Competition and Pass-Through: Evidence from Isolated Markets

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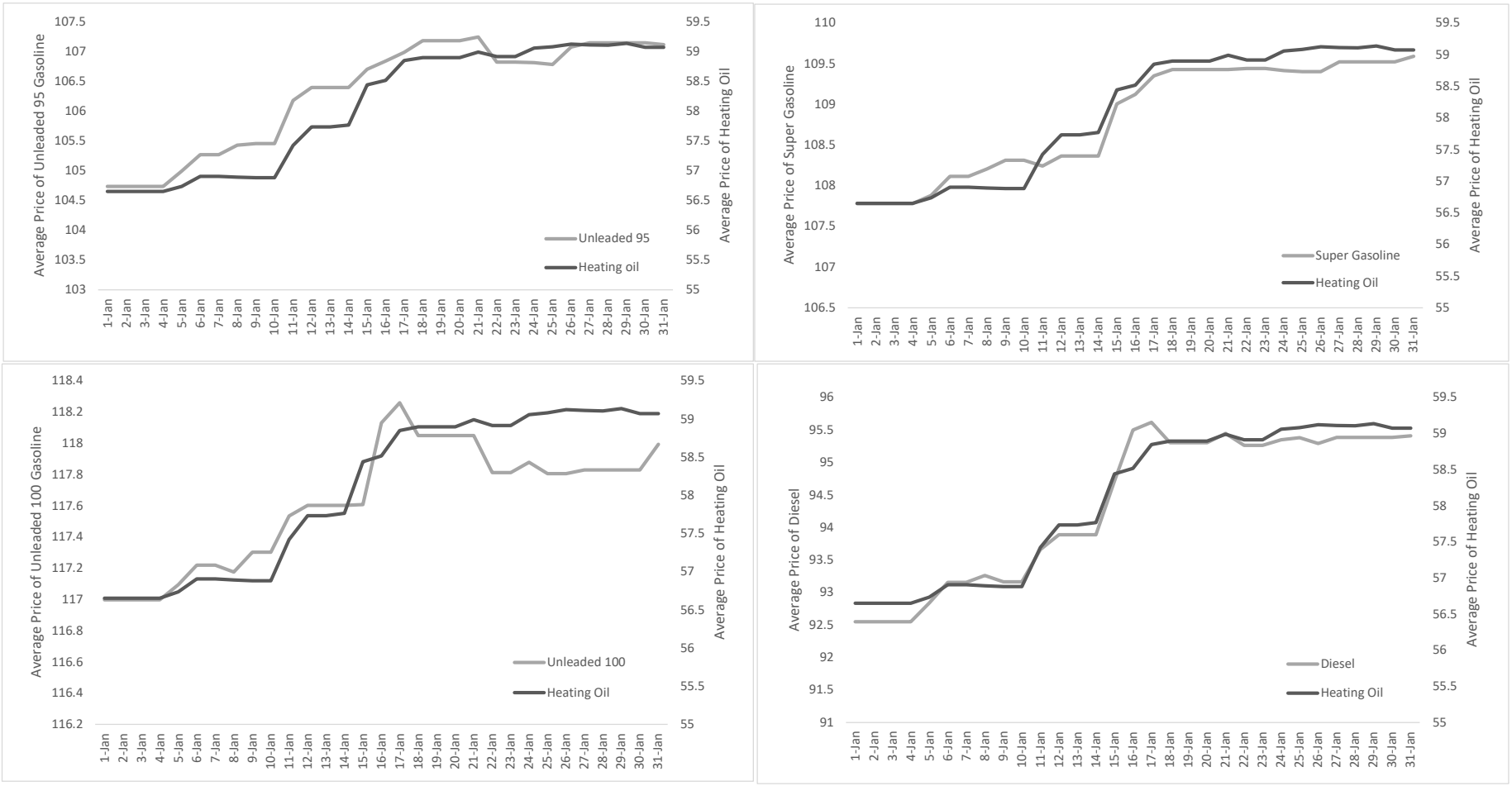
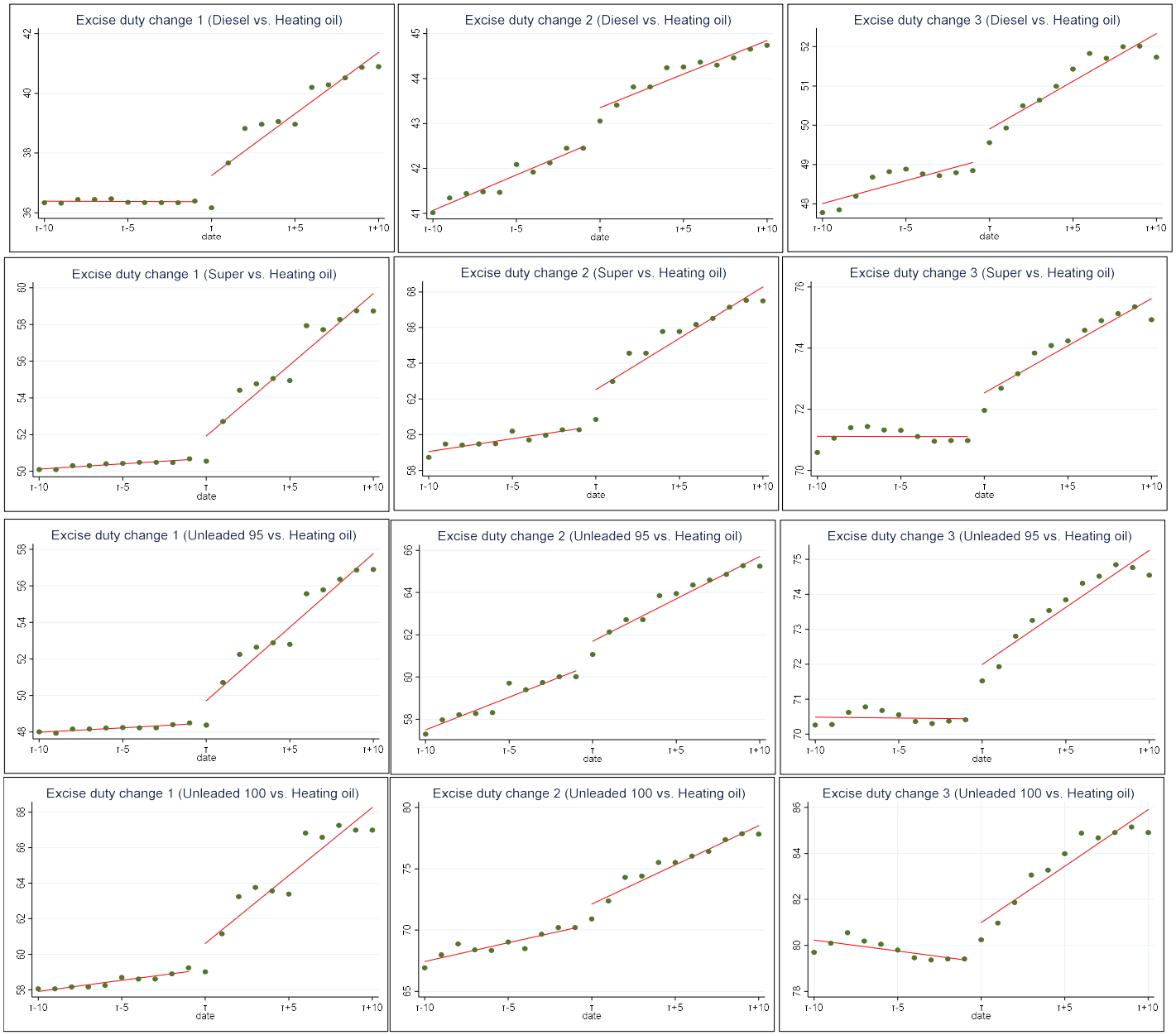
Online Appendix

