarrow+}$ / $DIGECA_{Gov}^{0\rightarrow+}$ / $FONAFIFO_{Gov}^{0\rightarrow+}$ / DGH_{Gov}^{0} $MOPT: COSEVI_{Gov}^{0\rightarrow+}$ / $CONAVI_{Gov}^{0}$ / $Transport\ Police_{Gov}^{0}$ MAG_{Gov}^{0} $car\ dealers_{Civ}^{0}$ $COMEX_{Gov}^{0}$

7. Definitive Stakeholders: $Min\ Finance_{Gov}^{+}$ $RTV\ SyC_{Civ}^{+}$

Source: Author
Note: Stakeholder position is with respect to maintaining the status quo.

Box 11. Stakeholder salience matrix for the circulation permit (marchamo) policy

Latent stakeholders

1. Dormant stakeholders: None identified.

2. Discretionary stakeholders: : $ICT_{Gov}^{0\rightarrow+}$ $CCSS_{Gov}^{0\rightarrow+}$ $MINAET: TAA_{Gov}^{0}$ $CANAECO_{Civ}^{0\rightarrow+}$ GTZ_{Civ}^{0} $Swisscontact_{Civ}^{0}$ WB_{Civ}^{0} GEF_{Civ}^{0} $BUN-CA_{Civ}^{0\rightarrow+}$ $VIDA_{Civ}^{0\rightarrow+}$ $ACEC_{Civ}^{0}$ $UNDP_{Civ}^{0}$ $IPS_{Civ}^{0\rightarrow+}$ $UCCAEP_{Civ}^{0}$ $CANATRANS_{Civ}^{0}$ $CANATRAC_{Civ}^{0}$ IDB_{Civ}^{0} $consumers\ of\ public\ transportation_{Civ}^{0}$ $CATIE: G-SEBSA_{Res}^{0}$ $UNA: LAA_{Res}^{0}$ $UCR: Produs_{Res}^{0}$ / $LANAMME_{Res}^{0}$

3. Demanding stakeholders: None identified.

Expectant Stakeholders

4. Dangerous stakeholders: None identified.

5. Dependent stakeholders: $consumers\ of\ private\ transportation_{Civ}^{-}$ $civilians\ affected\ by\ transport\ externalitites_{Civ}^{-}$

6. Dominant stakeholders. $ARESEP_{Gov}^{0}$ $Min\ Health_{Gov}^{0\rightarrow+}$ $MINAET: DTCC_{Gov}^{0}$ / $SINAC_{Gov}^{0\rightarrow+}$ / $SETENA_{Gov}^{0\rightarrow+}$ / $CONAGEBIO_{Gov}^{0\rightarrow+}$ / $IMN_{Gov}^{0\rightarrow+}$ / $DIGECA_{Gov}^{0\rightarrow+}$ / $FONAFIFO_{Gov}^{0\rightarrow+}$ / DGH_{Gov}^{0} $MOPT: CTP_{Gov}^{0}$ / $CONAVI_{Gov}^{0\rightarrow+}$ / $Transport\ Police_{Gov}^{0}$ $RECOPE_{Gov}^{0}$ $car\ dealers_{Civ}^{0}$ $COMEX_{Gov}^{0}$ $RTV\ Syc_{Gov}^{0}$

7. Definitive Stakeholders: $Min\ Finance_{Gov}^{+}$ INS_{Gov}^{+} $MOPT: COSEVI_{Gov}^{+}$ $Municipality\ of\ S.J._{Gov}^{+}$

Source: Author

Note: Stakeholder position is with respect to maintaining the status quo.

Box 12. Stakeholder salience matrix for the driving restriction policy

Latent stakeholders

1. Dormant stakeholders: None identified.

2. Discretionary stakeholders: : ICT^{0}_{Gov} $CCSS^{0\rightarrow+}_{Gov}$ $MINAET: TAA^{0}_{Gov}$ $CANAECO^{0}_{Civ}$ GTZ^{0}_{Civ} $Swisscontact^{0}_{Civ}$ WB^{0}_{Civ} GEF^{0}_{Civ} $BUN-CA^{0\rightarrow+}_{Civ}$ $VIDA^{0\rightarrow+}_{Civ}$ $ACEC^{0}_{Civ}$ $UNDP^{0}_{Civ}$ $IPS^{0\rightarrow+}_{Civ}$ $UCCAEP^{0\rightarrow-}_{Civ}$ $CANATRANS(bus)^{0\rightarrow+}_{Civ}$ IDB^{0}_{Civ} $CATIE: G-SEBSA^{0}_{Res}$ $UNA: LAA^{0}_{Res}$ $UCR: Produs^{0}_{Res}$ / $LANAMME^{0}_{Res}$

3. Demanding stakeholders: None identified.

Expectant Stakeholders

4. Dangerous stakeholders: None identified.

5. Dependent stakeholders: : $consumers\ of\ transportation: public^{+}_{Civ}$ / $private^{-}_{Civ}$ $civilians\ affected\ by\ transport\ externalitites^{+}_{Civ}$ $CANATRANS(taxi)^{-}_{Civ}$ $CANATRAC^{-}_{Civ}$

6. Dominant stakeholders . $ARESEP^{0}_{Gov}$ $Min\ Health^{0\rightarrow+}_{Gov}$ $MINAET: DTCC^{0}_{Gov}$ / $SINAC^{0\rightarrow+}_{Gov}$ / $SETENA^{0\rightarrow+}_{Gov}$ / $CONAGEBIO^{0\rightarrow+}_{Gov}$ / $IMN^{0\rightarrow+}_{Gov}$ / $DIGECA^{0\rightarrow+}_{Gov}$ / $FONAFIFO^{0\rightarrow+}_{Gov}$ / DGH^{0}_{Gov} $MOPT: CTP^{0}_{Gov}$ / $CONAVI^{0\rightarrow+}_{Gov}$ / $Transport\ Police^{0}_{Gov}$ $MAG^{0\rightarrow+}_{Gov}$ $INS^{0\rightarrow+}_{Gov}$ $car\ dealers^{0}_{Civ}$ $COMEX^{0}_{Gov}$ $RTV\ Syc^{0}_{Gov}$

7. Definitive Stakeholders: : $Min\ Finance^{+}_{Gov}$ $MOPT: COSEVI^{+}_{Gov}$

Source: Author
Note: Stakeholder position is with respect to maintaining the status quo.

4.5. Discussion

In Section 4.5.1. I address the three key questions posed at the beginning of this chapter. In Section 4.5.2. I discuss additional considerations and make policy recommendations.

4.5.1. Stakeholders, Policy Justification and the Role of Environmental Interest Groups

i. What stakeholders were involved in the implementation process of this set of policies, and in what ways were they involved?

In analyzing Boxes 8 through 12 as a set, the following overarching conclusions can be made regarding the role of stakeholders in the implementation process of this set of policies.

1) Definitive stakeholders belong primarily to the group Government/Public Sector. Their position with respect to policy objectives, as denoted by the superscripts, has proven to heavily influence the final outcome. For example, the Ministry of Finance and CONAVI are definitive stakeholders in the implementation process of the fuel tax policy. While the first is concerned with generating fiscal revenue, the second is interested in maintaining and improving the national roads system. During the negotiation process in which stakeholders discussed the distribution of fuel taxes, both the Ministry of Finance and CONAVI were reticent to assigning more than 3% of funds to FONAFIFO for the PSE program, and both were against assigning funds to a project for the reduction of air pollution proposed by GTZ (Corrales, *Interview*). Furthermore, the Ministry of Finance has failed to distribute fuel tax funds as established by law, and it has derailed some of the income generated by this tax to fund projects that are higher on its list of priorities, such as education, pensions and security projects (Oviedo 2003). In 2003, this ministry failed to distribute 91 billion colones ($182 million) of fuel tax funds to CONAVI for the maintenance and repair of the national roads, and there are suspicions that this has occurred more than once (Oviedo 2003; Rodriguez, Beatriz, *Interview*; González V., Luis Diego, *Interview*; González V., Luis Javier, *Interview*). These actions are evidence that the Ministry of Finance does not currently prioritize the reduction of transport externalities. Moreover, the institutional objectives of both stakeholders suggest that they have no incentive to increasing the amount of fuel tax funds assigned to address environmental problems associated transportation. The interests of these stakeholders have evidently influenced the final outcome of the fuel tax policy, because the potential environmental benefits of fuel taxes have not been stressed.

