NÚMERO 555

ARTURO ANTÓN-SARABIA AND FAUSTO HERNÁNDEZ-TRILLO †

Optimal Gasoline Tax in Developing, Oil-Producing Countries: The Case of Mexico

JULIO 2013

CIDE

www.cide.edu

† Centro de Investigación y Docencia Económicas (CIDE), Carretera México Toluca 3655, México DF 01210. Mexico. Correspondence to: fausto.hernandez@cide.edu.

Carretera México Toluca 3655, Col. Lomas de Santa Fe, 01210,
Álvaro Obregón, México DF, México.
www.cide.edu

Dirección de Publicaciones
publicaciones@cide.edu
Tel. 5081 4003

Acknowledgements

The authors thank the Economic Commission for Latin America and the Caribbean (ECLAC) for financial support, Luis Miguel Galindo for useful comments, and Alejandra Pérez for excellent research assistance.

Abstract

This paper uses the methodology of Parry and Small (2005) to estimate the optimal gasoline tax for a less-developed, oil-producing country. The relevance of the estimation relies on the differences between less-developed countries LDCs and industrial countries. We argue that lawless roads, general subsidies on gasoline, poor mass transportation systems, older vehicle fleets and cities' unregulated growth make the LDC tax rate differ substantially from rates in the developed world. We find that the optimal gasoline tax is $1.91 per gallon at 2011 prices and show that the estimate differences are in line with the factors hypothesized. In contrast to the existing literature on industrial countries, we illustrate that the relative gasoline tax incidence may be progressive in Mexico and, more generally, in LDCs.

Key Words: gasoline tax, gasoline subsidy, tax incidence, Mexico

JEL Classification: Q40, Q48 and H21

Resumen

Este artículo utiliza la metodología de Parry y Small (2005) para estimar el impuesto óptimo a la gasolina para un país productor de petróleo y de ingreso medio. La relevancia de este cálculo se inscribe en las diferencias existentes entre países en vías de desarrollo y los industriales. El trabajo argumenta que la falta de aplicación de los reglamentos de tránsito, los subsidios generalizados a la gasolina, las deficiencias en los sistemas de transporte masivo y el crecimiento anárquico de las ciudades harían que las tasas de impuesto a la gasolina difirieran entre dos grupos de países. El resultado arroja un impuesto óptimo de 1.91 USDLL por galón de gasolina a precios de 2011 y se muestra que las diferencias están acordes con las hipótesis planteadas. En adición y contrario a lo que normalmente se demuestra que este impuesto es progresivo.

Introduction

Optimal environmental taxation, particularly gasoline taxation, has received a great deal of attention in the academic literature (Sandmo, 1975; Bovenberg and de Mooij, 1994; Bovenberg and van der Ploeg, 1994; Bovenberg and Goulder, 1996; Parry and Small, 2005; West and Williams, 2007; and Lin and Prince, 2009, among others). With a few exceptions (Parry and Timilsina, 2008; Parry and Strand, 2010), empirical estimates regarding the optimal gas tax rate are generally calculated for developed economies. However, optimal tax estimates in oil-producing, less-developed countries (LDCs) may differ from those in advanced economies because of a series of factors.

First, in numerous oil-producing LDCs, this natural resource is extracted by a state company, which makes governments believe that the oil yields should benefit people through subsidized, cheap gasoline.[1] Second, cities' growth in LDCs is often anarchic with deficient, narrow, and pot-holed road systems; critical congestion areas; deficient modal shares of public transport; and urban sprawling that provokes higher congestion costs (Gakenheimer, 1999).[2] Third, poor regulation and a lack of traffic rule enforcement further increase the probability of accidents.[3] Finally, LDCs usually have a much older motor vehicle fleet than advanced countries, which increases pollution (Harrington and McConnell, 2003). All of these features call for the calculation of an appropriate gasoline tax for LDCs.

The objective of this paper is to estimate the optimal fuel tax for a representative middle-income country. For that purpose, we apply the methodology of Parry and Small (2005) to Mexico, a prominent oil-producing LDC that heavily subsidizes gasoline consumption. The advantage of this method is the decomposition of the second-best optimal fuel tax into several components, including those related to congestion, accidents, and air pollution. As previously mentioned, these negative externalities may in fact be more severe in LDCs relative to developed economies.

[1] The International Monetary Fund (IMF, 2013) reports that pre-tax petroleum subsidies are systematically higher in oil-exporting countries. Among these countries, Middle Eastern and North-African countries allocate approximately 4.5 percent of GDP to petroleum subsidies. This rate is approximately 1.2 percent in sub-Saharan Africa and Latin America.

[2] Based on a study by the International Association of Public Transport, Parry and Timilsina (2008) report that 10 out of 12 of the largest megacities with the lowest average travel speed are in developing countries. See also "Lawless Roads: Road Safety in Mexico", The Economist, Oct. 8, 2011.

[3] According to the World Health Organization (2013), middle-income countries have the highest annual road traffic fatality rates (20.1 per 100,000 population), whereas the rate in high-income countries is the lowest (8.7 per 100,000). In addition, 80 percent of road traffic deaths occur in middle-income countries, which account for 72 percent of the world population but only 52 percent of the world's registered vehicles. In fact, nearly 70 percent of road deaths occur in 13 countries, 12 of which are developing countries (including Mexico).

Our results suggest an optimal gasoline tax of $1.91/gallon at 2011 prices. The (adjusted) Pigouvian tax is the largest portion of the tax, amounting to $1.62/gallon. The accident component explains approximately one-third of the Pigouvian tax, followed by distance-related pollution damages and congestion externalities. The Ramsey tax component, arising from a relatively inelastic fuel demand, contributes another $0.28/gallon.

The optimal gas tax in Mexico is larger than the estimate reported by Parry and Small (2005) for the US, even after updating their results at 2011 prices.[4] To understand what accounts for the differences in results, we change each one of the parameters that is different in Mexico relative to the US, one at a time. We find that distance-related pollution damages and accident costs explain the majority of the differences. The presence of fuel subsidies (typical of oil-producing countries) also explains approximately 20 percent of the differences. Perhaps surprisingly, the lower fuel efficiency attributed to an older vehicle fleet does not explain the differences in tax estimates.

Using the optimal gas tax estimate, we address the effects of such a tax across income deciles in Mexico. Contrary to the conventional wisdom, we find that the fuel tax is progressive. The intuition is simple: only 9 percent of the poorest households demand fuel because the majority of these households (84 percent) do not own a car. Conversely, 86 percent of the wealthiest households demand fuel because 93 percent own at least one car.

