Welfare Effects of the 2026 Italian Fuel-Excise Cut

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May 30, 2026

Abstract

This article evaluates the welfare effects of the temporary excise cut on petrol and diesel introduced by the Italian government in March 2026 in response to the oil-price shock triggered by the closure of the Strait of Hormuz. We estimate pass-through from a difference-in-differences along the Italy-France border using daily station-level prices. We find 83% of the petrol cut and 74% of the diesel cut reached consumers at the pump. Plugging the pass-through estimates into a sufficient-statistics framework, we find a net welfare gain of EUR 107 million against a fiscal cost of EUR 841 million. Though the fiscal cost is broadly in line with a window-rescaled version of the official parliamentary scoring, imperfect pass-through routed a substantial share of the private welfare gain to refiners and retailers — 15% on petrol and 28% on diesel — at odds with the consumer-price-relief intent signalled by the decree's own anti-speculation provisions. The policy also delivered a relatively low marginal value of public funds of 1.13.

Keywords: Pass-through; Tax incidence; Fuel taxation; Welfare; MVPF; Difference-in-differences.

JEL codes: H22, H23, Q48, D61, L78.

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1 Introduction

This paper evaluates the welfare consequences of the fuel excise tax cut introduced on 19 March 2026 by the Italian government in response to the oil-price increase triggered by the closure of the Strait of Hormuz. The decree (DL 33/2026, art. 2) reduced the excise on petrol and diesel by 0.20 EUR/L from 19 March to 30 April 2026. Because Italian VAT on motor fuels is 22%, applied to the sum of the wholesale price and excise as required by Article 78(a) of the EU VAT Directive (European Union 2006), the cut translates to a $0.20 \times 1.22 = 0.244$ EUR/L price reduction at the pump under full passthrough. The parliamentary dossier accompanying the decree, prepared by the joint research service of the Chamber of Deputies and the Senate, put the budgetary cost of the excise reduction at EUR 417.4 million in 2026 for the originally enacted 20-day window (19 March – 7 April 2026), plus EUR 6.1 million in 2028, with a partial offset of EUR 15.5 million in 2027 from corporate income tax (IRES), regional production tax (IRAP), and lower tax-credit accruals (Servizio Studi di Camera e Senato 2026).[1] The decree applied uniformly across the Italian territory and to all retail outlets; neither was targeted to commuters, agricultural users, or hauliers.[2]

Figure 1 situates the policy in the Italian pricing landscape on the eve of the cut and documents the geographic pattern of the immediate pump-price response. The underlying data are the Italian Enterprise Ministry (MIMIT)'s daily station-level price archive, populated under a 2014 disclosure obligation; we aggregate to a province-day median panel restricted to provinces with at least five active stations per fuel-day.[3] Left panels report province-day median pre-cut price levels. They show non-trivial within-Italy price dispersion and place Italian fuel near the top of the EU distribution: in the EU Weekly Oil Bulletin snapshot of 16 March 2026, three days before the cut, Italy ranked 9th of 27 member states on petrol and 5th on diesel. Right panels show the province-level retail price change in a ±7-day symmetric window around 19 March 2026, net of the contemporaneous change in the relevant wholesale benchmark.[4] They show that while prices for both fuels did fall as a result of the excise cut, they did not fall by nearly as much as the full extent of the excise cut. The largest price reductions, net of wholesale price changes, appear in fact no larger than 0.15 EUR/L.

Although the wholesale adjustment in the maps nets out the global crude and refined-product price movements, the maps remain a before-after comparison with no untreated control group: any Italy-specific shock coinciding with the cut — seasonal demand shifts, announcement effects on the supply chain, or Italian refining-margin movements not captured by the international benchmark — is confounded with the excise change. Section 2 separates the excise effect from these coeval forces using a difference-in-differences along the IT-FR Alpine border on daily station-level prices (Doyle and Samphantharak 2008; Montag et al. 2023). We find a pass-through of 83% on petrol and 74% on diesel. To quantify the distributional consequences of imperfect passthrough, Section 3 develops a sufficient-statistics welfare framework that translates the pass-through estimates, combined with sensible ranges for the short-run demand elasticity and the retail margin, into welfare conclusions — consumer surplus, producer surplus, fiscal cost, and the marginal value of public funds. Section 4 combines data, calibrated parameters, and