   In the case of the car import tax policy, the definitive stakeholders are the Ministry of Finance and RTV SyC. The policy proposal is to increase import taxes for old vehicles and reduce import taxes for new and fuel-efficient vehicles. The Ministry of Finance is against this change, mainly because it de-stimulates the sale of older, more affordable vehicles, which would presumably have higher sales than newer, more expensive vehicles and would therefore generate higher total car import tax funds (Godines V., *Interview*;

Fonseca, *Interview*).[18] On the other hand, RTV SyC is in favor, because the change stimulates the renovation of the country's vehicle fleet and consequently a reduction in vehicle emissions, a result that corresponds with RTV's institutional objectives. As discussed in Section 3.1.2., the car import tax policy has evolved significantly since its initial implementation. The import tax scheme originally favored old vehicles, and this was likely a result of the Ministry of Finance's influence over the policy implementation process. Currently, the tax scheme favors new vehicles, and this is likely the result of RTV's influence over the implementation process. After the approval of Executive Decree 33096 in May 2006, clean-technology vehicles such as hybrids get a 15 percentage point reduction in the selective consumption tax. Despite this tax break, the Toyota Prius Hybrid Synergy Drive, the only hybrid vehicle on the market in Costa Rica, remains prohibitively expensive for most consumers at a cost of $32,000 (Rojas 2006). There is some interest in eliminating the import tax altogether for clean-technology vehicles, but policymakers have not yet reached a consensus. This standstill in the policy implementation process is likely due to the existence of conflicting interests between the two definitive stakeholders.

The Ministry of Finance and RTV SyC are also definitive stakeholders for the RTV policy. In this case, both stakeholders are in favor of maintaining the policy's status quo. Judging by the Ministry of Finance's institutional objectives, it favors the RTV policy because it is an additional source of government income. RTV SyC understandably favors the inspection because the inspection justifies its existence as a company. This may explain why, despite opposition from dependent stakeholders (especially consumers of private transportation and potential vehicle owners) the inspection has remained in effect.

In the case of the circulation permit (*marchamo*) policy, the definitive stakeholders are the Ministry of Finance, INS, COSEVI and the Municipality of San José. All four are in favor of maintaining the status quo. Again, the Ministry of Finance considers this fee an additional source of government income, as it receives 65.46% of funds. INS receives 19.78% of these funds to cover car insurance costs, and COSEVI receives 5.46% funds to cover road security costs. Consequently the Municipality of San José, which favors the

[18] There is no evidence to support this assumption.

improvement of the roads, also favors this policy. Every year around November and December, when the *marchamo* is due, consumers of private transportation complain that judging by the state of the roads, the circulation permit does not serve its purpose and some argue that it is unnecessary. Despite their complaints, the policy remains in effect and not much has been done to adjust the administration of funds.

The Ministry of Finance and COSEVI are the definitive stakeholders for the driving restriction policy, and both are in favor of keeping the restriction. The driving restriction was originally justified on grounds that it would help to reduce national expenditures on fuel, and for this reason the Ministry of Finance supported the program. COSEVI supports the program, because it has shown to reduce traffic accidents in the SJMA, and this is in line with its institutional objectives. This may explain why the restriction has remained in effect, despite opposition from some discretionary stakeholders, including consumers of private transportation, taxi drivers represented by CANATRANS and cargo transporters represented by CANATRAC.

2) Dependent stakeholders tend to be part of the group Civil Society/Private Sector. These stakeholders possess the attributes of legitimacy and urgency but lack the power to influence the policy implementation process. Civilians affected by transport externalities are listed as dependent stakeholders in all five policies, and they are generally in favor of modifying the current set of transport policies in such a way as to reduce the transport externalities that affect them on a daily basis (Rodriguez, Beatriz, *Interview*).

3) Research institutions are generally listed as discretionary stakeholders. As part of the scientific community, they usually take a neutral stance in political discussions; their role in the policy implementation process should focus on the generation of accurate data that can aid policymakers to make informed decisions. The objectives of our set of transport policies are negatively affected by an information gap caused by deficiencies in air quality data and the absence of a "data sharing culture" among research institutions and between research institutions and policymakers. During the data collection phase for this thesis, I encountered the absence of such a data sharing culture, which ultimately reduced the scope of the econometric study conducted in Chapter 5. Competition among leading research

institutions has led to rivalries that hinder the analysis of the relationship between the transport sector and the environment and create obstacles for the attainment of sustainable development in the country.

A few international organizations are listed among discretionary stakeholders, and although these agents generally take a neutral political stance, their financial services are a potentially important source of power for dependent stakeholders with environmental goals. The WB, GEF, GTZ, Swisscontact, UNDP, and the IDB have a history of financing projects that promote sustainability.

4) The stakeholders that have made the most significant contributions to the implementation process of our set of policies due to their high levels of salience include the Ministry of Finance (listed as a definitive stakeholder for all five policies), some division of MOPT (especially COSEVI—listed twice as definitive and three times as dominant, and CONAVI—listed once as definitive and four times as dominant stakeholder) and RTV SyC (listed twice as definitive and twice as dominant).

5) No dormant, demanding or dangerous stakeholders were identified, which means that all listed stakeholders possess the attribute of legitimacy. This implies that the identified stakeholders have the ability to legitimately participate in the implementation process of our set of policies. Whether they do so or not depends on their levels of urgency and power. Urgency can be obtained through access to information, which in turn fosters a greater understanding of the relationship between transport policies and the environment. Power is more difficult to obtain, but the first step toward its acquisition is organization and communication among those stakeholders that lack the attribute.

ii. On what grounds have these policies been justified, and what has been the role of environmental and fiscal concerns in this justification?

All of the policies in our set have been justified on fiscal grounds to some extent, at least initially. The fact that the Ministry of Finance is a definitive stakeholder in all five policies indicates that fiscal issues are always a primary concern for policymakers. Environmental

concerns have become important to policymakers in some instance, particularly in more recent justifications of car import taxes, RTV and the driving restriction.

The fuel tax policy in particular stands to benefit from the inclusion of environmental concerns in its justification. The fact that the Ministry of Finance and COSEVI are the two definitive stakeholders helps explain the strong role of fiscal concerns in the justification of fuel taxes, but what is not self-evident is why these actors have all but ignored the potential environmental effects of fuel taxes, given that these could improve the image of fuel taxes among opposing stakeholders. Perhaps this is because, despite Costa Rica's reputation as an environmentally conscious nation, activities that have contributed to this reputation have focused on other environmental themes, such as ecotourism and biodiversity conservation, as opposed to a reduction of externalities associated with the transport sector. An emphasis on the environmental effects of fuel taxes might not generate any tangible benefits for stakeholders, in which case they have little incentive to reformulate their argument.

Furthermore, stakeholders in favor of the fuel tax policy could strengthen their argument by addressing the double dividend hypothesis. In theory, fuel taxes can have two main purposes: to generate government income and to correct environmental externalities associated with the transport sector. There exists a third motivation that policymakers in several environmentally-conscious countries have recently taken into account, namely, the idea that environmental taxes generate a "double dividend". The basic hypothesis of the double dividend was first advanced by Tullock (1967), and it became popular during the early 1990s when economists began to draw their attention to climate change policies. The main idea behind the double dividend hypothesis is that a revenue-raising environmental tax (as opposed to a revenue-neutral tax) generates not one, but two dividends. The first dividend, which is also produced by a revenue-neutral tax, is an improvement in environmental quality by means of a reduction in the consumption of the taxed good. The second dividend is a reduction in the distortions caused by other revenue-raising taxes. For instance, income taxes have the distorting effect of reducing the labor supply, and consumption taxes have the distorting effect of reducing consumption. Revenues from the environmental tax can be used to cut distorting taxes, such as income and consumption taxes, thereby reducing their distorting effects (Schob 2003). All five policies have been influenced by fiscal motives, especially by the desire to reduce national

expenditures on fuel. Environmental goods and services represent an important contribution to Costa Rica's economy, and they deserve more attention from policymakers.

iii. What environmental interest groups have been involved in the implementation process of these policies? How successful have they been in highlighting the potential environmental benefits of these policies?

Costa Rica has several environmental interest groups, but very few of these have been actively involved in the implementation process of our set of transport policies. Many such groups, including the Association for the Conservation of Monteverde (*Asociación Conservacionista de Monteverde*), the Association for the Preservation of Wild Flora and Fauna (*Asociación Preservacionista de Flora y Fauna Silvestre*, APREFLOFAS), the ANAI Association (*Asociación ANAI*), and the Association of the Friends of Nature of the Central and Southern Pacific (*Asociación de Amigos de la Naturaleza del Pacífico Central y Sur*, ASANA), focus on biodiversity conservation. Only GTZ has been actively involved in the fuel tax policy execution process. Its representatives participated in formal negotiations regarding the terms of Law 8114, but they found little support for their environmental interests among the other participants (Corrales, *Interview*). GTZ's representatives were particularly concerned with the assignment of fuel tax funds, and they attempted to convince policymakers to devote a larger percentage of funds to environmental projects. They were not very successful in their efforts, and in the end, only 3.5% of funds have environmental ends, specifically the PSE program administered by FONAFIFO.

4.5.2. Final Considerations and Policy Recommendations

The development and implementation of policies involves a complex interplay of conflicting interests. These conflicts arise for various reasons. First, individuals often belong to more than one stakeholder group. For example, a city dweller affected by transport externalities can also be a driver and a direct consumer of fuel. Such an individual will likely be influenced simultaneously by an interest in reducing transport-related externalities and an interest in reducing fuel taxes that increase his personal expenditures, or eliminating a driving restriction that complicates his daily transportation routine. Second, a stakeholder group can be internally

divided, with some members in favor of a specific policy reform and others against it. For example, potential vehicle owners are divided in their position regarding car import taxes: potential owners with lower incomes are more likely to be opposed to a tax scheme that favors new and fuel-efficient vehicles than their higher income counterparts. Third, institutions are not free of corruption, which can be manifested in multiple ways and have various effects. For example, tax payers are suspicious of the distribution of funds generated by the fuel tax and circulation permit. Their most common complaint is that despite increases in these and other transport-related taxes, the roads remain in a poor state.