This paper is structured as follows. Section 2 briefly describes the fuel pricing policy in Mexico. Section 3 sketches the model, and section 4 presents the results. Section 5 compares the results to those obtained for advanced economies and includes a sensitivity analysis. Section 6 provides concluding remarks.

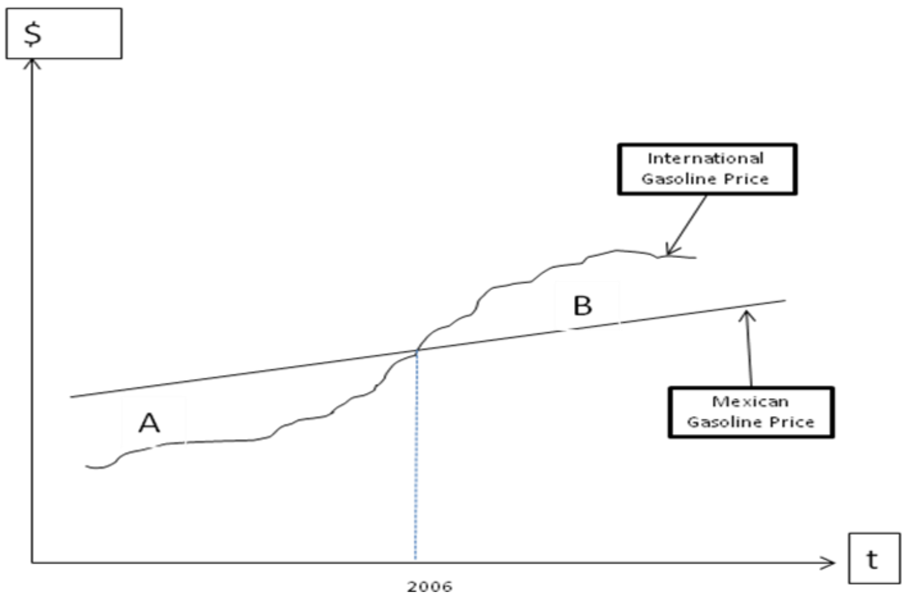
1. ¿How is the gasoline price set in Mexico?

Mexico is an oil-producing country. Because of an inappropriate gasoline pricing policy (a pre-determined crawling gas price), a subsidy emerges when the international petroleum price is above a certain level, as has been the case since 2006. This subvention, which produces a final price below its market price, is frequently justified under political, i.e., populist, grounds. To better understand this policy, consider Figure 1 for illustrative purposes. Clearly, area A implies a positive excise tax because the international gasoline

[4] Parry and Small (2005) report an optimal tax rate of $1.01/gallon for the US at 2000 prices. This estimate increases to $1.43/gallon at 2011 prices.

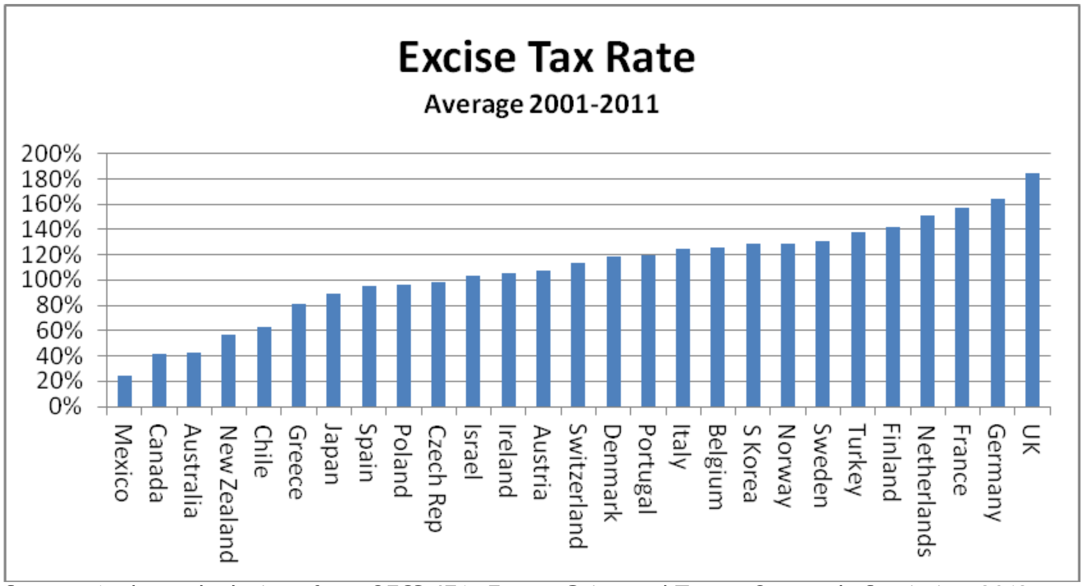
price (IGP) is lower than the pre-determined crawling Mexican price, whereas area B represents a negative tax (a subsidy) because the IGP is above the pre-determined price.

FIGURE 1



On average, Mexico registers the lowest excise tax rate among OECD countries for the period 2001-2011 (see Figure 2). When considering the period 2006-2011, the tax is in fact negative (a subsidy). This subsidy has cost the government an average of 1.4 percent of GDP over the period 2007-2011, an amount equivalent to the expenditures on poverty alleviation and public health-care programs in the country. Such a waste of resources calls not only for the elimination of the current pre-determined crawling price system but also for an estimation of the optimal gasoline tax rate.

FIGURE 2



Source: Author calculations from OECD-IEA, Energy Price and Taxes, Quarterly Statistics: 2012.

2. The model

2.1 Assumptions

In this section we describe the optimal gasoline tax model of Parry and Small (2005). Consider a static, closed economy with a representative agent with the following utility function:

$$U = u(\psi(C, M, T, G), N) - \varphi(P) - \delta(A), \tag{1}$$

where variables are expressed in per capita terms. Here, C is the consumption of the numeraire good, M is the vehicle miles of travel, T is time spent driving, G is government spending, N is leisure, P is the quantity of pollution, and A is severity-adjusted traffic accidents. Functions $u(\cdot)$ and $\psi(\cdot)$ are quasi-concave, whereas $\varphi(\cdot)$ and $\delta(\cdot)$ are weakly convex functions denoting disutility from pollution and (external) accident risk.

Vehicle miles traveled (VMT) are "produced" according to the following homogeneous function:

$$M = M(F, H), \tag{2}$$

where F is fuel consumption and H is a monetary expenditure of driving costs related to vehicle price and attributes.

