

Tax Credits Response to Tax Enforcement: Evidence from a Quasi-Experiment in Chile

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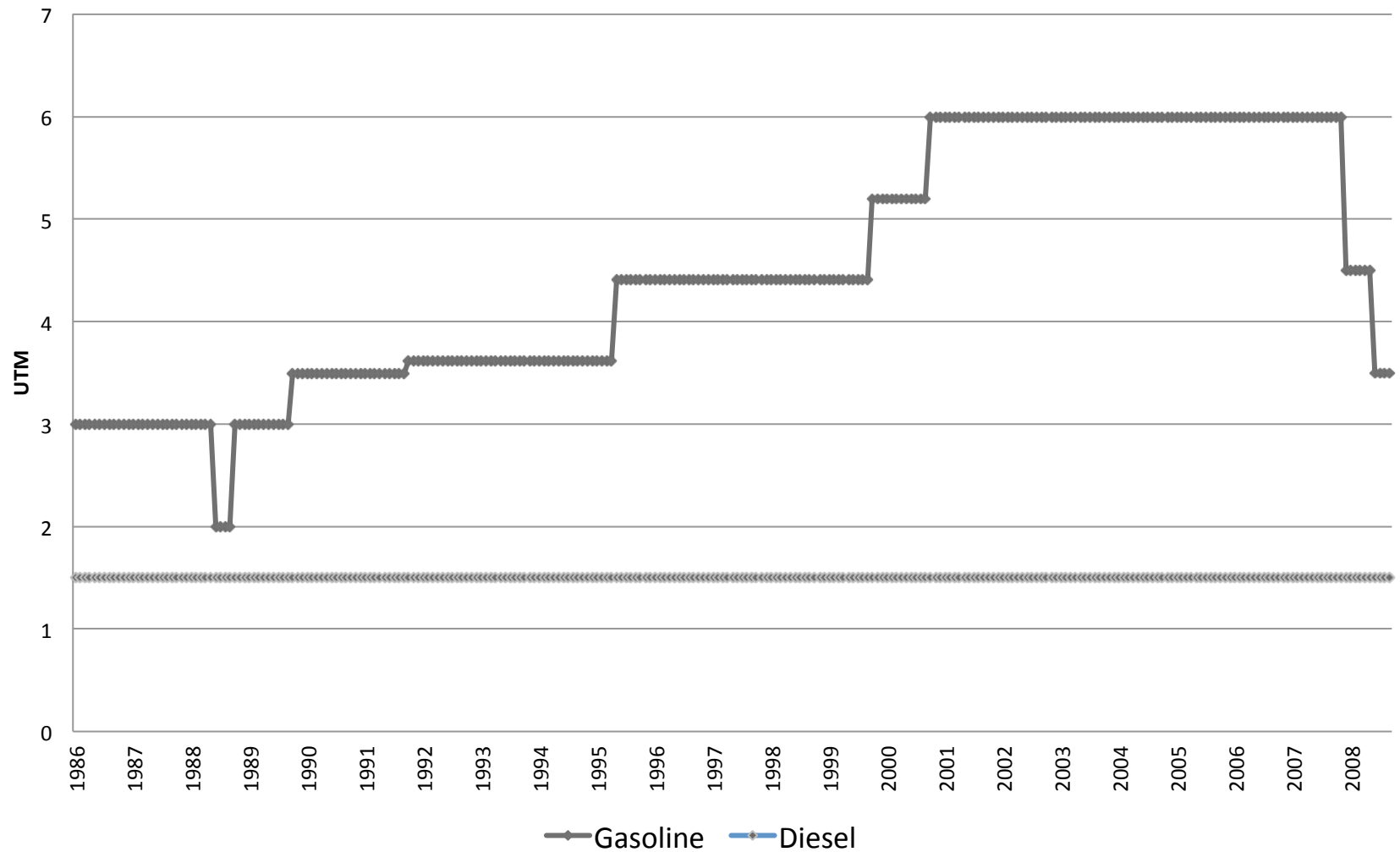
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Motivation

- Gasoline and diesel are subject to specific taxes and VAT in Chile, but diesel is taxed at a lower rate.
- Gasoline tax is equivalent to US\$1.27 a gallon while diesel tax is just US\$0.43 a gallon.
- The tax differential incentives the use of vehicles with diesel engines over gasoline.