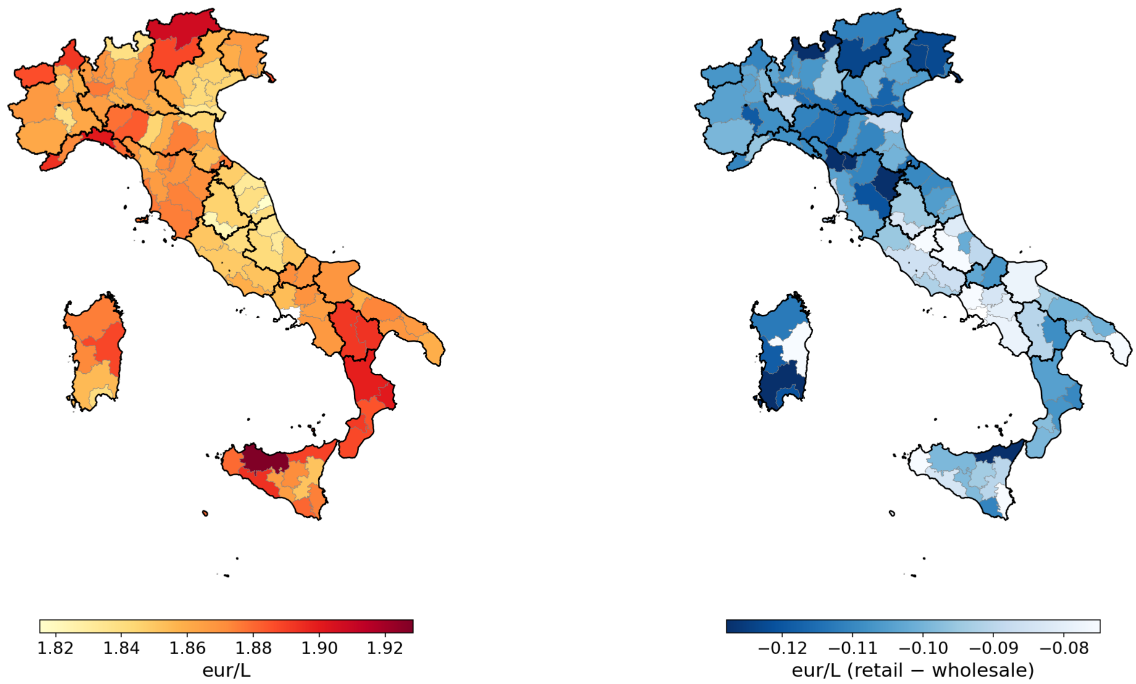
[1] A similar policy was introduced in Spain, whereas other countries resorted to subsidizing retail prices (Slovakia) or capping them (Hungary) (ThinkEuropa.dk 2026).

[2] Article 1 of DL 33/2026 also imposed a daily price-reporting obligation, banned intra-day price increases, and tasked the price-surveillance authority with monitoring the retail–wholesale spread. To the extent that these provisions constrained station pricing behaviour, the estimated pass-through is a joint effect of the excise cut and the regulatory intervention; the two cannot be separated in our design.

[3] Archive at https://www.mimit.gov.it/it/open-data/elenco-dataset/carburanti-archivio-prezzi, covering roughly 19,500 active stations as of February 2026. The province-day panel yields 19,080 province-day-fuel observations covering 106 of the 107 Italian provinces; aggregated to weekly national averages it agrees with the EU Bulletin Italian price within 0.03 EUR/L for petrol and 0.05 EUR/L for diesel over the 2026 Q1 window.

[4] Argus Gasoline EuroBob ARA Barge assessment for petrol and the ICE Low Sulphur Gasoil front-month for diesel. Data from LSEG Workspace, converted to EUR/L.