Time spent driving is a function of both VMT and the inverse of the average travel speed π as follows:

$$T = \pi M = \pi(\bar{M})M. \tag{3}$$

Here, $\bar{M}$ is the aggregate miles driven per capita, and the function $\pi(\cdot)$ satisfies $\pi' > 0$, reflecting the concept that an increase in aggregate VMT leads to more congested roads. From the agent's point of view, $\bar{M}$ is treated as exogenous so that the agent does not take into account her own impact on congestion.

There are two types of pollutants. The first type is carbon dioxide, P_F, which is proportional to aggregate fuel consumption per capita $\bar{F}$. This pollutant causes the fuel-related damages arising from climate change. The second type includes local air pollutants, P_M, which depend positively on aggregate VMT. These pollutants can be expressed in terms of the same units, and therefore, total pollution P may be written as

$$P = P_F(\bar{F}) + P_M(\bar{M}), \tag{4}$$

with properties $P_F', P_M' > 0$. Because pollution depends on variables at the aggregate level, the agent does not internalize the costs of pollution from her own driving.
Traffic accidents A vary with aggregate VMT according to the following:

$$A = A(\bar{M}) = a(\bar{M})\bar{M}. \tag{5}$$

where $a(\bar{M})$ is the average external cost per mile. The function (5) assumes that traffic accidents are exogenous to the agent. For this reason, the function $\delta(\cdot)$ in (1) is the expected disutility from the external cost of traffic accidents.[5] The sign of a' is ambiguous, reflecting the idea that heavier traffic causes more frequent but less severe accidents.

The representative agent derives income from labor L at the wage rate w. The agent pays a tax rate t_L on labor income and a tax t_F on gasoline consumption. If q_F represents the price of gasoline, the agent's budget constraint is given by:

[5] The internal costs of accidents are implicitly included in H.

$$C + (q_F + t_F)F + H = (1 - t_L)wL. \tag{6}$$

Let $\bar{L}$ denote the agent's time endowment, which she may distribute among labor, leisure, and driving activities. The time constraint may be written as follows:

$$L + N + T = \bar{L}. \tag{7}$$

Goods are produced by perfectly competitive firms. The single input is labor, and the production function is linear in L, which implies a constant marginal product of labor and thus a constant wage rate at the optimum. Conveniently, w is normalized to one so that net labor income in (6) may be simply written as $(1 - t_L)L$.

Finally, the government finances an exogenous spending G through taxes on gasoline consumption and labor income. Thus the government's budget constraint is as follows:

$$t_L L + t_F F = G.$$

2.2 The optimal gasoline tax

The optimal gasoline tax, t_F^*, is obtained by maximizing the agent's utility with respect to the gasoline tax t_F, once changes in the labor tax, labor supply, fuel consumption, VMT, and utility from external costs are taken into account.[6] As discussed in Parry and Small (2005), the optimal tax may be disentangled into the following three terms: an adjusted Pigouvian tax, a Ramsey tax, and a congestion feedback. The full expression is as follows:

$$t_F^* = \frac{MEC_F}{1+MEB_L} + \frac{(1-\eta_{MI})\varepsilon_{LL}^c}{\eta_{FF}} \cdot \frac{t_L(q_F+t_F)}{1-t_L} + E^C[\varepsilon_{LL} - (1-\eta_{MI})\varepsilon_{LL}^c]\frac{\beta M}{F} \cdot \frac{t_L}{1-t_L}, \tag{9}$$

where

Adjusted Pigouvian tax = $\frac{MEC_F}{1+MEB_L}$, (9a)

Ramsey tax = $\frac{(1-\eta_{MI})\varepsilon_{LL}^c}{\eta_{FF}} \cdot \frac{t_L(q_F+t_F)}{1-t_L}$, (9b)

Congestion feedback = $E^C[\varepsilon_{LL} - (1-\eta_{MI})\varepsilon_{LL}^c]\frac{\beta M}{F} \cdot \frac{t_L}{1-t_L}$, (9c)

[6] A detailed derivation for the optimal tax is provided in Parry and Small (2004).

$$MEC_F \equiv E^{P_F} + (E^C + E^A + E^{P_M})(\beta M/F), \tag{9d}$$

$$\beta \equiv \frac{\eta_{MF}}{\eta_{FF}}, \tag{9e}$$

$$MEB_L \equiv \frac{-t_L \frac{\partial L}{\partial t_L}}{L + t_L \frac{\partial L}{\partial t_L}} = \frac{\frac{t_L}{1-t_L}\varepsilon_{LL}}{1 - \frac{t_L}{1-t_L}\varepsilon_{LL}}. \tag{9f}$$

In the expressions above, η_{MI} is the elasticity of demand for VMT with respect to disposable income, η_{FF} is the own-price elasticity of demand for fuel, η_{MF} is the elasticity of VMT with respect to the consumer fuel price, and ε_{LL} and ε_{LL}^c are the uncompensated and compensated labor supply elasticities, respectively. Additionally, the terms E^{P_F}, E^C, E^A and E^{P_M} represent the marginal damage from carbon emissions and the marginal congestion, accident, and distance-related pollution costs, respectively.

3. Calibration and results

3.1 Parameter values

Despite the lack of information typical of a LDC, it is possible to construct good proxies of parameters for Mexico. A detailed discussion regarding the way in which each parameter is calculated may be found in the extended version of this paper (Anton and Hernandez, 2013). For easy reference, central values are presented in Table 1 at 2011 prices; a sensitivity analysis is conducted in the next section. Parameters for which there are small differences or for which there are no available estimates are simply taken from Parry and Small (2005). With regard to the remaining parameters, it is worth noting the salient differences with respect to the central values for the US and UK (countries considered by Parry and Small) and California (the US state studied by Lin and Prince, 2009).

TABLE 1

PARAMETER VALUES

PARAMETERS TAKEN FROM PARRY AND SMALL	**VALUE**
VMT portion of gas price elasticity: β	0.4
Uncompensated labor supply elasticity: ε_{LL}	0.2
Compensated labor supply elasticity: ε_{LL}^{c}	0.35
VMT expenditure elasticity: η_{MI}	0.6
Gasoline price elasticity: η_{FF}	0.55
PARAMETERS CALIBRATED FOR MEXICO	**VALUE**
Initial fuel efficiency: M^0/F^0 (miles/gallon)	18.2
Pollution damages, distance-related: E^{P_M} (cents/mile)	5.5
Pollution damages, fuel-related: E^{P_F} (cents/gallon)	18.2
External congestion costs: E^C (cents/mile)	5.0
External accident costs: E^A (cents/mile)	6.4
Government expenditure/GDP: α_G	0.2
Gasoline production share: α_F	0.024
Producer price of gasoline: q_F (cents/gallon)	252
Initial tax rate on gasoline: t_F^0 (cents/gallon)	(-18)

Note: all elasticities are defined as positive numbers.