The model of stakeholder salience developed by Mitchell et al. (1997) highlights the transitory nature of stakeholder roles and emphasizes the dynamic character of stakeholder interactions. This has important implications for the future of Costa Rica's transport policies: most importantly it implies that change is possible. This is possibly the most important contribution of the stakeholder salience matrices, which make it easier to visualize which the level of influence a particular stakeholder has over a specific policy and which attributes need to be acquired in order for this influence to increase.

The following recommendations are intended to improve Costa Rica's set of transport policies by shifting its objectives toward the achievement of environmental objectives.

First, a stronger science-policy interface is crucial. As noted in Section 4.5.1., definitive stakeholders in this set of policies belong primarily to the Government/ Public Sector, and they generally have little interest in meeting environmental goals. The Ministry of Finance is one of the more prominent stakeholders in this group, and its objectives are not oriented toward the fulfillment of environmental goals. Its tactic in addressing the country's financial problems is short-sighted in that it ignores environmental problems that if left unaddressed will grow worse and create more financial problems in the long term. If definitive stakeholders gained a greater understanding of the effect of the transport sector on the environment and of the effect of the environment on the economy, they might have a different influence on the policy implementation process of this set of transport policies.

The science-policy interface is also fundamental to the education of dominant stakeholders that currently possess environmental objectives, such as MINAET. With greater access to

information and data, these stakeholders can acquire the missing attribute of urgency that would enable them to become definitive stakeholders. Once in that position, they would be in the capacity to better influence the policy-formation process.

Second, relationships among discretionary stakeholders should be cultivated. Local environmental interest groups are a potential source of change. In order to gain salience, these groups must acquire the attributes of urgency and power. Urgency can be acquired through greater access to information, which is primarily produced and distributed by research institutions, which are also mainly categorized as discretionary stakeholders. Power can be acquired through relationships with international agencies such as the WB, IDB, GEF and Swisscontact and GTZ, which are interested in financing projects that contribute to sustainable development goals. These agencies are likely to remain discretionary, because they tend to be apolitical. However, this is no impediment for them to aid other discretionary stakeholders in gaining salience.

Third, research institutions should better assume their responsibility to collect more data and generate more studies on air quality in the GMA. One of the main setbacks in modifying the current set of transport policies is the lack of indicators by which to measure the progress and deficiencies of these policies. Furthermore, these research centers should be encouraged to share their findings with the rest of the scientific community as well as with policymakers.

Lastly, the relationship between private and public transportation is undeniable, and an efficient public transport system is vital to the success of policies that regulate the private transport sector. Air pollution, vehicular congestion and traffic accidents could be further reduced if in addition to reforming private transport policies, policymakers addressed problems associated with the public transportation system.

5. AN ECONOMETRIC ANALSYIS OF SAN JOSÉ'S DRIVING RESTRICTION

Life is too short for traffic.

— Dan Bellack

5.1. Background

In August 2005, Costa Rican policymakers implemented a driving restriction (DR) that bans most drivers from circulating their vehicle within a restricted zone of the San José Metropolitan Area (SJMA). For any particular vehicle, the restriction is effective on one weekday per week, depending on the last digit of the vehicle's license plate, during restricted hours. For example, vehicles whose license plate number ends in 1 or 2 are prohibited from circulating within the restricted zone on Mondays during restricted hours[19], while those whose license plate ends in 3 or 4 cannot circulate within the zone on Tuesdays.

Driving restrictions such as the one implemented in San José have been implemented elsewhere in Latin America, including Mexico City, Bogotá, Santiago and Sao Paolo. Despite their popularity among policymakers, the effects of such restrictions on common transport externalities such as air pollution and traffic congestion remain unclear. Proponents of San José's restriction argue that the policy is a reasonable way to reduce congestion and air pollution within the SJMA. Opponents argue that it is inefficient, in the sense that it fails to reduce transport fuel sales, and that reductions in traffic congestion and air pollution within the SJMA have likely aggravated congestion and pollution in the areas surrounding the restricted area.

Like most of the policies in our set, the driving restriction was originally implemented for fiscal reasons: it was initially justified on grounds that it would help to reduce consumption of gasoline and thereby reduce national expenditures on fuel. When fuel prices began to fall in late 2008, opponents argued that the restriction was no longer necessary. The program was halted on June 12, 2009, and among the more notable consequences of this decision was a

[19]Initially, restricted hours included only morning and afternoon peak hours. When the program's terms were modified in July 2008, restricted hours were extended to between 6:00 AM and 7:00 PM.

sharp rise in traffic congestion within the SJMA. Proponents pressed policymakers to re-establish the restriction, arguing that it was now needed to reduce traffic congestion. On July 21, the program was re-initiated on grounds that it would help to reduce traffic congestion and air pollution within the SJMA.

MOPT and UNA have conducted studies on the effects of the DR (González 2008; Villegas 2009). However, in measuring the effects of the restriction on fuel sales, these studies do not adequately account for the counfounding effect of a trend in rising fuel prices, which coincides with part of the program's implementation dates. Furthermore, in measuring the effects of the restriction on air pollution and vehicular congestion, these studies limit the scope of analysis to the SJMA and do not consider effects in the outskirts of the restricted zone. Consequently, they fail to address the question of whether the restriction causes pollution and congestion problems to be displaced to a different geographical area.

The regression analysis in this chapter contributes to a more accurate evaluation of the effects of the DR on transport fuel sales in Costa Rica by accounting for changes in fuel prices over time, as well as changes in the vehicle fleet.

5.2. Methods

In Section 5.2.1., I review the literature on modeling transport fuel demand and measuring the effects of driving restrictions. In Section 5.2.2., I define the econometric models used in this analysis.

5.2.1. Literature Review

In order to measure the effect of the driving restriction on national fuel sales, it is necessary to model national demand for transport fuel. In theory, the demand for any given good is primarily dependent on the price of that good and on the income of consumers. However, this assumption does not always hold, particularly when the good in question has a derived demand, as in the case of transport fuel. The consumption decision for the case of transport fuel involves a series of steps, including the decision to buy a car, how many cars to buy, what kind of car to buy, and how often and how long to drive the car. For this reason, it is difficult

to model transport fuel demand, and the literature on the subject displays a variety of models. In a seminal paper on modeling transport fuel demand, Sterner and Dahl (1992) compare four fuel demand models that differ in the inclusion of an independent variable that measures vehicle fleet and in their ability to capture time delays in consumers' responses to changes in fuel price and income.

The most basic model of fuel demand is the *Simple Static Model* (*SSM*). Its underlying assumption is that fuel consumption is determined solely by fuel price and some measure of income (such as GDP or GDP per capita). It does not account for changes in the number of vehicles that may be caused by changes in fuel price or income, nor does it account for time delays in consumers' responses to these changes. Sterner and Dahl (1992) point out that the adjustment captured by this kind of model is less than total.

The *Simple Vehicle Model* (*SVM*) enhances the *SSM* by accounting for changes in the number of vehicles that may be caused by changes in fuel price or income. The underlying assumption of the *SVM* is that fuel consumption is determined by fuel price, some measure of income and a measure of the stock of vehicles. Sterner and Dahl (1992) include a variable for GDP (or GDP per capita) and another variable that reflects the number of vehicles in the fleet at any given point in time. Sterner and Dahl (1992) point out that static vehicle models such as this one fail to account for the process of adaptation that occurs when vehicles are replaced, and they find that these static models mainly pick up short term effects.

The *Lagged Endogenous Model (LEM)* enhances the *SSM* by accounting for the fact that consumers do not immediately adjust their fuel consumption to changes in fuel price or income, and that in reality there is a time lag in their adaptation[20]. However, the *LEM* does not account for changes in the vehicle fleet. The coefficients for the independent variables in this model only reflect part of the consumer's adaptation, and they can be interpreted as short term effects.

[20] See Appendix 2 for a complete derivation of the *LEM*.

Joining the *SVM* and *LEM* produces a more complete fuel demand model—the *Vehicle Lagged Endogenous Model (VLEM)* [21]. This model is based on the idea that fuel demand is affected by a time lag caused by consumers' delayed responses to changes in the economy and by some measure of the vehicle fleet. It can be divided into two models: *VLEMa* and *VLEMb*. *VLEMa* is based on two underlying assumptions: (i) that fuel consumption is determined by fuel price, some measure of income and changes in the stock of vehicles; (ii) that there is a time lag in consumers' adaptation to changes in fuel price and income. *VLEMb* is based on three underlying assumptions: the same assumptions (i) and (ii) as *VLEMa* and an additional assumption (iii) that vehicles have a geometrically declining influence on fuel consumption[22]-- in other words, the variable that measures vehicle fleet is also lagged. This last assumption is not so realistic, and Sterner and Dahl's (1992) coefficient estimates for this model are significantly lower than those of the other models in their set. They interpret this as a warning against "simply 'sticking' in variables in the equations to be estimated without properly considering the structural form of the economic model" (p. 74) and caution against using this model.