FIGURE A1: AVERGE PRICES OF PETROLEUM PRODUCTS BEFORE THE EXCISE DUTY CHANGES.



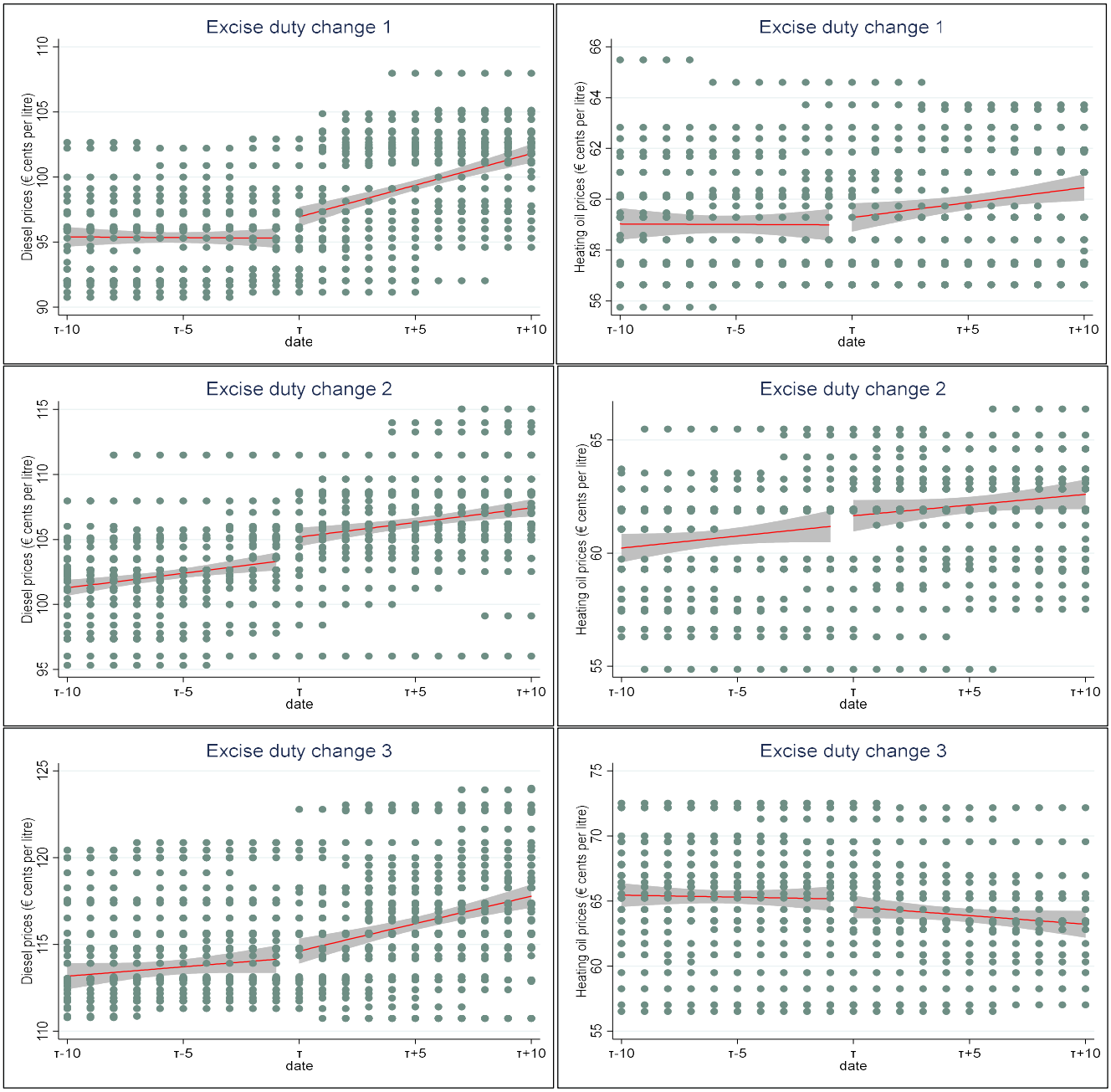
Notes: The four figures plot average retail prices of the different petroleum products (clockwise from left: Unleaded95, Super, Unleaded100, Diesel) and of heating oil during January 2010.
Source: Authors' calculations based on data from the Greek Ministry of Development.

FIGURE A2: AVERAGE PRICE DIFFERENCES BETWEEN DIESEL, SUPER, UNLEADED 95, UNLEADED 100 AND HEATING OIL.