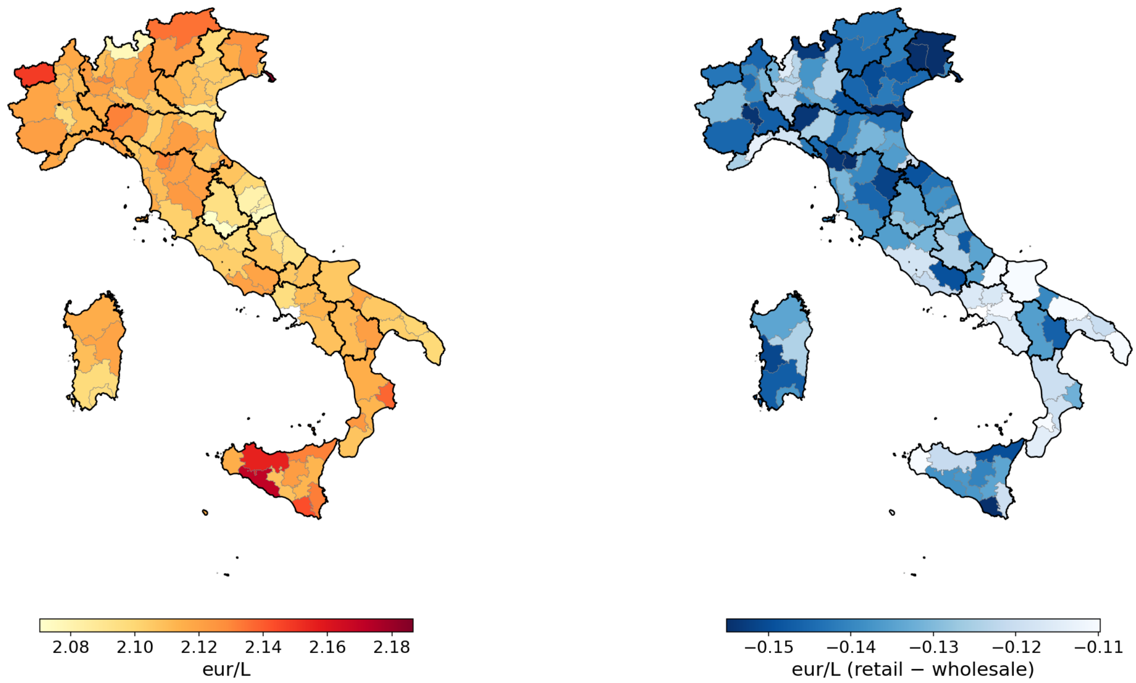
Figure 1: Province-Day Pre-Cut Prices and Trend-Adjusted Change Around Excise Cut



Pre-Cut Price Level

Trend-Adjusted Change

(a) Petrol



Pre-Cut Price Level

Trend-Adjusted Change

(b) Diesel

Notes: Province-day median pre-cut price level (left, 11–18 March 2026 average) and wholesale-adjusted retail price change (right, ±7-day symmetric window around 19 March 2026). The wholesale-adjusted change subtracts the change in the wholesale benchmark from each province's retail change. *Source*: MIMIT station archive; LSEG Workspace.

the estimated passthrough through the lens of the model to evaluate the outcomes of the policy. At a short-run compensated demand elasticity of 0.30 and a retail margin of 0.03 EUR/L,[5] the cut generated a net welfare gain of EUR 107 million over the 43-day window against a fiscal cost of EUR 841 million. The fiscal-cost figure is comparable in magnitude to a window-rescaled version of the EUR 417.4 million the parliamentary dossier scored for the original 20-day window of DL 33/2026 (Servizio Studi di Camera e Senato 2026); Section 5 decomposes the residual gap. In addition to replicating official estimates, we highlight two failures of the policy. First, the excise cut returned low return on investment, delivering a marginal value of public funds (Finkelstein and Hendren 2020) of 1.13. Second, we evaluate the policy against the welfare criterion implied by its own legislative design. The decree's Article 1 imposed anti-speculation provisions — daily price reporting, a ban on intra-day increases, price-surveillance enforcement — that reveal a planner whose welfare weight on consumer pass-through exceeded its weight on supply-chain margins. Under such a planner, the operative statistic is the consumer share of the private surplus gain, and on this metric the policy fell short: consumers captured only 85% of the petrol gain and 72% of the diesel gain across sensible ranges of demand elasticity and price-cost margins.