The literature on measuring the effects of driving restrictions includes theoretical attempts (Levinson and Shetty 1992; Goddard 1997; Molina and Molina 2002) and empirical attempts (Eskeland and Feyzioglu 1997; Davis 2008). The theoretical studies suggest that driving restrictions are a costly way to reduce traffic and pollution, and the empirical studies indicate that such restrictions are also counterproductive. Both Eskeland and Feyzioglu (1997) and Davis (2008) assess a driving restriction, *Hoy No Circula*, implemented in Mexico City in 1989. Eskeland and Feyzioglu (1997) measure the restriction's effects on gasoline sales and vehicle registrations. Davis (2008) expands that study by measuring the restriction's effects on air pollution, gasoline sales, bus ridership and vehicle registration, and he also refines the analysis by using a regression discontinuity specification to control for omitted time-varying factors, among other refinements. These empirical attempts suggest that Mexico City's restriction increased congestion and pollution. Davis finds that in order to avoid the restriction, many individuals bought an additional vehicle (usually an old one), instead of switching to

[21] Sterner and Dahl (1992) refer to this as the "Vehicle Lagged Endogenous Model".
[22] See Appendix 2.

public transportation. The author suggests that a greater use of old cars and increased weekend driving may have contributed to the counterproductive effects of the restriction.

Davis's (2008) analysis consists of regressing hourly air pollution, in logs, on an indicator variable for observations after the implementation of the driving restriction and a vector of covariates that includes indicator variables for month of the year, day of the week, hour of the day, interactions between weekends and hour of the day, and weather variables. He compares results from an ordinary least squares (OLS) design and a regression discontinuity (RD) design. In the OLS estimation, the error term might be correlated with time, and thus with the driving restriction dummy, which would in turn produce biased estimates of the coefficient for the driving restriction dummy. The RD design addresses this problem of endogeneity by considering an arbitrarily small window of time around the implementation of the driving restriction (Thistlethwaite and Campbell 1960; Angrist and Pischke 2009). Because unobserved factors that might influence air quality are similar near the date on which the restriction was implemented, observations before the restriction was implemented provide a comparison group for observations after its implementation.

5.2.2. The Models

I develop two models of transport fuel demand based on Sterner and Dahl's (1992) *SVM* and *VLEMa*, which I apply to four types of transport fuels: diesel, regular gas, premium gas and gasoline in general (regular and premium gas sales combined). The program's terms were significantly modified in July 2008[23], thus its dates of implementation are split into two periods: August 2005—June 2008 (Period 1) and July 2008—April 2009 (Period 2). I treat these changes in the policy as two separate programs, and therefore I include two dummy variables for the driving restriction—one indicates implementation in Period 1 and the other indicates implementation in Period 2. Since it is not advisable to use time windows smaller than one year when running a regression analysis using an RD design (Angrist and Pischke 2009), I use an OLS design. To address endogeneity problems, I keep the time frame of analysis narrow (January 2002—April 2009), and I include indicator variables for month of

[23] Initially, the restricted times were only during peak hours and the restricted zone was limited to downtown San José. After July 2008, restricted times were from 6:00 AM to 7:00 PM, and the restricted zone was expanded to include the entire SJMA.

year (to adjust for seasonal variation in fuel sales) and for year (to adjust for the increasing trend in fuel sales over time).

Simple Vehicle Model

In the *SVM*, fuel sales in logs, F_t, is regressed on the log of fuel price, the log of GDP per capita, Y_t, a vector of covariates, x_t, that includes indicator variables for month of the year and year, and two indicator variables for the driving restriction: $DR05_t$ (Period 1) and $DR08_t$ (Period 2). The regression equation for the *SVM* is as follows:

$$\ln F_t = \alpha + \beta_1 \ln P_t + \beta_2 \ln Y_t + \beta_3 x_t + \beta_4 \ln V_t + \gamma_1 DR05_t + \gamma_2 DR08_t + u_t \quad (9),$$

where:

F_t is monthly national fuel sales in barrels,
P_t is the national price of fuel in real USD per barrel,
Y_t is real GDP per vehicle,
x_t is a vector of covariates that includes indicator variables for month of year and year,
$DR05_t$ is an indicator variable for the driving restriction, equaling 1 between August 2005 and June 2008 (inclusive) and 0 elsewhere,
$DR08_t$ is an indicator variable for the driving restriction, equaling 1 between July 2008 and April 2009 (inclusive) and 0 elsewhere,
u_t is a cumulative error term.

The coefficients of interest, namely γ_1 and γ_2, are interpreted as follows:

$e^{\wedge}\gamma_1$ is the factor by which fuel sales increase or decrease as a result of the driving restriction for Period 1, and it is used to calculate the percentage change in fuel sales during this period.[24]

$e^{\wedge}\gamma_2$ is the factor by which fuel sales increase or decrease as a result of the driving restriction for Period 2 and it is used to calculate the percentage change in fuel sales during this period.

Vehicle Lagged Endogenous Model (a)

In this model, the *SVM* is slightly modified by the inclusion of lagged fuel sales, F_{t-x}, which represents the log of fuel sales in period *t-x*, where x can take values of 1, 2 or 3 months. All else remains the same, and the regression equation for *VLEMa* is as follows:

[24] Alternatively, one could interpret γ_1 as an elasticity, multiplying by 100 to get the percent effect of the DR on fuel sales. Literature on the interpretation of the coefficient of an independent indicator variable in equations with a dependent variable in logarithmic form suggest that a more accurate interpretation is as described in the body of this paper (Lye and Hirschberg 2002). It should be noted that the difference in the end results is minimal, and many studies, including Davis (2008), interpret the dummy coefficient directly as an elasticity.

$$\ln F_t = \alpha + \beta_1 \ln P_t + \beta_2 \ln Y_t + \beta_3 x_t + \beta_4 \ln F_{t-x} + \gamma_1 DR05_t + \gamma_2 DR08_t + u_t \quad (10),$$

where:

F_t is monthly national fuel sales in barrels,
P_t is the national price of fuel in real USD per barrel,
Y_t is real GDP per vehicle,
x_t is a vector of covariates that includes indicator variables for month of year and year,
F_{t-x} is monthly national fuel sales in barrels in period *t-x*, where *x* is 1, 2 or 3 months,
$DR05_t$ is an indicator variable for the driving restriction, equaling 1 between August 2005 and June 2008 (inclusive) and 0 elsewhere,
$DR08_t$ is an indicator variable for the driving restriction, equaling 1 between July 2008 and April 2009 (inclusive) and 0 elsewhere,
u_t is a cumulative error term.

The interpretation of the coefficients of interest, γ_1 and γ_2, does not change with respect to their interpretation in the *SVM* model.

5.3. Data

Fuel prices and GDP are deflated by the CPI, a measure of the vehicle stock is included in the regression equation, and log-linearity is assumed.

Data on national monthly fuel sales for the period January 2002 to April 2009 were obtained from the Costa Rican Petroleum Refinery (RECOPE). GDP data were obtained from the Central Bank of Costa Rica (*Banco Central de Costa Rica*) and were deflated by the CPI, as defined by the Costa Rican National Statistics and Census Bureau (*Instituto Nacional de Estadística y Censo*, INEC). Vehicle stock data were obtained from the Costa Rican National Registry (*Registro Nacional*); the stock includes the total number of registered vehicles in the country used for private as well as public transportation.

Table 7 provides summary statistics for the data set.

Table 7. Summary statistics for regression analysis data set

Variable	Mean	Minimum	Maximum
Real GDP (2006 US$)	2,737,030	2,275,226	3,334,570
Real GDP per capita	650,023	560,378	1,041,490
Fleet (# veh.)	924,429	664,563	1,041,490
Price diesel ($/barrel)	48,370	26,492	86,773
Price regular gas ($/barrel)	62,715	39,151	86,240
Price premium gas ($/barrel)	65,403	36,557	88,660
Price gasolines ($/barrel)	64,059	40,012	86,928
Quantity diesel sales (barrels)	537,081	371,581	951,479
Quantity regular gas sales (barrels)	283,836	235,424	345,778
Quantity premium gas sales (barrels)	165,043	115,920	210,559
Quantity gasolines sales (barrels)	448,879	388,124	542,292

5.4. Results

Regression results are summarized in Tables 8 through 11; stars (*) denote levels of statistical significance ("*" denotes 10%, "**" denotes 5%, and "***" denotes 1%). Figures 13 through 16 complement the tables. Results for each fuel type are summarized in each of subsections 5.4.1. through 5.4.4.

5.4.1. Diesel

Coefficients on the dummies for the driving restriction indicate that in Period 1, the restriction is associated with a statistically significant increase in diesel sales, and in Period 2 it is not associated with a statistically significant change in diesel sales. Raising *e* to the coefficient on *DR05* and multiplying by 100, we conclude that the restriction lead to an increase in diesel sales of between 9.16% and 10.53% in Period 1.