First, the vehicle fleet in Mexico is 16.5 years old on average (Melgar, 2011), well above the average in industrial countries. The older vehicle fleet negatively affects average fuel efficiency; this figure is set at 18.2 miles/gallon, which is lower than the referred cases. Distance-related pollution damages are set at 5.5 cents/mile, based on the estimates of Small and Kazimi (1995) and Parry and Timilsina (2008) for Mexico City. Notably, this cost is more than twice the estimate from Parry and Small, even after updating to 2011 prices. The cost of fuel-related pollution damages in Mexico is taken from Johnson et al. (2009). Again, the estimate of 18.2 cents/gallon is substantially higher than those in the reference studies.

External congestion costs are calculated using the method of Parry and Timilsina (2008). According to this method, the cost of congestion is inversely related to the average car speed. The estimate of 5 cents/mile is slightly larger than those reported in Parry and Small at 2011 prices; there are a number of reasons why this result may be the case. The majority of automobiles in Mexico circulate in major cities.[7] In addition, city roads are typically in poor shape and full of reduced-speed bumps, and the modal share of public transport in cities is deficient, among other factors. These elements contribute to a lower average speed and thus to a higher congestion cost.

External accident costs are estimated at 6.4 cents/mile. This figure, which is also large relative to the reference studies above, may be explained by a number of factors. These factors include the following: the ease of obtaining a driver's license without even taking a driver's examination; the poor regulation and weak enforcement of traffic laws; and the lack of traffic road signs. Perhaps unsurprisingly, the World Health Organization (2013) reports that Mexico is among the 13 countries in the world with the highest number of road traffic deaths (approximately 16,700 in 2010). Medina (2012) estimates that accident costs account for 1.3 percent of GDP. This number is used to calculate the accident costs in Table 1.

The government expenditure share and the gasoline production share are taken from national accounts and official data sources. The gas price of $2.52/gallon is the estimated average for the producer's price in Mexico for the period 2003-2011. Finally, the initial tax on gasoline is negative (i.e., a subsidy of 18 cents/gallon) because this is the average tax for the period 2003-2011. As previously mentioned, such subsidies are not unusual in oil-producing LDCs such as Mexico.

3.2 The optimal gas tax

According to the model, the optimal gasoline tax in Mexico reaches $1.91/gallon. This tax can be disentangled into an adjusted Pigouvian tax of $1.62, a Ramsey tax component of $0.28 and a congestion feedback effect of only 1 cent/gallon (see Table 2). The accident costs component is the largest among the Pigouvian externalities, explaining approximately 29 percent of the optimal tax. Distance-related pollution and congestion costs contribute an additional 25 and 22.5 percent of the optimal tax, respectively.

[7] For example, one-fifth of total cars in the country circulate in Mexico City's metropolitan area, where the average speed is 10.6 miles/hour.

TABLE 2

COMPONENTS OF THE OPTIMAL GASOLINE TAX IN MEXICO
CENTS PER GALLON IN 2011 US DOLLARS

Adjusted Pigouvian tax:	162
Pollution, fuel-related	17
Pollution, distance-related	47
Congestion	43
Accidents	55
Ramsey tax	28
Congestion feedback	1
Optimal gasoline tax rate (t_F^*)	191

Table 3 presents the welfare gain for different levels of the optimal tax rate t_F^*. The optimal tax of $1.91/gallon would produce a welfare gain of 15.1 percent of initial pre-tax fuel expenditure. Interestingly, eliminating the current subsidy on gasoline explains slightly more than one-fifth of the total welfare gain. Likewise, a tax of only 0.25 times the optimal gasoline tax (48 cents/gallon) would cover 63 percent of the total welfare gain.

TABLE 3
WELFARE EFFECTS OF GASOLINE TAX RATES
(RELATIVE TO CURRENT RATE, EXPRESSED AS PERCENT OF INITIAL PRE-TAX FUEL EXPENDITURES)

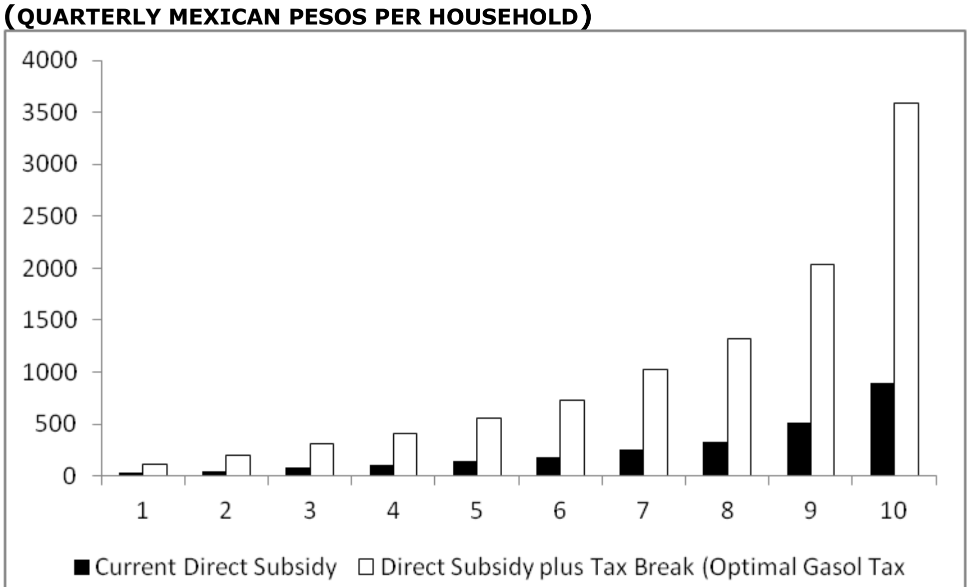
FUEL TAX RATE	RATE (CENTS/GALLON)	WELFARE CHANGE (% OF PRE-TAX EXPENDITURE)
0	0	3.4
$0.25t_F^*$	48	9.5
$0.50t_F^*$	95	13.0
$0.75t_F^*$	143	14.6
Optimal rate (t_F^*)	191	15.1
$1.25t_F^*$	239	14.7
$1.50t_F^*$	286	13.7

Is Gasoline Tax Regressive?
A typical claim against the implementation of a gasoline tax is that such a tax is regressive, although it is less regressive if the analysis is expenditure-based rather than income-based (see, for example, KPMG Peat Marwick, 1990;

Poterba, 1991; Walls and Hanson, 1999).[8] Based on this concern, Figure 3 presents the average ("current") fuel subsidy of 18 cents/gallon across deciles in Mexico (numbers are converted to Mexican pesos at 2011 prices). The figure also includes the "implicit" subsidy arising from the absence of the optimal gasoline tax estimated above. Interestingly, both current and implicit subsidies are much higher for the higher-income deciles. The explanation for this finding is relatively simple: only 9 percent of the lowest decile demand fuel, whereas nearly 87 percent of the highest decile do so. Thus, the fuel tax is in fact progressive in absolute terms.