2 Price Effects of the 2026 Excise Cut

This section estimates the consumer-side pass-through of the Italian excise cut from a difference-in-differences along the IT-FR Alpine border, exploiting daily station-level prices from the Italian MIMIT and French Etalab feeds. The design rests on parallel trends between Italian and French border stations absent the cut.[6] Throughout, we report the pass-through coefficient $\hat{\rho}_e^f \equiv \widehat{\Delta p}_e^f / \Delta\tau_e^f$, where $\widehat{\Delta p}_e^f$ is the price change attributable to the cut and $\Delta\tau_e^f$ is the post-VAT mechanical price reduction under full pass-through for fuel f in episode e. The denominator is $\Delta\tau_{2026}^{\text{petrol}} = \Delta\tau_{2026}^{\text{diesel}} = 0.20 \times 1.22 = 0.244$ EUR/L for the 2026 episode (Section 1).[7] Appendix A reports additional results.

Data. MIMIT publishes an 08:00 daily snapshot of every Italian station's standing pylon price; Etalab publishes event-driven updates for the French network with update (*mise-à-jour*) timestamps. French retailers are under a legal obligation to report their posted prices and every subsequent change to the government price portal that feeds Etalab, so a quote carrying an old timestamp is the price still in force at the pump — the station has declared no change — rather than a missing or stale observation. We harmonise the two feeds into a station-day-fuel panel covering 22 January – 18 May 2026, carrying each French quote forward from its most recent

[5] See Section 4.1 for a discussion of these values.

[6] Appendix D reports a complementary synthetic control analysis on EU-wide weekly national-average data; the SCM point estimates sit below the border DiD on both fuels, but the difference is not statistically significant and has a natural direction (weekly aggregation and national averaging attenuate measured pass-through). Figure A9 shows that Italian and French without-tax (wholesale-equivalent) retail prices moved in parallel in the weeks before the cut, ruling out a differential wholesale-margin response to the Hormuz shock as a pre-existing confound; the post-cut convergence visible in the same figure is consistent with the producer-price increase implied by $\rho < 1$. For the analogous 2022 Italian excise cut, Drolsbach, Gail, and Klotz (2023) find approximately full pass-through using station-chain-level data; Marion and Muehlegger (2011) show more generally that supply conditions shape fuel-tax incidence.

[7] DL 33/2026 (art. 2) cut the excise on petrol and diesel by 0.20 EUR/L and on LPG by 0.12 EUR/kg beginning 19 March 2026, in force initially for 20 days and then extended through 30 April 2026; the legal mechanism was an equalisation of both rates at 472.90 EUR/1000 L (from the 1 January 2026 baseline of 672.90 EUR/1000 L). The 25 c/L figure widely reported in press coverage at the announcement was a rounded approximation; the legal magnitude on each fuel is 20 c/L pre-tax, equivalent to $0.20 \times 1.22 = 0.244$ EUR/L at the pump under full pass-through. A May 2026 mini-extension differentiated the cut, holding diesel at 20 c/L excise and reducing petrol to 5 c/L excise (3-week window from 1 May 2026); the analysis here is restricted to the March–April window.

update to the 08:00 Italian-time snapshot; we drop rows where that carry-forward exceeds seven days, beyond which a missing update more plausibly reflects a station that has left the feed than a genuinely unchanged price. The Italian side is restricted to self-service prices, since Etalab has no service-mode flag and the French network is de facto self-service nationwide. The resulting panel has 3,805,442 station-day-fuel observations covering all Italian and French stations, of which 95,429 lie 50–75 km from the IT-FR border. The Italian price archive is published quarterly; the Q2 2026 archive was not yet available at the time of writing, so the Italian side of the panel ends on 31 March 2026 ($k = +12$).