Table 8. Regression results for diesel demand

	SVM	VLEMa		
	F_t	F_{t-1}	F_{t-2}	F_{t-3}
Variable	**Coefficient**			
$ln\ P_t$	-0.2409825*	-0.2060312	-0.2218847	-0.2583317*
$ln\ Y_t$	0.6046451**	0.5790103**	0.5534647**	0.628768**
ln fleet	-0.1841921	-0.2008568	-0.1852777	-0.140004
$ln\ F_{t-1}$	-	0.0757609	-	-
$ln\ F_{t-2}$	-	-	-0.1284759	-
$ln\ F_{t-3}$	-	-	-	0.0170706
$DR05_t$	0.0829863	0.0723859	0.1001065**	0.08766*
$DR08_t$	-0.0436553	-0.0527595	-0.0397918	-0.0278127

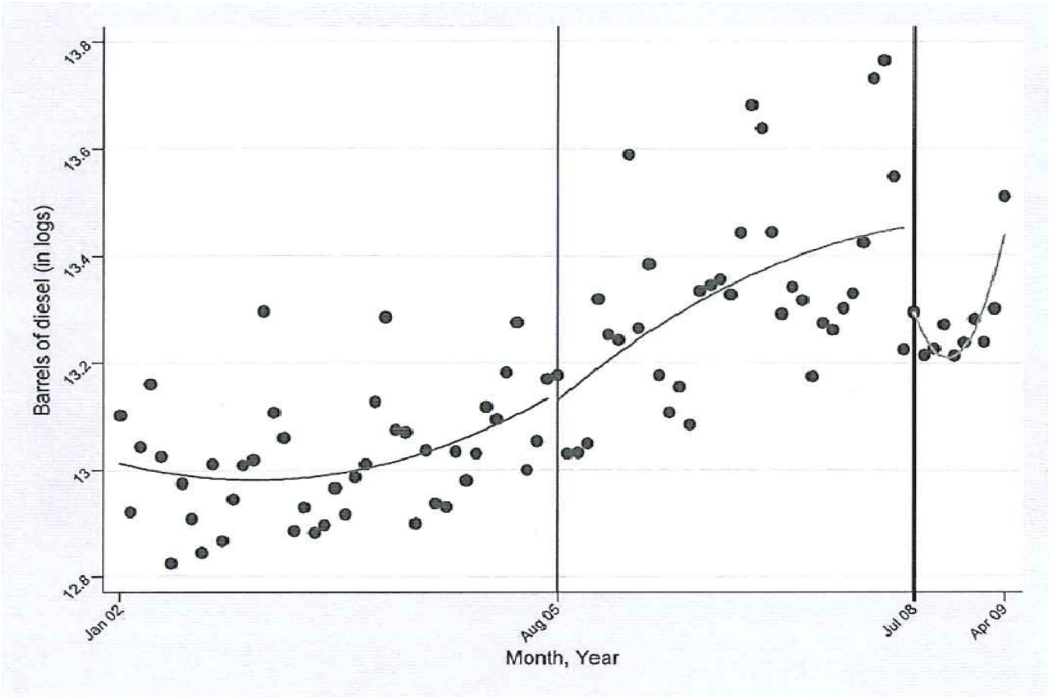

Figure 13. National monthly sales of diesel, Jan 2002 to Apr 2009
Source: RECOPE

5.4.2. Gasoline

Coefficients on the dummies for the driving restriction indicate that in Period 1, the restriction is not associated with a statistically significant change in gasoline sales, and in Period 2 it is associated with a statistically significant decrease in gasoline sales. Raising *e* to the coefficient on *DR08* and multiplying by 100, we conclude that the driving restriction lead to an increase in gasoline sales of between 6.23% and 9.23% in Period 2.

Table 9. Regression results for gasoline demand (regular and premium combined)

	SVM	VLEMa		
	F_t	F_{t-1}	F_{t-2}	F_{t-3}
Variable	**Coefficient**			
ln P_t	-0.1810244***	-0.1795233***	-0.1897747***	-0.20699***
ln Y_t	-0.0210661	-0.0413467	-0.0063684	-0.0137193
ln fleet	0.0563685	0.0746761	0.075181	0.0922607
ln F_{t-1}	-	-0.2865259**	-	-
ln F_{t-2}	-	-	-0.0038581	-
ln F_{t-3}	-	-	-	0.1555575
$DR05_t$	-0.0147451	-0.0229291	-0.0126277	-0.0070745
$DR08_t$	-0.0660882*	-0.0883014**	-0.0604801*	-0.0517514

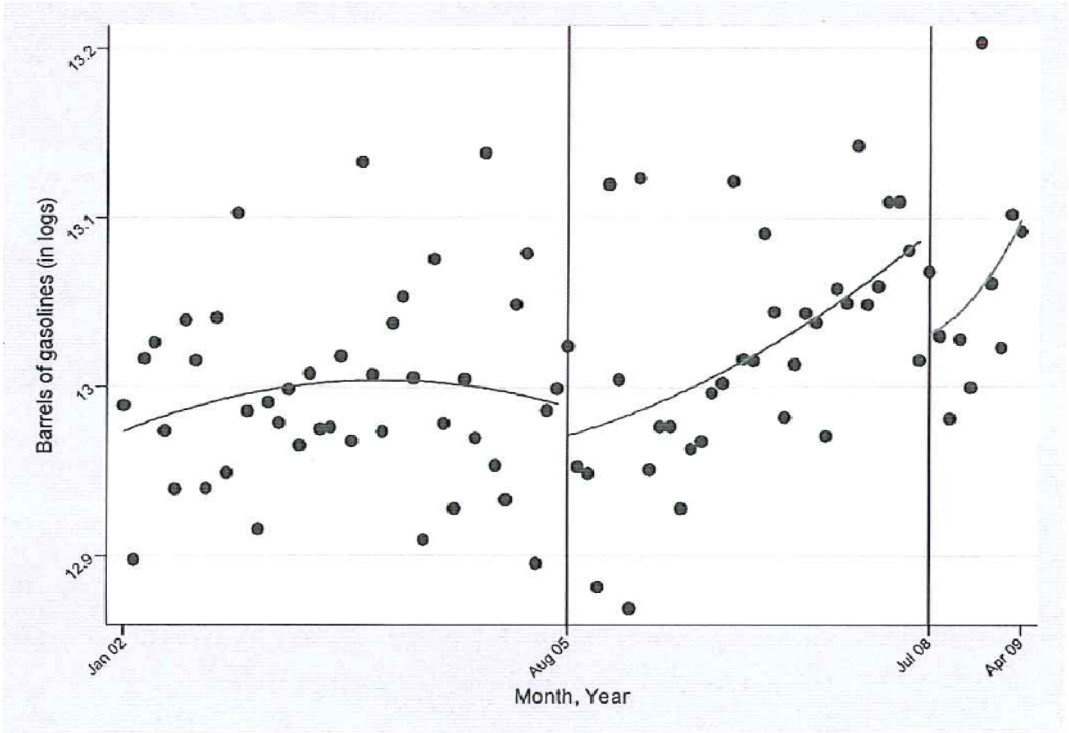

Figure 14. National monthly sales of gasoline (regular and premium combined), Jan 2002 to Apr 2009
Source: RECOPE

5.4.3. Regular gasoline

Coefficients on the dummies for the driving restriction indicate that in Period 1, the restriction is associated with a statistically significant increase in regular gas sales, and in Period 2 it is not associated with a statistically significant change in gasoline sales. Raising *e* to the coefficient on *DR05* and multiplying by 100, we conclude that the restriction lead to an increase in regular gas sales of between 3.74% and 4.59% in Period 1.