Figure 4 now presents the incidence across deciles of the optimal fuel tax, where households are classified according to their total expenditures as suggested by Poterba (1991). Light bars denote the incidence of such a tax on car owners. Clearly, the tax is regressive in relative terms. However, these estimates do not take into account that only 9 percent of the poorest households demand fuel, since the majority of these households do not own a car. Conversely, 87 percent of the wealthiest households demand fuel. When such an adjustment is made, the optimal tax is in fact progressive with the exception of the upper decile (dark bars). Thus contrary to conventional wisdom and the findings reported for industrial economies, the gasoline tax does not necessarily affect the poor the most even in relative terms.

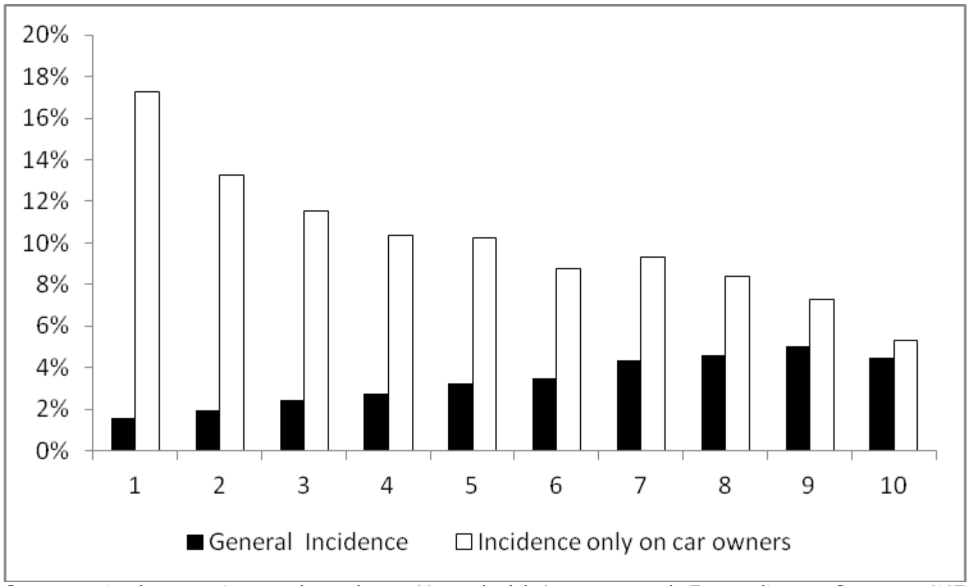
FIGURE 3
GASOLINE SUBSIDY ACROSS INCOME DECILES IN MEXICO
(QUARTERLY MEXICAN PESOS PER HOUSEHOLD)



Source: Author estimate based on Household Income and Expenditure Survey, INEGI, Mexico (2010).

[8] West (2004) finds that a greater price responsiveness among low-income households makes a gas tax progressive across lower incomes and mitigates progressivity across upper incomes.

FIGURE 4
RELATIVE GASOLINE TAX INCIDENCE
(% WITH RESPECT TO HOUSEHOLD TOTAL EXPENDITURE)



Source: Author estimate based on Household Income and Expenditure Survey, INEGI, Mexico (2010).

4. Explaining the differences in estimates and sensitivity analysis

It is also useful to compare our findings with the findings obtained by Parry and Small (PS, 2005). For this purpose, we initially set all parameters in the model at the values reported by PS for the US economy.[9] For each exercise, we then change a single parameter according to the values listed in Table 1. The results for relevant parameters are presented in Table 4. The parameter that most contributes to an explanation of the differences between our estimates and those from PS is the distance-related pollution damages. A higher value in our case increases the original PS estimate by 38.6 percent. Higher external accident costs in Mexico also contribute, increasing the original estimate by 37.6 percent. Also noteworthy is the lower initial tax rate on gasoline (a subsidy in our case), which explains 20 percent of the difference with respect to PS. Interestingly, lower fuel efficiency is not a major factor accounting for such differences.

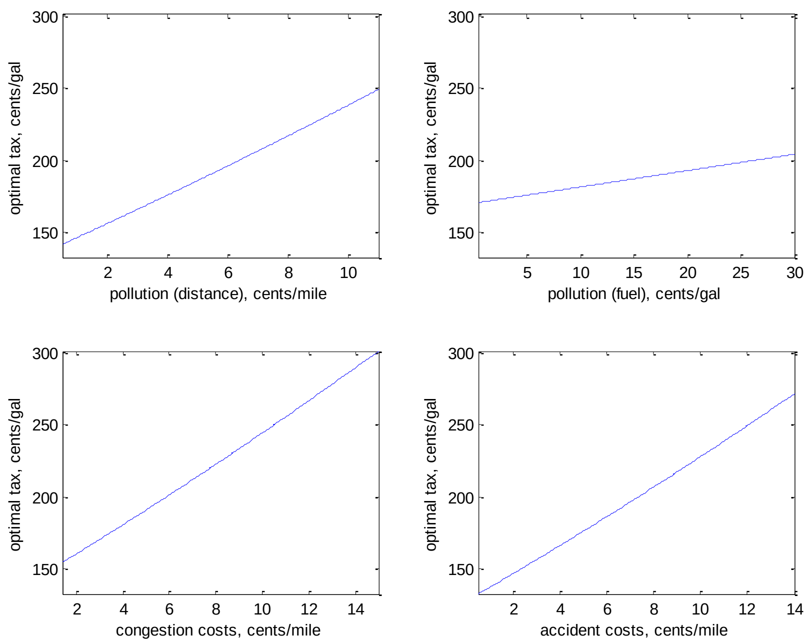
[9] It should be kept in mind that PS parameters are in 2000 prices. We chose not to update parameter values to 2011 prices to facilitate comparison with the original PS estimates.