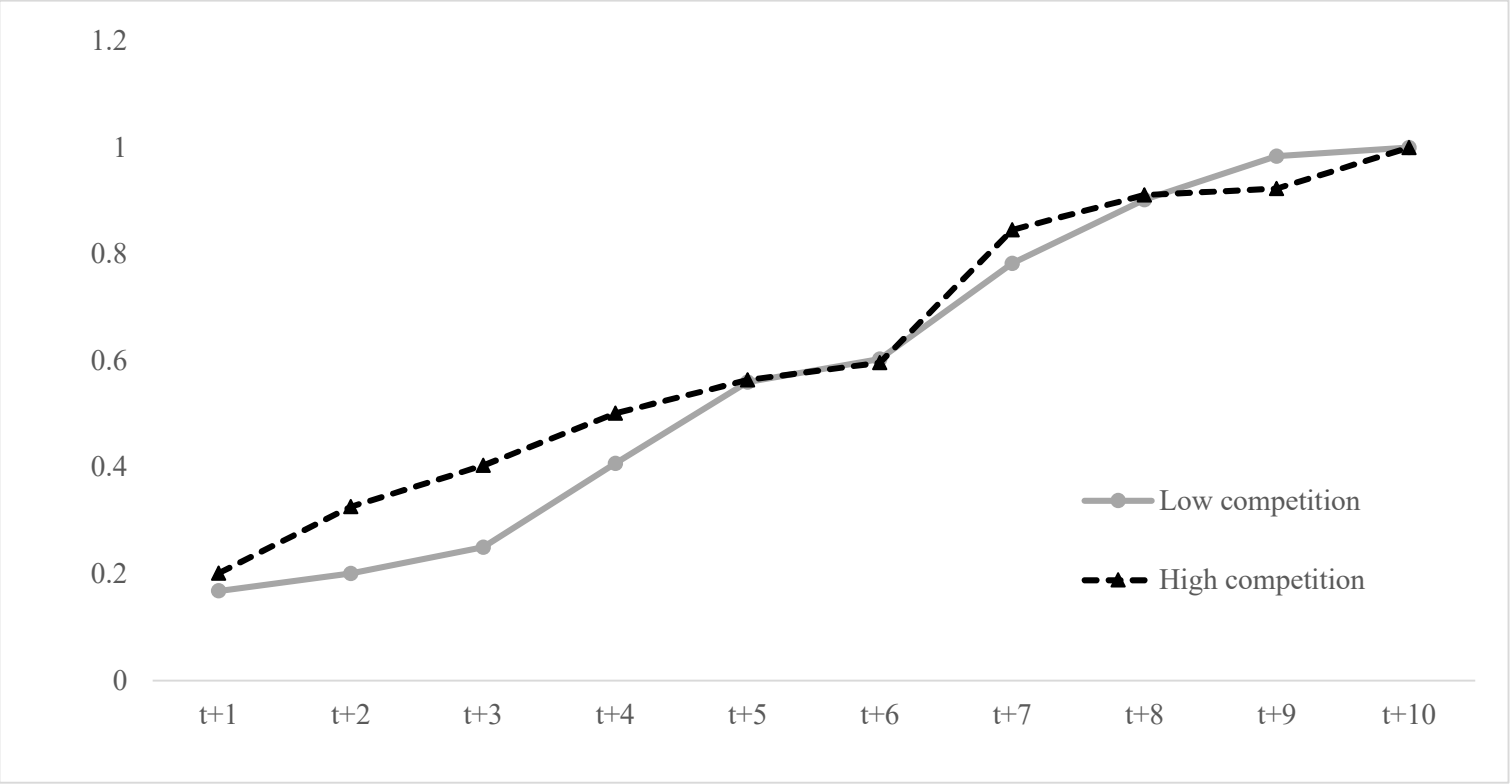
Notes: The figures plot the average difference between diesel, unleaded95, unleaded100, super and heating oil ten days before and after the changes in excise duties for each of the three increases, as detailed in Table 1, together with two local linear regression lines of the difference in prices against time both before and after the events.
Source: Authors' calculations based on data from the Greek Ministry of Development.

FIGURE A3: AVERAGE PRICES BEFORE AND AFTER THE EXCISE DUTY CHANGES (DIESEL vs. HEATING OIL)



Notes: The figures plot the evolution of average prices together with two local linear regression lines of the prices against time for diesel and heating oil separately ten days before and after the changes in excise duties for each of the three increases as detailed in Table 1.
Source: Authors' calculations based on data from the Greek Ministry of Development.

FIGURE A4: CUMULATIVE FREQUENCY OF PRICE CHANGES FOLLOWING CHANGES IN VAT



Notes: The figure plots the cumulative frequency of station-product combinations that changed their prices between τ and $\tau+\delta$, where τ is the date of the VAT change and δ=1,...,10, on islands with 1-3 (low competition) and 4-7 (high competition) gas stations. The Kolmogorov-Smirnov test rejects the equality of the CDFs at the 1 percent confidence level.

TABLE A1 - GREEK ISLANDS

Number of gas stations:	1	2	3	4	5	7
	Agios Eustratios					
	Agkistri					
	Anafi	Amorgos				
	Fourni	Antiparos				
	Kimolos	Astypalaia		Alonnisos		
	Nisyros	Folegandros		Karpathos		
	Samothraki	Kythnos		Sifnos		
	Serifos	Paxi	Ithaki	Kythira	Ios	Aigina
	Sikinos	Poros	Kea	Skopelos	Milos	Tinos
	Symi	Spetses	Skyros	Skiathos	Mykonos	Leros

Note: Greek islands with less than eight gas stations.
Source: Greek Ministry of Development, Yellow pages and the Hellenic Statistical Authority.