Table 10. Regression results for regular gasoline demand

	SVM	**VLEMa**		
	F_t	F_{t-1}	F_{t-2}	F_{t-3}
Variable	**Coefficient**			
$ln\ P_t$	-0.1020111*	-0.102275*	-0.104046*	-0.1153734**
$ln\ Y_t$	0.0044593	-0.036021	0.0087273	0.0188469
ln fleet	0.0329387	0.0301201	0.0419328	0.0528595
$ln\ F_{t-1}$	-	-0.3382876***	-	-
$ln\ F_{t-2}$	-	-	-0.0344748	-
$ln\ F_{t-3}$	-	-	-	0.1085421
$DR05_t$	0.0370584*	0.044872**	0.0391353*	0.0366768*
$DR08_t$	-0.0276878	-0.0464459	-0.0264562	-0.0200982

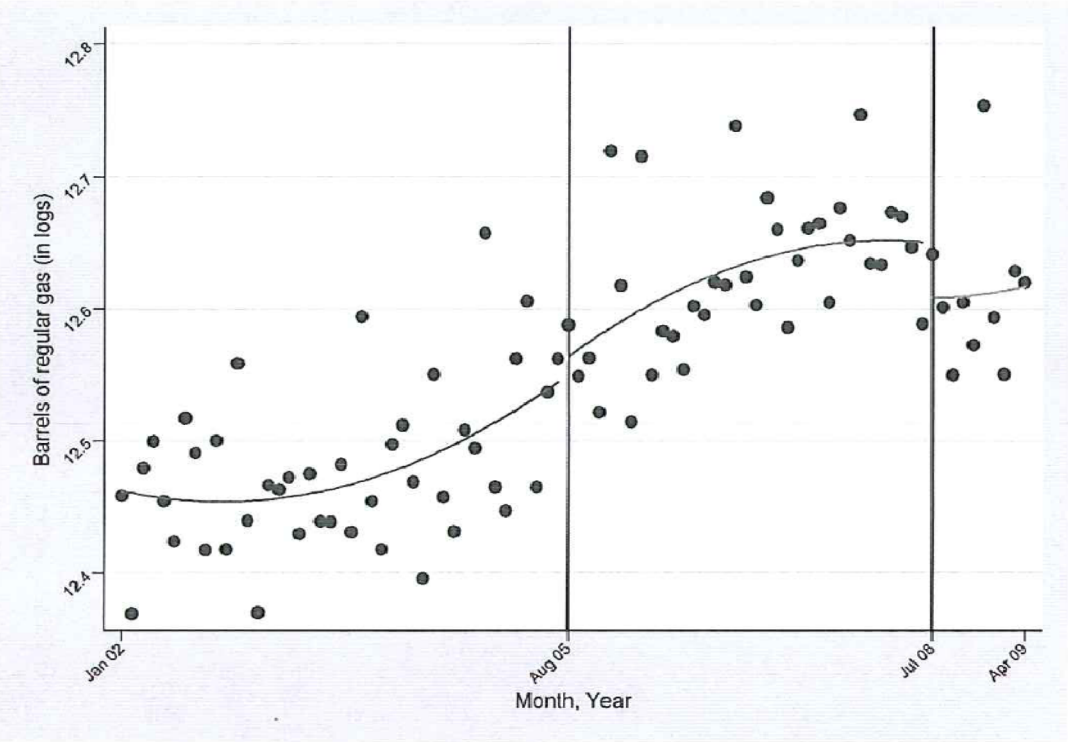

Figure 15. National monthly sales of regular gasoline, Jan 2002 to Apr 2009
Source: RECOPE

5.4.4. Premium gasoline

Coefficients on the dummies for the driving restriction indicate that the restriction is associated with a statistically significant decrease in premium gas sales and both Period 1 and Period 2. Raising *e* to the coefficient on *DR05* and multiplying by 100, we conclude that the restriction lead to a decrease in premium gas sales of between 8.14% and 11.72% in Period 1. Doing the same to the coefficient on *DR08*, we conclude that the restriction lead to a decrease in premium gas sales of between 12.84% and 15.56% in Period 2.

Table 11. Regression results for premium gasoline demand

	SVM	VLEMa		
	F_t	F_{t-1}	F_{t-2}	F_{t-3}
Variable	**Coefficient**			
$ln\ P_t$	-0.3022597***	-0.3071321***	-0.3495598***	-0.3535303***
$ln\ Y_t$	-0.1925881	-0.185303	-0.2247158	-0.2456073
ln fleet	0.0948149	0.0910077	0.0832838	0.143583
$ln\ F_{t-1}$	-	0.0633916	-	-
$ln\ F_{t-2}$	-	-	0.164549	-
$ln\ F_{t-3}$	-	-	-	0.2469495*
$DR05_t$	-0.1109113***	-0.1020254***	-0.0927714**	-0.0782268**
$DR08_t$	-0.1446231***	-0.1342995**	-0.1268555**	-0.120829**

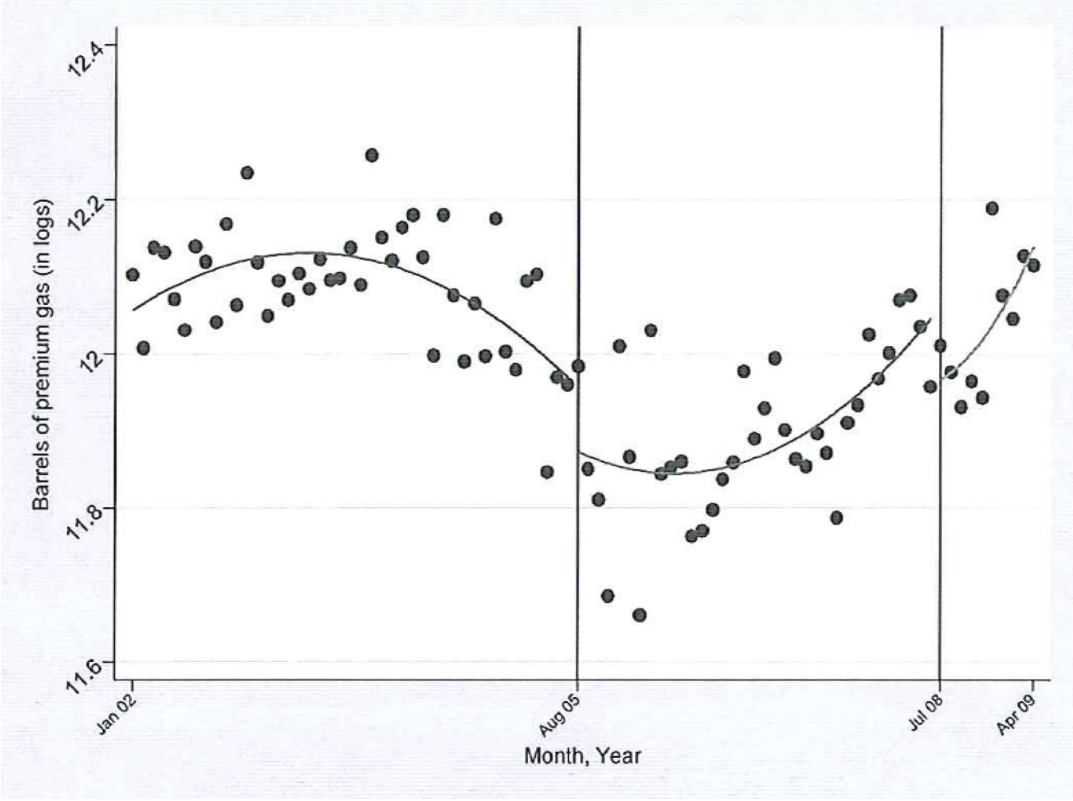

Figure 16. National monthly sales of premium gasoline, Jan 2002 to Apr 2009
Source: RECOPE

5.5. Discussion

The results of this regression analysis are divided into Periods 1 and 2 by fuel type and can be summarized as follows:

- Diesel sales increased by between 9.16% and 10.53% during Period 1, but they did not change in a statistically significant way during Period 2.
- Gasoline sales (regular and premium combined) did not change in a statistically significant way in Period 1, and they decreased by between 6.23% and 9.23% in Period 2. The effects on gasoline sales can be divided into regular and premium gas, as follows:
  - Regular gas sales increased by between 3.74% and 4.59% in Period 1, but they did not change in a statistically significant way during Period 2.
  - Premium gas sales decreased by between 8.14% and 11.72% during Period 1 and by between 12.84% and 15.56% during Period 2.

Table 12. Effect of the driving restriction on fuel sales

Period	% change in fuel sales			
	Diesel	Gasolines	Regular gas	Premium gas
1	+ 9.16 to 10.53	none	+ 3.74 to 4.59	- 8.14 to 11.72
2	none	-6.23 to 9.23	none	- 12.84 to 15.56

Several explanations could be given account for the changes in fuel sales.

The results for Period 1 should be interpreted with caution, given that the DR was practically not enforced after April 2006 (Cantero 2008). Since enforcement was weak, it is reasonable to believe that compliance was also weak. Thus, changes in fuel sales during this period are likely influenced by some other factor that coincides with the DR05 dummy and has not been considered in this regression analysis.

One such factor might be the substitution of premium gas for regular gas or diesel, which may have occurred as a consequence of rising premium gas prices—a phenomenon that occurred all throughout Period 1. Substitution fuel prices are not included in the regressions, because substitution between fuel types is unclear. The difference in fuel quality between premium and

regular gasoline sold in Costa Rica is so large that any substitution between these fuel types suggests the acquisition of low-quality vehicles (which can be fueled by regular gasoline without incurring serious damages), as opposed to the use of regular gasoline to fuel high-quality vehicles (which are damaged if not fueled by premium gas) (Murillo, *Interview*). The rise in diesel and regular gas sales, coupled by a fall in premium gas sales, may be a reflection of changes in the composition of the vehicle fleet. If rising fuel prices prompted consumers to buy diesel-powered vehicles or to buy older cars, which can easily be fueled by regular gas, this might explain the increase in diesel sales and regular gas sales, and the decrease in premium gas sales during Period 1. These consumption decisions can only be verified by detailed vehicle ownership data, which are unavailable.[25]

It is also possible that in Period 1, some consumers of premium gas switched to public transportation (diesel used for transportation purposes is consumed primarily by public buses and taxis). Assuming this is true, it is not clear what kind of public transportation was selected (the data do not identify whether sold diesel was used to fuel buses or taxis). The type of public transportation selected is of interest because of its implications for air quality. If most consumers of premium gas switched to the bus, the effects on air pollution are likely positive—public buses are more fuel efficient than private vehicles, because their ratio of fuel consumption to passenger per trip is lower than that of private cars. If, however, they switched to taxis, the effects on air pollution are likely negative—the ratio of fuel consumption to passenger per trip of taxis and private vehicles is similar, but diesel combustion produces more of the particles that are harmful to human health than does gasoline combustion (Murillo, *Interview*; Herrera 2005). But because the restriction was so weakly enforced during this period, it is unlikely that drivers made any permanent changes in their transportation habits in response to the DR.