Motivation



Motivation

- Additionally, because diesel is used as a main input in several industrial activities it receives a special tax treatment depending on its use.
- Specifically, if diesel is used in industrial activities the diesel tax paid can be used as a credit against VAT (100% tax credit).
- If diesel is used in freight or public transportation (on-road purposes) a fraction of gasoline taxes paid can be used as a credit against VAT (20%-35%)

Motivation

- As a result of this different tax treatment firms have incentives to use “tax exempted” diesel in activities requiring “non tax exempted” diesel.
- This might be particularly easy to do for multi-products firms using diesel for several activities, allowing them to evade diesel taxes by claiming a larger tax credit than the legally allowed.

Motivation

- Tax revenue increased between 2000 and 2009 in 97.9% .
- Diesel VAT credit has increased in 192.3%.
- The percentage of the diesel tax that is claimed as VAT credit has increased from 48.06% to 70.9%.

Motivation

- In 2003 the IRS implemented a plan to detect diesel tax evasion
- For this purpose they sent letters to some firms asking for detailed information about diesel purchases
- After reviewing the information a subsample of firms was audited
- The goal of the paper is to analyze the impact of receiving the letter from the IRS on diesel tax credits claimed.

Literature

- Slemrod, Blumenthal, and Christian (2001) analyze the impact of a letter sent to randomly selected taxpayers in Minnesota informing them that their income tax returns would be closely examined. The results show:
 - Low and middle income taxpayers increased reported tax by 2% relative to taxpayers who did not receive the letter.
 - The effect was stronger on taxpayers with more opportunities to evade (measured by source of income).
 - The reported income of high income taxpayers fell after the treatment.

Literature

- Blumenthal, Christian, and Slemrod (2001) explore the impact of letters with different normative appeals sent to randomly selected taxpayers in Minnesota. Results:
 - “Support valuable services” letter increased reported federal taxable income 0.8% on the treatment group, but not statistically significant.
 - “Join compliant majority” letter had even smaller effect and also statistically not different from zero.
 - In the case of the second letter the impact on high income taxpayers was to reduce the taxable income reported.
 - Homeowners increased reported income in response to the first letter but decreased it in response to the second

Literature

- Fellner, Sausgruber, and Traxler (2009) investigate the effects of different mailings to potential evaders of TV fees in Austria. Different letters were randomly sent to identified potential evaders. The results show:
 - The legal threat produces a strong response only among evaders. Compared to the baseline mailing, the threat increases the share of individuals who start complying by an additional percentage point, which corresponds to a 15% increase in compliance.
 - There are no effects of moral appeals or social information.

Literature

- Kleven, Knudsen, Kreiner, Pedersen, and Saez (2010) analyze an experiment in Denmark, where half of randomly selected taxpayers were comprehensively audited the first year and the other half was not examined. Then, the second year letters with a threat of audit were randomly sent to taxpayers in both groups. The results show:
 - Prior audits increase self-reported income (but not third-party reported income)
 - Threat-of-audit letters also have a significant effect on self-reported income and the magnitude of the effect depends positively on the audit probability expressed in the letter.
 - Overall, receiving a letter increases the probability of an upward adjustment in reported total net income of 1.65 percentage points.
 - The effect of a 100% audit probability letter is twice as large as the effect of the 50% audit probability letter

Literature

- Marion and Muehlegger (2008) analyze the impact on tax evasion of the Federal Highway Administration requirement of adding red dye to untaxed diesel fuel. The dye reduced the cost of auditing for inspectors and increased the cost of achieving a given level of diesel tax evasion for firms. The empirical results comparing sales of diesel fuel and untaxed fuel oil show a 25-30% discontinuous increase in sales of diesel fuel (taxed) at the start of the fuel dye program.

Tax Enforcement Program

- In 2003 the Chilean IRS implemented a special auditing plan to detect diesel tax evasion and improve tax enforcement.
- The IRS selected the firms that had had large changes in the tax credits reported between 2001 and 2002 and sent them a letter asking to report more details of every diesel transaction.

Tax Enforcement Program

- The letter says: “The IRS will start an auditing program for taxpayers claiming diesel tax credits. For this reason you should send the following information to the IRS
 - Diesel purchases between January 2001 and August 2003
 - Diesel tax paid
 - Quantity and fraction of diesel used by vehicles
 - List and registration number of vehicles owned by the firm, including year, maker, model, mpg and monthly miles traveled.