TABLE A2 - TEST OF SAMPLE REPRESENTATIVENESS

	(1) In sample (N=58)	(2) Out of sample (N=37)	(3) p-value
Shop (binary indicator)	0.63	0.83	0.070
Services (binary indicator)	0.65	0.66	0.985
Carwash (binary indicator)	0.57	0.45	0.379
Lubricants (binary indicator)	0.50	0.55	0.718
Vulcanisateur (binary indicator)	0.10	0.20	0.257
Number of competitors on the same island	4.28	3.65	0.128
Population	5,103	4,976	0.889
Size (Km^2)	115.1	100.5	0.455
Number of tourist arrivals (2010)	206,928	153,903	0.365
Population with tertiary education	0.11	0.11	0.574
Population with secondary education	0.19	0.20	0.088
Number of ports	1.83	1.74	0.754
Number of airports	0.36	0.39	0.809

Note: Socioeconomic and geographic characteristics for each island obtained from the Hellenic Statistical Authority. Gas station characteristics obtained from Google maps.
Source: Authors' calculations based on data from the Greek Ministry of Development, the Hellenic Statistical Authority and Eurostat.

TABLE A3 - PARALLEL TREND TESTS

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$
Sample	Excise change 1	Excise change 1	Excise change 2	Excise change 2	Excise change 3	Excise change 3
$Trend_t$	-0.017	0.017	0.052	0.139	0.041	0.033
	(0.029)	(0.017)	(0.074)	(0.077)	(0.039)	(0.025)
$Trend_t$ × Treat	0.039		0.166		0.023	
	(0.037)		(0.097)		(0.051)	
$Trend_t$ × Diesel		-0.038		0.028		0.108
		(0.031)		(0.046)		(0.054)
$Trend_t$ × Gasoline		0.010		0.020		0.025
		(0.023)		(0.080)		(0.048)
$Trend_t$ × Unleaded Gasoline		0.013		0.161		-0.014
		(0.025)		(0.108)		(0.032)
Window before the event	[τ-10, τ-1]	[τ-10, τ-1]	[τ-10, τ-1]	[τ-10, τ-1]	[τ-10, τ-1]	[τ-10, τ-1]
Adjusted R^2	0.994	0.994	0.984	0.984	0.989	0.989
Observations	1,196	1,196	1,552	1,552	1,750	1,750
Product type FE	yes	yes	yes	yes	yes	yes
Station FE	yes	yes	yes	yes	yes	yes

Notes: The table reports results for the parallel trend assumption test based on equation (3) in the main text. Standard errors clustered at the island are reported in parentheses below coefficients.
Source: Authors' calculations based on data from the Greek Ministry of Development, the Hellenic Statistical Authority and Eurostat.

TABLE A4 - PARALLEL TREND TESTS (NON-PARAMETRIC)

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$
Sample	Excise change 1	Excise change 1	Excise change 2	Excise change 2	Excise change 3	Excise change 3
Day (T-10) × Treat	-0.358	-0.395	-1.806	-1.666	-0.551	-0.329
	(0.293)	(0.305)	(0.784)	(0.733)	(0.479)	(0.464)
Day (T-9) × Treat	-0.435	-0.473	-1.221	-1.078	-0.351	-0.175
	(0.356)	(0.373)	(0.810)	(0.756)	(0.420)	(0.372)
Day (T-8) × Treat	-0.304	-0.341	-0.992	-0.849	-0.265	-0.017
	(0.306)	(0.321)	(0.779)	(0.725)	(0.468)	(0.360)
Day (T-7) × Treat	-0.326	-0.337	-1.051	-0.909	-0.265	0.107
	(0.298)	(0.320)	(0.775)	(0.718)	(0.448)	(0.261)
Day (T-6) × Treat	-0.272	-0.283	-1.052	-0.909	-0.299	0.073
	(0.292)	(0.314)	(0.774)	(0.717)	(0.435)	(0.237)
Day (T-5) × Treat	-0.259	-0.263	-0.481	-0.257	0.077	0.121
	(0.162)	(0.177)	(0.665)	(0.570)	(0.323)	(0.237)
Day (T-4) × Treat	-0.262	-0.274	-0.768	-0.553	-0.036	-0.020
	(0.147)	(0.163)	(0.633)	(0.540)	(0.229)	(0.086)
Day (T-3) × Treat	-0.262	-0.274	-0.282	-0.282	-0.251	-0.038
	(0.147)	(0.163)	(0.220)	(0.223)	(0.235)	(0.070)
Day (T-2) × Treat	-0.136	-0.146	-0.000	0.000	-0.022	-0.022
	(0.119)	(0.130)	(0.000)	(0.000)	-0.017	(0.017)
Joint test of significance (F-test)	1.594	1.579	2.472	2.106	0.582	0.0298
(p-value)	(0.229)	(0.231)	(0.137)	(0.167)	(0.453)	(0.864)
Window before the event	[τ-10, τ-1]	[τ-10, τ-1]	[τ-10, τ-1]	[τ-10, τ-1]	[τ-10, τ-1]	[τ-10, τ-1]
Within R^2	0.975	0.994	0.966	0.984	0.993	0.993
Observations	1,196	1,196	1,552	1,552	1,750	1,750
Day FE	yes	yes	yes	yes	yes	yes
Product type FE	yes	yes	yes	yes	yes	yes
Station FE		yes		yes		yes