During Period 2 the restriction was well enforced, and thus it is reasonable to assume that compliance was consistent throughout the period. The effects of the restriction on gasoline sales (regular and premium combined) are of particular interest, since the program was originally implemented to reduce national gasoline sales. The results indicate that this objective was indeed fulfilled, at least in Period 2. The DR reduced gasoline sales by between

[25] Some data on vehicle ownership is included in the National Registry's Movable Property (*Bienes Muebes*) database, however the accuracy and completeness of this database are questionable.

6.23% and 9.23%, however it had no significant effect on diesel sales. The fact that diesel sales did not increase suggests that changes in driving habits spurred by the restriction did not include the substitution of private transportation for public transportation—a hypothesis that could be verified by an analysis of bus and taxi ridership data.

When gasoline sales are divided into regular and premium, the results are different for each fuel type. While the restriction had no significant effect on regular gas sales, it reduced premium gas sales by between 12.84% and 15.56%. Differences in the number of vehicles owned by consumers of regular gas as compared to consumers of premium gas might account for these results. Households that consume premium gas probably have a higher income than households that consume regular gas[26]. Furthermore, wealthier households likely own more than one vehicle, and consequently they are likely to carpool with members of their own family in order to avoid the restriction. On the other hand, poorer households (those that consume regular gas) likely own only one vehicle, and consequently carpooling becomes more complicated and therefore less appealing (since they must coordinate with vehicle owners outside of the household who have room for at least one additional passenger). If poorer car owners consider the public transport system inappropriate for their transportation needs, they may be more inclined to risk being fined for violating the restriction—this would explain why neither diesel nor regular gas sales changed in response to the DR in Period 2. If this is true, the restriction may place an unfair burden on poorer car owners, and this has important implications for the distributional impacts of the policy. While it is easier for rich car owners to accommodate to the restriction by carpooling with members of their own household, poor car owners, who cannot carpool as easily and are less able to pay taxi fares, are more likely to modify their transport habits by either taking the bus (which apparently does not satisfy their current transport needs) or by risking a fine. In either case, poorer drivers bear a greater part of the burden of reducing gasoline consumption by means of the restriction.

Thus, although San José's driving restriction was successful in reducing gasoline sales between July 2008 and April 2009, poorer drivers were likely disproportionately affected by the policy. Policymakers should keep this in mind when evaluating the effects of the policy

[26] Not only is premium gas more expensive than regular gas, but the difference in fuel quality between premium and regular gas sold in Costa Rica implies that consumers of premium gas own better quality, and therefore more expensive, vehicles than do consumers of regular gas.

and in deciding what other transport policies to implement simultaneously. If the restriction were complemented by an improvement in mass public transport, its presumed unfavorable distributional consequences would likely disappear, and its effects on gasoline consumption might be stronger.

The regression analysis in this chapter could be strengthened by an analysis of data on bus and taxi ridership, air pollution (both within the restricted area and in its surroundings), as well as traffic congestion (both within the restricted area and in its surroundings). Unfortunately, these data either do not exist or are not easily obtained.

These results generate a few lessons for Costa Rican policymakers, summarized below.

1. If policymakers wish to decrease gasoline sales in a way that does not disproportionately affect drivers in different income groups, they must find a way to create incentives for consumers of both regular and premium gasoline to substitute private transport for mass public transport. This implies improving the current public city bus system and the passenger train service.
2. Given that national gasoline sales decreased as a result of the DR, it is likely that vehicular emissions and traffic congestion have also decreased. Because policies such as this one can have unintended consequences in geographical areas that lie outside of their implementation zone, it is important to determine whether changes in emissions and traffic congestion within the restricted zone differ markedly from such changes in the area surrounding this zone. Although some studies show that air pollution and traffic congestion within the SJMA have decreased as a consequence of the DR, they do not adequately address the program's effects outside of the restricted zone. Policymakers should find ways to address this gap by creating incentives for research institutions to expand and improve the analysis of the effects of San José's DR.
3. This analysis could be improved by the use of data on bus and taxi ridership, air quality and traffic congestion; however these data either do not exist or are not readily available. Policymakers are advised to incentivize the collection and sharing of data related to the transport sector in order to facilitate and promote research that might contribute to an improvement of transportation policies.

6. CONCLUSIONS AND RECOMMENDATIONS

Unless someone like you cares a whole awful lot, nothing is going to get better. It's not.
— Dr. Seuss

This thesis characterizes the political economy of Costa Rica's private transport sector through an analysis of a set of five policies (fuel taxes, car import taxes, a comprehensive vehicular inspection, a circulation permit, and a driving restriction program). Qualitative and quantitative methods complement each other in an innovative combination of stakeholder, incidence and econometric analysis. In this chapter I summarize the main results of the analysis conducted in chapters 4 and 5, and in so doing I review the main opportunities and challenges policymakers face in designing a more integrated regulatory approach for the transport sector. In Sections 6.1. and 6.2. I summarize the Specific Objectives 1 and 2, and in Section 6.3. I address Specific Objective No. 3.

6.1. Specific Objective No. 1

To identify current and potential stakeholders associated with the relevant set of policies and analyze their role in current and future environmental policymaking.

- Definitive stakeholders belong primarily to the group Government/Public Sector. Due to their high level of salience, their position with respect to policy objectives has proven to heavily influence the final policy outcome.
- Dependent stakeholders belong primarily to the group Civil Society/Private Sector. These stakeholders possess the attributes of legitimacy and urgency but lack the power to influence the policy implementation process.
- Civilians affected by transport externalities are listed as dependent stakeholders in all five policies, and they are generally in favor of modifying the current set of transport policies in such a way as to reduce the transport externalities that affect them on a daily basis.

- Research institutions are generally listed as discretionary stakeholders. Their role in the policy implementation process should focus on the generation of accurate data that can aid policymakers to make informed decisions.
- The stakeholders that have made the most significant contributions to the implementation process of our set of policies due to their high levels of salience include the Ministry of Finance, some division of MOPT (especially COSEVI and CONAVI) and RTV SyC.
- No dormant, demanding or dangerous stakeholders were identified, which means that the listed stakeholders possess the attribute of legitimacy. This implies that all identified stakeholders have the ability to legitimately participate in the implementation process of our set of policies.
- Most of the policies in our set have been justified on fiscal grounds, at least initially. The fact that the Ministry of Finance is a definitive stakeholder in all five policies indicates that fiscal issues are always a primary concern for policymakers.
- Costa Rica has several environmental interest groups, but very few of these have been actively involved in the implementation process of our set of transport policies. Most focus on biodiversity conservation.
- Despite Costa Rica's reputation as an environmentally conscious nation, activities that have contributed to this reputation have focused on other environmental themes, such as ecotourism and biodiversity conservation, as opposed to a reduction of externalities associated with the transport sector.
- The fuel tax policy in particular stands to benefit from the inclusion of the double dividend hypothesis in the policy's justification. Policymakers could effectively combine fiscal and environmental interests by taking into account the double dividend hypothesis. thereby making fuel taxation an intelligent option for raising government revenue and simultaneously reducing transport-related externalities.

6.2. Specific Objective No. 2

To assess the effects of the driving restriction policy on fuel sales through an econometric analysis.

- Although the San José's driving restriction was successful in reducing gasoline sales by between 12.84% and 15.56% in Period 2, poorer drivers were likely disproportionately affected by the policy. Policymakers should keep this in mind when evaluating the effects of the policy and in deciding what other transport policies to implement simultaneously.
- If policymakers wish to decrease gasoline sales in a way that does not disproportionately affect drivers in different income groups, they must find a way to create incentives for consumers of both regular and premium gasoline to substitute private transport for mass public transport.
- Policymakers should find ways to create incentives for research institutions to expand and improve the analysis of the effects of San José's DR, particularly its effects on air pollution and congestion outside the restricted area.
- Policymakers are advised to incentivize the collection and sharing of data related to the transport sector in order to facilitate and promote research that might contribute to an improvement of transportation policies.

6.3. Specific Objective No. 3

To identify the main shortcomings of the current set of policies that regulate Costa Rica's private transport sector and provide recommendations for policymakers.

- *Shortcoming*: Rivalries among research institutions are an impediment to reaching sustainability goals.
  Recommendation: Relationships and communication among research institutions should be cultivated.
- *Shortcoming*: Policymakers do not have access to the information they need in order to make informed policy decisions.
  Recommendation: (1) Research institutions should collect more data and generate more studies that analyze the links between the transport sector and environmental problems. Air pollution data for the GMA is particularly important. (2) Relationships and communication between research institutions and policymakers should be cultivated in order to strengthen the science-policy interface.