The requirement to send this information does not imply you are going to be audited. In case your firm is selected for a detailed auditing you will received a new letter from the IRS.”

Tax Enforcement Program

- In October of 2003, 205 firms received the letter asking them to submit the information within the next 30 days.
- The IRS received some type of information from 183 firms and after revising the information sent by the firms, 66 firms were selected for an exhaustive and mandatory audit.
- This special enforcement/auditing plan was implemented only once in October 2003.

Data

- We focus on intensive margin response only
- Monthly data from October 2002 to September 2004 for small, medium and large firms reporting diesel tax credit every month (N=2.408; 2.307 not notified firms and 101 notified firms):
 - Sales
 - VAT credits and debits
 - Diesel credits
 - Economic sector (transportation (except passenger transportation), manufacturing, commerce and construction)
 - Accounting system/Tax regime
 - Number of different economic activities
 - Age
- Annual data for 2000-2004: VAT and diesel credits

Summary Statistics

	Obs.	Mean	Std. Dev.	Min	Max
Firm Characteristics					
Letter	2408	0,042	0,201	0	1
Number Activities	2407	2,345	1,672	1	17
Construction	2408	0,080	0,271	0	1
Transport	2408	0,695	0,461	0	1
Manufacturing	2408	0,154	0,361	0	1
Commerce	2408	0,071	0,257	0	1
Small Firm	2408	0,675	0,469	0	1
Medium Firm	2408	0,190	0,392	0	1
Large Firm	2408	0,135	0,342	0	1
Age between 0 and 2	2407	0,014	0,118	0	1
Age between 2 and 4	2407	0,147	0,354	0	1
Age between 5 and 6	2407	0,120	0,326	0	1
Age between 7 and 10	2407	0,137	0,344	0	1
Older than 10	2407	0,582	0,493	0	1
Accrual Reporting	2408	0,725	0,447	0	1
Presumptive Tax	2408	0,201	0,401	0	1
Monthly Data					
Diesel Tax Credit	45752	794252	4123867	150	135000000
VAT reported	45752	5865571	45900000	0	2580000000

Empirical Strategy

- The letter was not randomly selected.
- Strategy 1: We know the criteria used by the IRS to send the letter
 - We estimate the DD between the treatment and control group, considering the selection (based on pre treatment changes on diesel tax credit)
- Strategy 2: Propensity score matching

Letter vs. No Letter: Firms are different

	Not Notified (N=2.307)		Notified (N=101)		Difference	
	Mean	Std. Desv.	Mean	Std. Desv.	Mean	ttest
Number Activities	2,328	1,643	2,743	2,208	-0,415	-2,443
Construction	0,069	0,253	0,327	0,471	-0,258	-9,533
Transport	0,710	0,454	0,347	0,478	0,363	7,860
Manufacturing	0,153	0,360	0,178	0,385	-0,025	-0,674
Commerce	0,068	0,251	0,149	0,357	-0,081	-3,103
Small Firm	0,702	0,457	0,050	0,218	0,653	14,269
Medium Firm	0,185	0,388	0,297	0,459	-0,112	-2,812
Large Firm	0,113	0,316	0,653	0,478	-0,541	-16,386
Age between 0 and 2	0,015	0,121	0,000	0,000	0,015	1,229
Age between 2 and 4	0,146	0,353	0,158	0,367	-0,012	-0,341
Age between 5 and 6	0,122	0,327	0,089	0,286	0,033	0,989
Age between 7 and 10	0,138	0,345	0,109	0,313	0,029	0,830
Older than 10	0,579	0,494	0,644	0,481	-0,064	-1,280
VAT repoted (log)	10,371	6,009	9,064	8,164	1,308	2,104
Accrual Reporting	0,713	0,453	1,000	0,000	-0,287	-6,379
Presumptive Tax	0,209	0,407	0,000	0,000	0,209	5,169

Strategy 1: DD

$$\Pr(T_i = 1) = \alpha_0 + \alpha_1 \Delta \text{Ranking}_i + u_i$$

$$\text{TaxCredit}_{it} = \beta_0 + \beta_1 T_i A_t + \beta_2 T_i + \beta_3 A_t + \beta_4 X_{it} + \beta_\lambda \text{IMR} + \varepsilon_{it}$$

- The identification assumption is that notified/not notified firms have a parallel trend in absence to the change.