Notes: The table reports results for the parallel trend assumption test based on equation (3) in the main text, where the trend is replaced by day binary indicators. Only the interaction effects of day fixed effects with the treat variable are reported here. Standard errors clustered at the island level are reported in parentheses below coefficients.
Source: Authors' calculations based on data from the Greek Ministry of Development, the Hellenic Statistical Authority and Eurostat.

TABLE A5 - CONDITIONAL PASS-THROUGH AND COMPETITION - ROBUSTNESS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$
Sample	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes
Tax_{it}	0.449	-0.424	0.258	0.447	0.470	0.398	0.475	-0.736
	(0.102)	(0.452)	(0.294)	(0.092)	(0.126)	(0.134)	(0.093)	(1.040)
Tax_{it} × Number of competitors$_s$	0.086	0.075	0.087	0.090	0.086	0.079	0.058	0.082
	(0.024)	(0.019)	(0.024)	(0.021)	(0.020)	(0.019)	(0.027)	(0.034)
Tax_{it} × Income$_s$		0.048						0.042
(×1000)		(0.022)						(0.044)
Tax_{it} × Education$_s$			1.876					4.223
			(2.112)					(3.873)
Tax_{it} × Tourists$_s$				-0.092				-0.379
(×1000000)				(0.177)				(0.205)
Tax_{it} × Distance from Piraeus					-0.179			-0.242
(×1000)					(0.807)			(1.333)
Tax_{it} × Number of ports$_s$						0.045		0.009
						(0.062)		(0.066)
Tax_{it} × Number of airports$_s$							0.183	0.054
							(0.115)	(0.209)
Observations	879	879	879	879	879	879	879	879
Within R^2	0.937	0.939	0.937	0.937	0.937	0.937	0.938	0.939

Notes: Estimated by OLS with standard errors clustered at the island level reported in parentheses below coefficients. All regressions include time, product × station, excise change × product type and excise change × station FE as indicated in Table 4, column 2. The dependent variable is the retail price of product k, on island i, in gas station s, and day $t \in \{\tau - 1, \tau + 10\}$, where τ is the date of each of the three excise duty changes. The pass-through is estimated using observations for station-product combinations that have changed the price at least once between τ and τ+10 (conditional pass-through).
Source: Authors' calculations based on data from the Greek Ministry of Development and Eurostat.

TABLE A6 - CONDITIONAL PASS-THROUGH AND COMPETITION (NON-LINEAR)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	FE	FE	FE	FE	FE	FE	FE	FE
Dependent variable	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$
Sample	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes
Tax_{it}	0.139	-0.237	-0.016	0.122	-0.086	0.059	0.190	-0.601
	(0.208)	(0.459)	(0.348)	(0.210)	(0.285)	(0.194)	(0.197)	(0.930)
Tax_{it} × Number of competitors$_s$	0.289	0.214	0.286	0.305	0.351	0.289	0.247	0.265
	(0.112)	(0.125)	(0.111)	(0.115)	(0.122)	(0.096)	(0.114)	(0.135)
Tax_{it} × Number of competitors$_s^2$	-0.025	-0.017	-0.025	-0.026	-0.033	-0.026	-0.023	-0.023
	(0.012)	(0.014)	(0.012)	(0.0120)	(0.014)	(0.010)	(0.011)	(0.015)
Tax_{it} × Income$_s$		0.026						0.022
(×1000)		(0.027)						(0.038)
Tax_{it} × Education$_s$			1.574					2.719
			(2.089)					(4.050)
Tax_{it} × Tourists$_s$				-0.163				-0.315
(×1000000)				(0.129)				(0.235)
Tax_{it} × Distance from Piraeus					1.144			0.453
(×1000)					(0.784)			(1.459)
Tax_{it} × Number of ports$_s$						0.060		0.034
						(0.054)		(0.074)
Tax_{it} × Number of airports$_s$							0.143	0.039
							(0.102)	(0.190)
Observations	879	879	879	879	879	879	879	879
Within R^2	0.937	0.939	0.939	0.939	0.939	0.939	0.939	0.939