- *Shortcoming:* Inadequate public transport policies hinder the success of private transport polices.

  Recommendation: The public transport system should be improved in such a way as to complement private transport policies. For example, bus routes and stops can be redesigned so as to reduce urban congestion; buses and taxies can be subject to import taxes that incentivize high fuel efficiency; railway infrastructure can be improved so that more cargo can be transported by rail, instead of by truck.
- *Shortcoming*: A perception among stakeholders that policymakers and government institutions do not adequately fulfill their responsibilities persists. This decreases stakeholder participation in the policy implementation process and reinforces the salience of current definitive stakeholders.

  Recommendation: (1) government institutions and stakeholders that manage policy funds should increase the level of transparency of their actions in order dispel suspicions of corruption and eliminate any existing corruption; (2) better financial planning should be encouraged among responsible institutions, especially MOPT.
- *Shortcoming:* The Ministry of Finance, a definitive stakeholder of this set of policies, is notably uninterested in the attainment of environmental goals, and this is detrimental to policy design.

  Recommendation: The Ministry of Finance should adopt a more long term vision in addressing national financial problems. Such a vision can be developed through greater access to data and studies that address the relationship between fiscal and environmental goals.

Despite the shortcomings described above, this set of transport policies is not entirely inadequate: fuel taxes incentivize a reduction in fuel consumption; car import taxes now incentivize the acquisition of newer, more fuel-efficient vehicles; the driving restriction has decreased the consumption of diesel and regular gas nationwide and reduced vehicular congestion in the SJMA; the circulation permit (*marchamo*) and the technical vehicular inspection (RTV) are a step toward better air quality and fewer traffic accidents. In designing private transport policies, policymakers should strive to create an integrated set of policies that complement each other and specifically address transport externalities. Costa Rica's current set of private transport policies has developed in a haphazard manner, and since policymakers

have been overly concerned with fiscal problems, many of the policies' positive effects on the reduction of transport externalities have been secondary, and almost accidental.

The development and implementation of transport policies involves a complex interplay of conflicting interests, and for this reason the problems generated by the transport sector are almost to be expected. The set of transport polices analyzed in this thesis has the potential to further reduce externalities associated with the transport sector. Their improvement requires that policymakers have access to interdisciplinary knowledge (especially in the fields of economics, law and environmental studies) and that communication among different sectors of society be more fluid. With this research, I attempt to contribute to a better understanding of the political economy of private transport regulation in Costa Rica, and in so doing, I hope to contribute to the design of a more integrated regulatory approach for the sector.

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APPENDICES

Appendix 1. Semi-structured Interview

This interview is part of the data collection phase of my master's thesis. The general objective of this thesis is to analyze the political economy of Costa Rica's private transport sector and identify the main opportunities and challenges in designing a more integrated regulatory approach for the sector. The purpose of this interview is to discuss a few topics that are central to my thesis, which I have identified below.

- I focus on the following five policies:
  1) fuel taxes(as established by Law 8114)
  2) car import taxes
  3) RTV (technical vehicular inspection)
  4) marchamo (annual circulation permit)
  5) the driving restriction

- I am interested in doing the following with respect to the above mentioned policies:
  - Identify key actors in the policy execution process
  - Understand the policy execution process and the role of identified actors in this process
  - Identify the fundamental justification for the policy's implementation (i.e., What is its main objective? Is the policy a fiscal/environmental measure?)
  - Identify the effects of the policy on the activities of the identified actors

Preliminary Questions

1. Please indicate the actors/institutions that you consider important in the implementation of each policy.
2. Please describe the role of the institution you represent in the implementation process of each policy.
3. Please describe the relationships between the institution you represent and other institutions that are involved in the implementation process of each policy. If there are problems between institutions, please describe the cause(s) and effect(s) of those problems, and suggest a way to minimize or resolve them.
4. In your opinion, what is the main objective of each policy? Please justify your response, either by mentioning relevant legislation or making reference to political discussions on the topic.
5. Please identify the effects of each policy on the activities of the institution you represent.
6. Please recommend another person who might be able to help me with the data collection phase and interview process.

Appendix 2. Derivation of the Lagged Endogenous Model

Sterner and Dahl (1992) derive the Lagged Endogenous Model as follows.

Desired consumption G* is based on real income and real gas price (eq. A2.1).

$$G_t^* = c + \alpha P_t + \beta Y_t + \varepsilon_{t1} \qquad \text{(A2.1)}$$

When prices change, consumers are either unable or unwilling to immediately adjust their new level of desired consumption. The only adapt partially, by a fraction *s* (eq. A2.2).

$$G_t - G_{t-1} = s(G_t^* - G_{t-1}) + \varepsilon_{t2} \qquad \text{(A2.2)}$$

Combining equations A2.1 and A2.2 and rearranging yields the following:

$$G = sc + s\alpha P + s\beta Y + (1 - s)G_{t-1} + \mu_t \qquad \text{(A2.3)}$$

where $\mu_t = s\varepsilon_{t1} + s\varepsilon_{t2}$.

Equation (A2.3) is equivalent to (A2.4):

$$G = sc + s\alpha\left[P_t + (1 - s)P_{t-1} + (1 - s)^2 P_{t-2} + \ldots\right] + s\beta\left[Y_t + (1 - s)Y_{t-1} + (1 - s)^2 Y_{t-2} + \ldots\right] + \Theta_t \qquad \text{(A2.4)}$$

where $\Theta_t = \mu_t + (1 - s)\mu_{t-1} + (1 - s)^2\mu_{t-2} + \ldots$

This shows that the effects of a change in price or income (or any other independent variable included, such as vehicle fleet, for instance) have a gradually decreasing effect through time. In other words, they have a geometrically declining effect.

Appendix 3. CRC/USD buy/sell exchange rates (Jan 2006 to Dec 2009)

Throughout the text, monetary values are given in Costa Rican Colones (CRC) with approximate United States Dollar (USD) values in parentheses. The exchange rate used to calculate USD values is 500 CRC/USD, which is an approximation based on historic exchange rates between January 1, 2006 and December 31, 2009. The source of the exchange rates is the Central Bank of Costa Rica (*Banco Central de Costa Rica*).

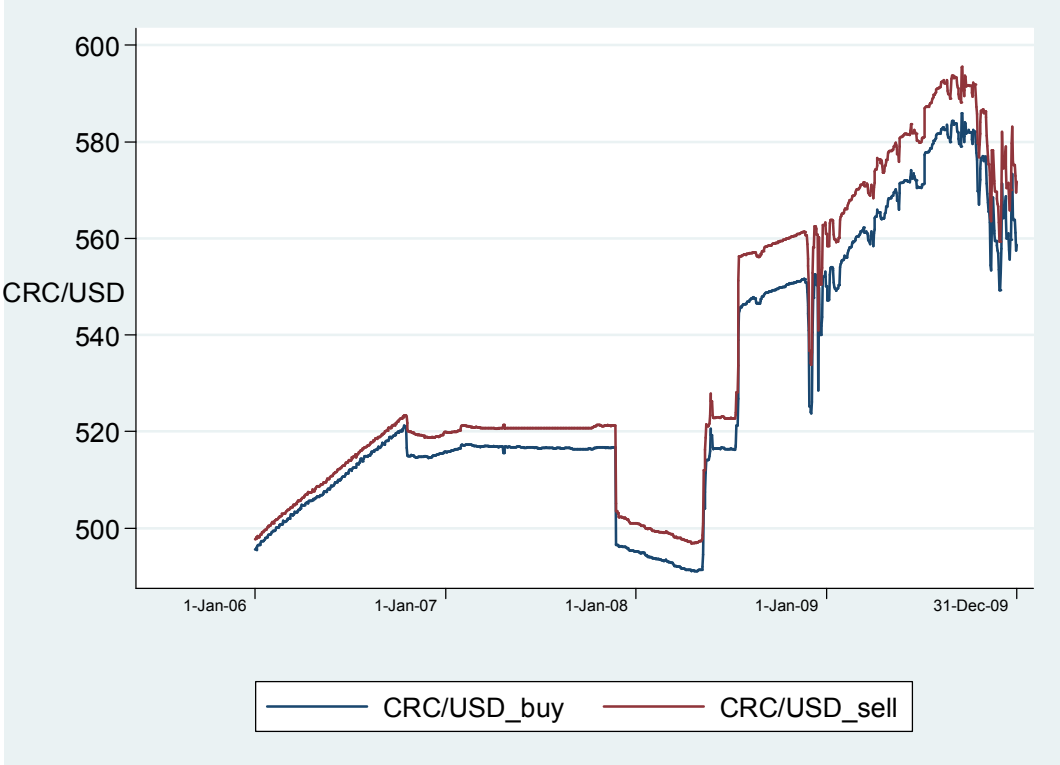

Figure 1A. CRC/USD exchange rate, January 1, 2006 to December 31, 2009