TABLE 4
DIFFERENCES BETWEEN PARRY AND SMALL (2005) ESTIMATE AND THE OPTIMAL GASOLINE TAX IN MEXICO

Parameter	Change in the optimal gasoline tax rate relative to the Parry and Small estimate (%, ceteris paribus)
Higher pollution damages, distance related	38.6
Higher external accident costs	37.6
Higher producer price of gasoline	20.8
Lower initial tax rate on gasoline	18.8
Higher external congestion costs	15.8
Higher pollution damages, fuel related	13.9
Higher gasoline production share	-0.0
Lower fuel efficiency	-0.1
Lower government spending/GDP	-0.1

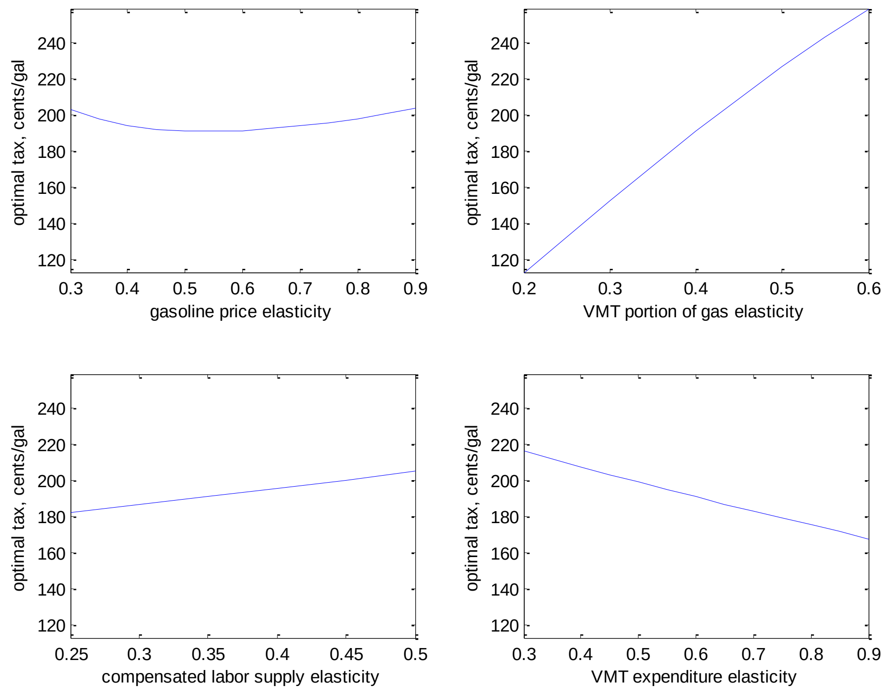
We also conduct a sensitive analysis given the uncertainty surrounding central parameter values. For that purpose, we vary 8 of the most relevant parameters, one at a time. The intervals for each case approximately follow the intervals considered by Parry and Small (2005) for the US. The results are presented in Figure 5.

FIGURE 5
SENSITIVITY OF OPTIMAL GASOLINE TAX TO PARAMETER VARIATION



The optimal tax is particularly sensitive to distance-related pollution, congestion costs, accident costs, and the VMT portion of gas elasticity. These parameters are related to the marginal external cost of fuel use, MEC_F (see equation 9d). Notice that the first three parameters also explain the majority of the differences between the estimates of Parry and Small (2005) and our estimates. In all the remaining cases, the optimal tax is primarily between \$1.70 and \$2.10 per gallon.

FIGURE 5 (CONTINUED)
SENSITIVITY OF OPTIMAL GASOLINE TAX TO PARAMETER VARIATION



5. Final discussion and implications for public policy

Fuel subsidies in Mexico have cost 1.2 percent of GDP on average during the period 2006-2011. Noticeably, this figure does not include tax expenditures (foregone public revenues). Including this additional amount, foregone public revenues would reach 2.0 percent of GDP (equivalent to 20 percent of non-oil tax revenues in Mexico). Adding direct subsidies plus tax breaks, the cost is approximately 3.2 percent of GDP (approximately one-third of non-oil tax revenues). This figure is large when one takes into account that VAT collection in Mexico is approximately 3.8 percent of GDP and that corporate and personal income taxes together account for 5.1 percent of GDP.

As previously mentioned, such a waste of resources is not atypical in oil-exporting countries. In fact, since 2008, pre-tax energy subsidies in the world have been steadily increasing over time, especially in developing, oil-exporting countries (IMF, 2013). Given the negative effects that these subsidies may have on human health, the environment, and traffic congestion, there exists a strong case against the use of these subsidies. In fact, the major issue is not only to eliminate fuel subsidies but also to find ways to ameliorate such externalities. As frequently argued in the literature, a gasoline tax may at least partially accomplish this goal.

Our optimal tax estimate of $1.91 per gallon is well above the Parry and Small (2005) calculation for the US, even after updating their results at 2011 prices. This result is primarily explained by differences in distance-related pollution damages, accident costs, and congestion costs estimates. The presence of a fuel subsidy also contributes to such differences. Based on the parameters examined, we find that the existence of an older motor vehicle fleet in an LDC does not help to explain the difference in optimal tax estimates with respect to the US.

We have also demonstrated that fuel subsidies (current and implicit) primarily benefit the wealthiest deciles of population. Contrary to the findings reported for developed countries, a fuel tax is progressive in an LDC such as Mexico (see also Sterner, 2011). The intuition for this result is simple: the majority of people at the lowest deciles do not own a car, and thus, their spending on fuel is relatively low; as income increases, the share of the population that demands fuel for their vehicles increases. This result is striking because fuel taxes are typically avoided based on equity grounds. However, it should be stressed that this finding does not take into account the negative effects that a gasoline tax may have on the poor through fuel-intensive sectors such as public transport and the once-and-for-all effect on consumer prices. This issue merits further study that extends beyond the scope of this paper. However, a plan in which a share of fuel revenue is used to compensate poor households through the subsidization of public transport might yield a better outcome in terms of lower external damages, including those related to the environment and human health.

References

Antón, Arturo and Fausto Hernandez (2013), “El impuesto sobre gasolinas: una aplicación para Ecuador, El Salvador y México”, mimeo, Economic Commission for Latin America and the Caribbean.

Bovenberg, A. L. and R. A. de Mooij (1994), “Environmental Levies and Distortionary Taxation”, American Economic Review Vol. 84 No. 4, 1085 – 1089.

Bovenberg, A. L. and L. H. Goulder (1996), “Optimal Environmental Taxation in the Presence of Other Taxes: General-Equilibrium Analyses”, American Economic Review Vol. 86 No. 4, 985 – 1000.

Bovenberg, A. L. and F. van der Ploeg (1994), “Environmental Policy, Public Finance, and the Labor Market in a Second-Best World”, Journal of Public Economics 55, 349 – 390.

Gakenheimer, R. (1999), “Urban Mobility in the Developing World”, Transportation Research Part A: Policy and Practice 33, 671 – 689.

Harrington, W. and V. McConnell (2003), “Motor Vehicles and the Environment”, Resources for the Future Report, Washington, DC.