Notes: Estimated by OLS with standard errors clustered at the island level reported in parentheses below coefficients. All regressions include time, product × station, excise change × product type and excise change × station FE as indicated in Table 4, column 2. The dependent variable is the retail price of product k, on island i, in gas station s, and day $t \in \{\tau - 1, \tau + 10\}$, where τ is the date of each of the three excise duty changes. The pass-through is estimated using observations for station-product combinations that have changed the price at least once between τ and τ+10 (conditional pass-through).
Source: Authors' calculations based on data from the Greek Ministry of Development and Eurostat.

TABLE A7 - AVERAGE PASS-THROUGH AND COMPETITION - ROBUSTNESS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$
Sample	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes
Tax_{it}	0.409	-0.476	0.193	0.406	0.404	0.314	0.445	-0.599
	(0.109)	(0.563)	(0.339)	(0.111)	(0.156)	(0.159)	(0.116)	(1.107)
Tax_{it} × Number of competitors$_s$	0.082	0.069	0.082	0.088	0.082	0.068	0.045	0.068
	(0.023)	(0.019)	(0.023)	(0.028)	(0.023)	(0.021)	(0.027)	(0.036)
Tax_{it} × Income$_s$		0.048						0.033
(×1000)		(0.028)						(0.044)
Tax_{it} × Education$_s$			2.120					4.879
			(2.513)					(4.480)
Tax_{it} × Tourists$_s$				-0.148				-0.564
(×1000000)				(0.158)				(0.245)
Tax_{it} × Distance from Piraeus					0.046			-0.724
(×1000)					(0.738)			(1.370)
Tax_{it} × Number of ports$_s$						0.087		0.045
						(0.073)		(0.079)
Tax_{it} × Number of airports$_s$							0.232	0.148
							(0.139)	(0.199)
Observations	945	945	945	945	945	945	945	945
Within R^2	0.931	0.932	0.931	0.931	0.931	0.931	0.932	0.934

Notes: Estimated by OLS with standard errors clustered at the island level reported in parentheses below coefficients. All regressions include time, product × station, excise change × product type and excise change × station FE as indicated in Table 4, column 2. The dependent variable is the retail price of product k, on island i, in gas station s, and day $t \in \{\tau - 1, \tau + 10\}$, where τ is the date of each of the three excise duty changes. The pass-through is estimated using all available observations for station-product combinations between τ and τ+10 (average pass-through).
Source: Authors' calculations based on data from the Greek Ministry of Development and Eurostat.

TABLE A8 - AVERAGE PASS-THROUGH AND COMPETITION (NON-LINEAR)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	FE	FE	FE	FE	FE	FE	FE	FE
Dependent variable	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$
Sample	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes	All excise changes
Tax_{it}	0.233	-0.492	0.045	0.207	0.066	0.100	0.306	-0.561
	(0.228)	(0.613)	(0.384)	(0.239)	(0.337)	(0.249)	(0.217)	(1.065)
Tax_{it} × Number of competitors$_s$	0.195	0.057	0.191	0.218	0.240	0.198	0.136	0.110
	(0.132)	(0.158)	(0.133)	(0.144)	(0.156)	(0.124)	(0.121)	(0.158)
Tax_{it} × Number of competitors$_s^2$	-0.014	0.001	-0.014	-0.016	-0.020	-0.016	-0.011	-0.005
	(0.014)	(0.018)	(0.015)	(0.015)	(0.017)	(0.014)	(0.013)	(0.018)
Tax_{it} × Income$_s$		0.050						0.025
(×1000)		(0.039)						(0.041)
Tax_{it} × Education$_s$			1.912					4.565
			(2.704)					(4.835)
Tax_{it} × Tourists$_s$				-0.198				-0.553
(×1000000)				(0.184)				(0.257)
Tax_{it} × Distance from Piraeus					0.867			0.581
(×1000)					(0.821)			(1.590)
Tax_{it} × Number of ports$_s$						0.098		0.051
						(0.070)		(0.088)
Tax_{it} × Number of airports$_s$							0.216	0.148
							(0.142)	(0.196)
Observations	945	945	945	945	945	945	945	945
Within R^2	0.931	0.932	0.932	0.932	0.932	0.932	0.932	0.934

Notes: Estimated by OLS with standard errors clustered at the island level reported in parentheses below coefficients. All regressions include time, product × station, excise change × product type and excise change × station FE as indicated in Table 4, column 2. The dependent variable is the retail price of product k, on island i, in gas station s, and day $t \in \{\tau-1, \tau+10\}$, where τ is the date of each of the three excise duty changes. The pass-through is estimated using all available observations for station-product combinations between τ and τ+10 (average pass-through).
Source: Authors' calculations based on data from the Greek Ministry of Development and Eurostat.