	(1)	(2)	(3)
Log Diesel Tax Credit			
Notification	3.064*** (0.133)	3.064*** (0.133)	1.678*** (0.109)
After Letter	0.200*** (0.00580)	-0.0579** (0.0193)	-0.0585** (0.0193)
Notification*After Letter	-0.191*** (0.0283)	-0.191*** (0.0274)	-0.191*** (0.0274)
Number Activities			0.0531*** (0.0127)
Commerce			-0.0375 (0.0840)
Manufacturing			0.0940 (0.0618)
Construction			0.217** (0.0827)
Small Firm			-1.871*** (0.0717)
Medium Firm			-0.777*** (0.0759)
Age between 2 and 4			-0.0542 (0.180)
Age between 5 and 6			0.115 (0.181)
Age between 7 and 1			-0.00643 (0.181)
Older than 10			0.0602 (0.174)
VAT reported (log)			0.00455** (0.000569)
Accrual Accounting			0.372*** (0.0824)
Presumptive Tax			-0.339*** (0.0899)
Constant	11.80*** (0.0273)	11.37*** (0.0326)	12.40*** (0.210)
Montrly Dummies	No	Yes	Yes

	(1)	(2)	(3)
Log Diesel Tax Credit			
After Letter	0.199*** (0.00496)	0.0592** (0.0213)	-0.0595** (0.0200)
Notification*After Letter	-0.159*** (0.0329)	0.161*** (0.0294)	-0.168*** (0.0275)
Number Activities			0.0539*** (0.00139)
Commerce			-0.0109 (0.0120)
Manufacturing			0.0241*** (0.00652)
Construction			0.365*** (0.0103)
Small Firm			-2.043*** (0.00880)
Medium Firm			-0.883*** (0.00964)
Age between 2 and 4			-0.0304 (0.0274)
Age between 5 and 6			0.135*** (0.0277)
Age between 7 and 10			0.0195 (0.0263)
Older than 10			0.0777** (0.0266)
VAT reported (log)			0.00461*** (0.000567)
Accrual Accounting			0.386*** (0.0117)
Presumptive Tax			-0.331*** (0.0120)
Constant	17.98*** (0.0413)	17.55*** (0.0555)	16.46*** (0.0604)
Letter			
Diff. Diesel Tax Credit 2002-2001	1.17E-09 (1.27E-10)	1.17E-09 (1.27E-10)	1.17E-09 (1.27E-10)
Lambda (Inverse Mills)	-2.753*** (0.0185)	-2.754*** (0.0229)	-1.772*** (0.0198)
Montly Dummies	No	Yes	Yes
Year Dummies	No	Yes	Yes
Observations	45752	45752	45733
R2	0.0676	0.0758	0.451

Strategy 2: Propensity Score

	Kernel	Nearest Neighbord
ATT	-0.165 (0.036)	-0.1489 (0.068)

False Experiment

- The estimated treatment effect of the IRS letter relies on the idea that in the absence of the letter, there would be no different trends in the diesel tax credits claimed between these two type of firms (notified and not-notified).
- We test this assumption doing a false experiment implemented with the data for the period before the notification.
- For this purpose, we estimated the same equations again but defining the dummy Notification as if the letter was sent in March

False Experiment

Log Diesel Tax Credit		
After Letter		0.0566** (0.0264)
Notification*After Letter		-0.00650 (0.0250)
Constant		18.75** (0.0524)
Lambda (Inverse Mills Ratio)		-2.221** (0.0218)
Letter		
Diff. Diesel Tax Credit 2002-2001		2.81e-08** (3.03e-09)
Monthly Dummies		Yes
Year Dummies		Yes
Observations		6259
R2		0.398
Wald		13646.2

Standard errors in parentheses * p<0.1 ** p<0.05

Conclusions and Future Research

- Firms receiving the IRS letter reduced diesel tax credits claimed by 19%-16% on average
- Letter did not have any effect on VAT
- We are currently working on regression discontinuity to identify the effects of the letter
- Future work should analyze the impact on the extensive margin