International Monetary Fund (2013), Energy Subsidy Reform: Lessons and Implications, Washington, DC.

Johnson, T., C. Alatorre, Z. Romo and F. Liu (2009), Low-Carbon Development for Mexico, The World Bank, Washington, DC.

KPMG Peat Marwick (1990), “Changes in the Progressivity of the Federal Tax System, 1980 to 1990”, Prepared for the Coallition Against Regressive Taxation, Washington, DC.

Lin, C. and L. Prince (2009), “The Optimal Gas Tax for California”, Energy Policy, 37, 5173–5183.

Medina, S. (2012), La importancia de la reducción del uso de los automóviles en México, ITDP and British Embassy in Mexico.

Melgar Consultants of Mexico (2011), Estadística de la Población de Vehículos en México 1972-2011, Report to the Mexican Auto Industry Association, Mexico.

Parry, I. W. H. and K. A. Small (2005), “Does Britain or the United States Have the Right Gasoline Tax?” American Economic Review, Vol. 95, No. 4, 1276 – 1289.

Parry, I. W. H. and K. A. Small (2004), “Does Britain or the United States Have the Right Gasoline Tax?”, Discussion Paper 02-12, Resources for the Future.

Parry, I. W. H. and J. Strand (2010), “International Fuel Tax Assessment: An Application to Chile”, Discussion Paper 10-07, Resources for the Future.

Parry, I. W. H. and G. R. Timilsina (2008), “How Should Passenger Travel in Mexico City Be Priced?”, Discussion Paper 08-17, Resources for the Future.

Poterba, J. M. (1991), “Is the Gasoline Tax Regressive?” In Tax Policy and the Economy vol. 5, edited by D. Bradford, Cambridge: MIT Press, 145 - 164.

Sandmo, A. (1975), “Optimal Taxation in the Presence of Externalities”, Swedish Journal of Economics 77 (1), 86 – 98.

Small, K. A. and C. Kazimi (1995), “On the Costs of Air Pollution from Motor Vehicles”, Journal of Transport Economics and Policy 29, 7 – 32.

Sterner, T., ed., (2011), Fuel Taxes and the Poor: The Distributional Effects of Gasoline Taxation and Their Implications for Climate Policy, RFF Press, Routledge.

Walls, M. and Hanson, J. (1999), “Distributional Aspects of an Environmental Tax Shift: The Case of Motor Vehicle Emissions Taxes”, National Tax Journal 52 (1), 53 - 65.

West, S. E. (2004), “Distributional Effects of Alternative Vehicle Pollution Control Policies”, Journal of Public Economics 88, 735 - 757.

West, S. E. and R. C. Williams III (2007), “Optimal Taxation and Cross-Price Effects on Labor Supply: Estimates of the Optimal Gas Tax”, Journal of Public Economics 91, 593-617.

World Health Organization (2013), Global Status Report on Road Safety, Geneva, Switzerland.

Novedades

División de Administración Pública

José Ramón Gil, Sara A. Berg, Theresa A. Pardo, G. Brian Burke y Ahmet Guler, *Realización de Encuestas vía Internet en Ciencias Sociales…*, DTAP-272.

Ma. Amparo Casar, *Persuasion, Coercion and the Domestic Costs of Compliance: Evaluating the NAALC Resolutions against Mexico*, DTAP-271.

Rodrigo Velázquez, *Bureaucratic Discretion in the Mexican Public Health Sector*, DTAP-270.

Salvador Espinosa, *On Bond Market Development and Strategic Cross-Border Infrastructure…*, DTAP-269.

Ignacio Lozano, *Ejidos y comunidades: ¿cuarto nivel de gobierno?...*, DTAP-268.

Ernesto Flores y Judith Mariscal, *Oportunidades y desafíos de la banda ancha móvil en América Latina*, DTAP-267.

Judith Mariscal y Walter Lepore, *Oportunidades y uso de las TIC: Innovaciones en el Programa de combate a la pobreza*, DTAP-266.

Ernesto Flores y Judith Mariscal, *El caso de la Licitación de la Red Troncal en México: Lecciones para el Perú,* DTAP-265.

Dolores Luna *et al.*, *Índice de Gobierno Electrónico Estatal: La medición 2010*, DTAP-264.

Gabriel Purón Cid y J. Ramón Gil-García, *Los efectos de las características tecnológicas en los sitios web del gobierno*, DTAP-263.

División de Economía

Eva Olimpia Arceo, Rema Hanna y Paulina Oliva, D*oes the Effect of Pollution on Infant Mortality Differ Between Developed and Developing…*, DTE-546.

David Mayer, *A Cross-Country Causal Panorama of Human Development and Sustainability,* DTE-545.

Rodolfo Cermeño, María Roa García y Claudio González Vega, *Financial Development and Growth Volatility: Time Series Evidence…*, DTE-544.

David A. Mayer y Claudia Pescetto Villouta, *Economic Development and Non-Communicable Chronic Diseases*, DTE-543.

Víctor G. Carreón Rodríguez, Sonia Di Giannatale y Jorge L. García García-Menéndez, *Do Consumers Really Prefer Formal Credit to Informal Credit?*, DTE-542.

Dr. David Juárez Luna, *Ideology, swing voters, and taxation*, DTE-541.

Victor G. Carreón Rodríguez y Juan Rosellón, *Oil and Gas in Mexico*, DTE-540.

Daniel Ventosa-Santaulària, Frederick H. Wallace y Manuel Gómez-Zaldívar, *Is the Real Effective Exchange Rate Biased against the PPP hypothesis?*, DTE-539.

Victor G. Carreón Rodríguez y Miriam Grunstein Dickter, *PEMEX: ¿La no empresa de todos los mexicanos? Por qué Pemex no es…*, DTE-538.

Rodolfo Cermeño y Nahieli Vasquez Feregrino, *Volatilidad de la inflación y crecimiento del producto: el caso de México*, DTE-537.

Antonio Jiménez, *Anticipating Future Expected Utility and Coordination Motives for Information Decisions in Networks*, DTE-536.

División de Estudios Internacionales

Jorge Chabat, *Medidas Económicas en el Combate al Crimen Organizado*, DTEI-236.

Brian J. Phillips, *What is a Terrorist Group? Conceptual Questions and Empirical Implications*, DTEI-235.

Rodrigo Morales, *El camino bifurcado: los alcances y límites de la política exterior mexicana en América Latina*, DTEI-234.

Ezequiel González-Ocantos, *Judicial Change and Transitional Justice in Argentina*, DTEI-233.