TABLE A9 - FIRST STAGE RESULTS OF PASS-THROUGH AND COMPETITION

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	$Tax_{it} \times$ Number of competitors$_s$	$Tax_{it} \times$ Number of competitors$_s$	$Tax_{it} \times$ Number of competitors$_s^2$	$Tax_{it} \times$ Number of competitors$_s$	$Tax_{it} \times$ Number of competitors$_s$	$Tax_{it} \times$ Number of competitors$_s^2$
Sample	All excise changes - conditional	All excise changes - conditional	All excise changes - conditional	All excise changes - average	All excise changes - average	All excise changes - average
Tax_{it}	1.692	0.647	-5.668	1.815	0.709	-5.377
	(0.407)	(0.368)	(3.446)	(0.437)	(0.409)	(3.837)
$Tax_{it} \times$ Population$_s$	0.513	1.149	8.246	0.477	1.151	8.255
(×1000)	(0.110)	(0.170)	(2.040)	(0.113)	(0.195)	(2.280)
$Tax_{it} \times$ Population$_s^2$		-0.057	-0.358		-0.059	-0.385
(×1000000)		(0.016)	(0.167)		(0.019)	(0.195)
F-test	21.86	36.53	13.21	18.00	30.66	11.34
Within R^2	0.814	0.871	0.801	0.794	0.855	0.774
Observations	879	879	879	945	945	945
Time FE	yes	yes	yes	yes	yes	yes
Product × Station FE	yes	yes	yes	yes	yes	yes
Excise change × Product type FE	yes	yes	yes	yes	yes	yes
Excise change × Station FE	yes	yes	yes	yes	yes	yes

Notes: The table reports the first stage results for Table 4, columns 3 and 6. Standard errors clustered at the island level are reported in parentheses below coefficients.
Source: Authors' calculations based on data from the Greek Ministry of Development, the Hellenic Statistical Authority and Eurostat.

TABLE A10 - AVERAGE PASS-THROUGH AND COMPETITION: ALTERNATIVE MARKET DEFINITIONS

	(1)	(2)	(3)	(4)	(5)
Estimation method	FE	FE	FE	FE	FE
Dependent variable	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$	$Price_{kist}$
Market definition	Island	3 Km driving distance	3 Km radius	10 min driving distance	5 Km driving distance
Tax_{it} × One competitor	0.427	0.715	0.666	0.666	0.657
	(0.136)	(0.099)	(0.076)	(0.084)	(0.078)
Tax_{it} × Two competitors	0.540	0.932	1.033	0.901	0.964
	(0.118)	(0.063)	(0.054)	(0.117)	(0.122)
Tax_{it} × Three competitors	0.748	0.912	0.875	0.770	0.786
	(0.046)	(0.170)	(0.121)	(0.104)	(0.099)
Tax_{it} × Four competitors	0.845	0.831	0.876	0.734	0.822
	(0.104)	(0.138)	(0.144)	(0.086)	(0.126)
Tax_{it} × Five competitors	0.833	0.803	0.862	0.871	0.882
	(0.171)	(0.062)	(0.069)	(0.056)	(0.054)
Tax_{it} × Six competitors				0.764	0.785
				(0.062)	(0.059)
Tax_{it} × Seven competitors	0.907				
	(0.051)				
Observations	945	649	649	531	569
Within R^2	0.931	0.958	0.958	0.956	0.955
Time FE	yes	yes	yes	yes	yes
Product × Station FE	yes	yes	yes	yes	yes
Excise incident × Product type FE	yes	yes	yes	yes	yes
Excise incident × Station FE	yes	yes	yes	yes	yes

Notes: The dependent variable is the retail price of product *k*, on island i, in gas station s, and day $t \in \{\tau-1, \tau+10\}$, where τ is the date of each of the three excise duty changes. The pass-through is estimated using all available observations for station-product combinations (average pass-through). Standard errors clustered at the island level are reported in parentheses below coefficients.
Source: Authors' calculations based on data from the Greek Ministry of Development, the Hellenic Statistical Authority, Eurostat and Google Maps.