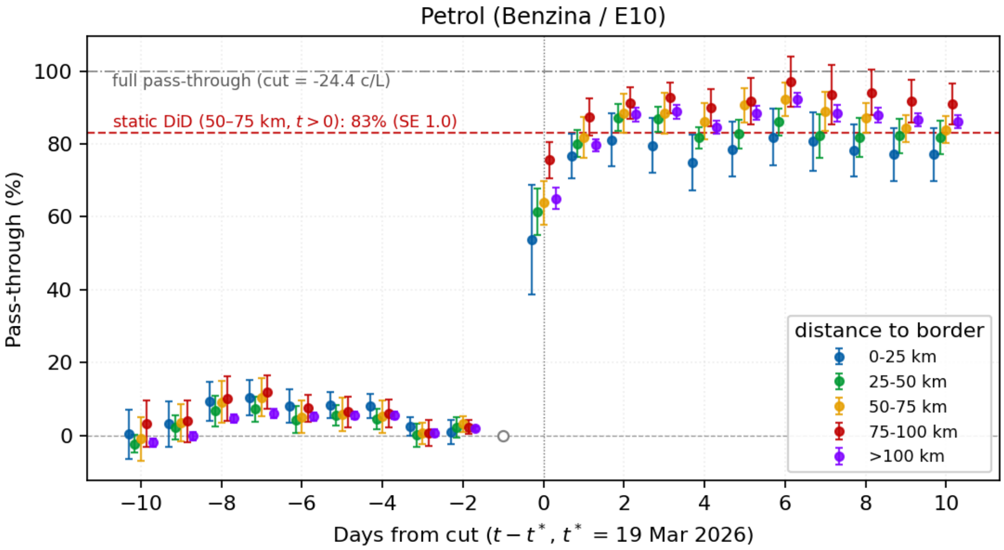
Estimator. For station i, day t, and fuel f, run separately by fuel and by distance band $b \in \{0\text{–}25, 25\text{–}50, 50\text{–}75, 75\text{–}100\}$ km:

$$p_{i,t}^{f} \;=\; \alpha_i + \gamma_t + \sum_{k \neq -1} \beta_k^f \cdot \mathbb{1}\{\mathrm{IT}_i\} \cdot \mathbb{1}\{t - t^* = k\} + \varepsilon_{i,t}^{f}, \tag{1}$$

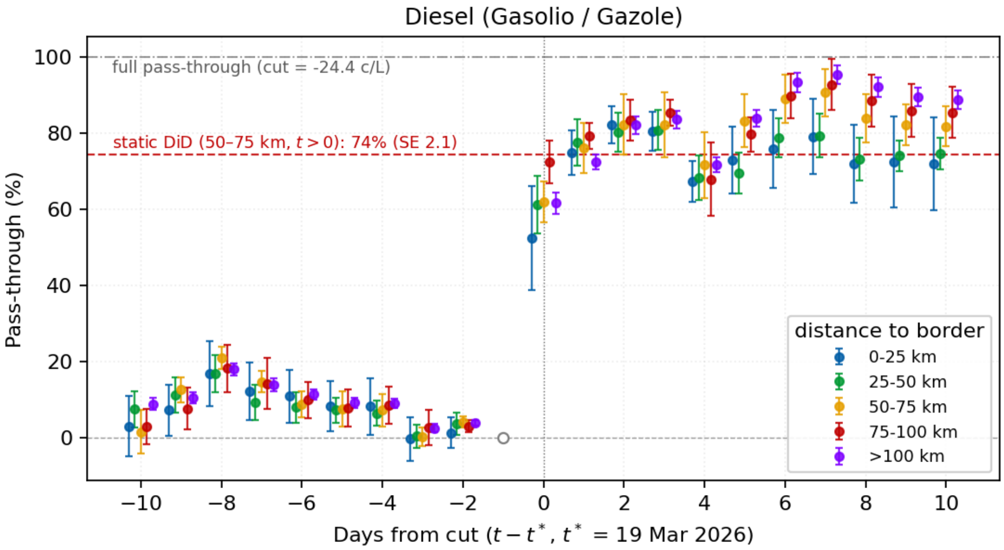
with $t^* =$ 19 March 2026 and $k \in [-10, +10]$ days around the cut. Standard errors are clustered at the province (IT) or département (FR) level. We also report the pooled static analog that collapses the post-period into a single $\mathrm{IT}_i \cdot \mathrm{POST}_t$ interaction on the 50–75 km panel, which we adopt as the headline specification. Under parallel trends between Italian and French border stations absent the cut, the pre-period coefficients $\widehat{\beta}_k^f$ for $k < 0$ should sit at zero; the distance-band split lets the data speak to cross-border refueling spillovers, which if material would attenuate the near-border rings relative to bands further from the frontier. We restrict the headline to 50–75 km because this is the first ring in which the within-France ring DiD against the 100–300 km interior is statistically indistinguishable from zero, indicating that French control stations in this band no longer respond to the Italian cut (Figure A2).