Kendra Dupuy, James Ron and Aseem Prakash, *Reclaiming Political Terrain: The Regulatory Crackdown on Overseas Funding for NGOs*, DTEI-232.

Kimberly A. Nolan García, *Persuasion, Coercion and the Domestic Costs of Compliance: Evaluating the NAALC Resolutions against Mexico*, DTEI-231.

Kimberly A. Nolan García, *Transnational Tensions: Network Dynamics and Local Labor Rights Movements*, DTEI-230.

Mariana Magaldi and Sylvia Maxfield, *Banking Sector Resilience and the Global Financial Crisis: Mexico in Cross-National Perspective*, DTE-229.

Brian J. Phillips, *Explaining Terrorist Group Cooperation and Competition*, DTE-228.

Covadonga Meseguer and Gerardo Maldonado, *Kind Resistance: Attitudes toward Immigrants in Mexico and Brazil*, DTEI-227.

División de Estudios Jurídicos

Ma. Mercedes Albornoz, *La falta de confianza en el comercio electrónico*, DTE-60.

Catalina Pérez Correa, *(Des) proporcionalidad y delitos contra la salud en México*, DTEJ-59.

Rodrigo Meneses y Miguel Quintana, Los motivos para matar: Homicidios instrumentales y expresivos en la ciudad de México, DTEJ-58.

Ana Laura Magaloni, *La Suprema Corte y el obsoleto sistema de jurisprudencia constitucional*, DTEJ-57.

María Mercedes Albornoz, *Cooperación interamericana en materia de restitución de menores*, DTEJ-56.

Marcelo Bergman, *Crimen y desempleo en México: ¿Una correlación espuria?*, DTEJ-55.

Jimena Moreno, Xiao Recio y Cynthia Michel, *La conservación del acuario del mundo. Alternativas y recomendaciones para el Golfo de California*, DTEJ-54.

María Solange Maqueo, *Mecanismos de tutela de los derechos de los beneficiarios*, DTEJ-53.

Rodolfo Sarsfield, *The Mordida's Game. How institutions incentive corruption*, DTEJ-52.

Ángela Guerrero, Alejandro Madrazo, José Cruz y Tania Ramírez, *Identificación de las estrategias de la industria tabacalera en México*, DTEJ-51.

División de Estudios Políticos

Ma. Amparo Casar e Ignacio Marván, *Pluralismo y reformas constitucionales en México: 1997-2012*, DTEP-247.

Gilles Serra, *When will incumbents avoid a primary challenge? Primary elections to aggregate partial information about candidates' valence*, DTEP-246.

Ignacio Marván, *Los constituyentes abogados en el Congreso de 1916–1917*, DTEP-245.

Aldo Fernando Ponce, *Exchange Rate Shocks, Public Media Salience, and the Legislative Importance of Economic Sectors in Argentina*, DTEP-244.

Rosario Aguilar, Saul Cunow y Scott Desposato, *The Impact of Candidate Gender on Vote Choice in Brazil*, DTEP-243.

Rosario Aguilar, Saul Cunow, Scott Desposato y Leonardo Barone, *The Racial Democracy? Latent Racial Cues And Vote Choice in Brazil*, DTEP-242.

Ana Carolina Garriga y Juan J. Negri Malbrán, *"Unite and Reign": When do Presidents Ask for Delegated Decree Authority?*, DTEP-241.

Andreas Schedler, *The Twin Uncertainty of Authoritarian Regimes*, DTEP-240.

Allyson Benton, *The (Authoritarian) Governor's Dilemma: Supporting the National Authoritarian*, DTEP-239.

Gilles Serra, *The Risk of Partyarchy and Democratic Backsliding: Mexico's Electoral Reform*, DTEP-238.

División de Historia

Adriana Luna, *Defining the borders for an interpretation of the Concept of Liberalism in Cadiz's constitutional moment 1810-1812*, DTH-78.

Michael Sauter, *Spanning the Poles: Spatial Thought and the 'Global' Backdrop to our Globalized World, 1450-1850*, DTH-77.

Adriana Luna, *La reforma a la legislación penal en el siglo XVIII: Notas sobre el aporte de Cesare Beccaria y Gaetano Filangieri*, DTH-76.

Michael Sauter, *Human Space: The Rise of Euclidism and the Construction of an Early-Modern World, 1400-1800*, DTH-75.

Michael Sauter, *Strangers to the World: Astronomy and the Birth of Anthropology in the Eighteenth Century*, DTH-74.

Jean Meyer, *Una revista curial antisemita en el siglo XIX: Civiltá Cattolica*, DTH-73.

Jean Meyer, *Dos siglos, dos naciones: México y Francia, 1810- 2010*, DTH-72.

Adriana Luna, *La era legislativa en Nápoles: De soberanías y tradiciones*, DTH-71.

Adriana Luna, *El surgimiento de la Escuela de Economía Política Napolitana*, DTH-70.

Pablo Mijangos, *La historiografía jurídica mexicana durante los últimos veinte años*, DTH-69.

Estudios Interdisciplinarios

Ugo Pipitone, México y América Latina en la tercera oleada (crecimiento, instituciones y desigualdad), DTEIN-02

Eugenio Anguiano, El estudio de China desde cuatro enfoques: histórico, político, internacionalista y económico, DTEIN-01

Ventas

El **CIDE** es una institución de educación superior especializada particularmente en las disciplinas de Economía, Administración Pública, Estudios Internacionales, Estudios Políticos, Historia y Estudios Jurídicos. El Centro publica, como producto del ejercicio intelectual de sus investigadores, **libros, documentos de trabajo,** y **cuatro revistas especializadas:** *Gestión y Política Pública*, *Política y Gobierno*, *Economía Mexicana Nueva Época* e *Istor*.

Para adquirir cualquiera de estas publicaciones, le ofrecemos las siguientes opciones:

VENTAS DIRECTAS:	VENTAS EN LÍNEA:
Tel. Directo: 5081-4003 Tel: 5727-9800 Ext. 6094 y 6091 Fax: 5727 9800 Ext. 6314 Av. Constituyentes 1046, 1er piso, Col. Lomas Altas, Del. Álvaro Obregón, 11950, México, D.F.	Librería virtual: **www.libreriacide.com** Dudas y comentarios: **publicaciones@cide.edu**

¡¡Colecciones completas!!

Adquiere los **CDs de las colecciones completas** de los documentos de trabajo de todas las divisiones académicas del CIDE: **Economía**, **Administración Pública**, **Estudios Internacionales**, **Estudios Políticos**, **Historia** y **Estudios Jurídicos.**

¡Nuevo! ¡¡Arma tu CD!!

Visita www.libreriacide.com.