Estimates. Figure 2 plots the dynamic coefficients in pass-through units, together with the pooled static coefficient (red dashed) and the full-pass-through benchmark (grey dash-dot). The pre-period coefficients are small relative to the post-treatment effect, though a mild downtrend is visible from $k = -8$ toward the cut as coefficients converge to zero. The elevation at $k = -8$ and $k = -7$ (11–12 March) coincides with a roughly 10 c/L wholesale spike in the Eurobob ARA Barge benchmark over those two days; French event-driven pricing transmitted the spike to retail faster than the Italian daily snapshot, producing a transient IT-FR gap that closed within two days. The pooled pre-period placebo DiD ($t \leq -2$, estimated on pre-period data only) on the 50–75 km panel averages to -1.1 c/L (SE 0.54) for petrol and -2.1 c/L (SE 0.39) for diesel. The $k = 0$ coefficient lands at roughly half the post-treatment magnitude, plausibly reflecting intra-day price-setting frictions, and the path reaches its post-cut level two days after the cut date. The static DiD on the 50–75 km panel, averaging over $t > 0$ to avoid intra-day price-setting frictions on the day of the excise cut, is -20.3 c/L for petrol (SE 0.24) and -18.2 c/L for diesel (SE 0.52). These estimates represent $\widehat{\rho}_{2026}^{\text{petrol}} = 0.83$ and $\widehat{\rho}_{2026}^{\text{diesel}} = 0.74$ of the at-pump mechanical reduction $\Delta\tau = -24.4$ c/L. Figure 2 also shows the price effects divided by station distance from the border. The static-DiD pass-through rises monotonically in absolute value with distance from the border: from -17.9 c/L (petrol) and -16.6 c/L (diesel) in the 0–25 km ring, through -19.6 and -16.7 at 25–50 km and -20.3 and -18.2 at 50–75 km, to -21.2 and -18.6 c/L in the 75–100 km band. This is consistent with cross-border spillovers: the excise cut made Italian fuel cheaper relative to French fuel at the border, drawing cross-border demand toward the Italian side; French border stations cut their own prices to retain volume, and because those stations serve as the DiD control, the induced reduction shrinks the measured IT–FR gap and biases the near-border pass-through toward zero. Figure A2 confirms this directly from the within-France ring DiD: the 0–25 and 25–50 km rings price significantly below the 100–300 km interior during the cut window, the 50–75 km ring is statistically indistinguishable from zero, and the 75–100 km ring is a small but statistically significant positive deviation on petrol — consistent with the

Figure 2: Border Event Study, Pass-Through (2026)



(a) Petrol



(b) Diesel

Notes: Markers are dynamic IT$\times 1\{t - t^* = k\}$ coefficients from Equation (1) rescaled by the in-force mechanical cut $\Delta\tau = -24.4$ c/L. Distance-to-border bands are non-overlapping. Grey dash-dot is full pass-through (100%); red dashed is the static-DiD pooled coefficient ($t > 0$, cut date dropped from sample). Window $k \in [-10, +10]$ days around $t^* = 19$ March 2026. Two-way (station, day) fixed effects; SE clustered by province (IT) / département (FR), giving 9 Italian and 18 French clusters in the 50–75 km panel. *Source*: MIMIT daily 08:00 prices, Etalab carry-forward feed; author elaboration.

contamination being exhausted by 50 km and a mild margin-recovery response further inland. We therefore exclude the bands within 50 km of the frontier and adopt the 50–75 km panel as the headline, the first ring that does not display significantly different price changes from the 100–300 km ring. Extending the sample to all Italian and French stations (> 100 km from the border) yields post-period coefficients essentially equal to the 50–75 km band, confirming that the contamination is confined to within 50 km; however, the parallel-trends assumption becomes harder to sustain at national scale, where treated and control stations face different local demand and competitive conditions, so we retain the 50–75 km border sample as the headline.

3 Model

The excise cut caused four changes: consumers paid a lower retail price, pump owners received a higher net price, the government forewent revenue on the cut excise and on the layered VAT, and consumers expanded purchases along the demand curve. The first three are transfers between consumers, producers, and the Treasury. The fourth – consumption expansion on a pre-taxed good – is the social welfare gain. This section builds on Kleven (2021) to map observed quantities, calibrated parameters, and estimated passthrough into these welfare-relevant quantities. Appendix B and Appendix C contain additional material related to the model.

3.1 Tax Structure

Italian motor fuels are taxed twice: a per-litre excise τ_f and a 22% VAT at rate v levied on the wholesale-plus-excise base.[8] Let p_f^p be the per-litre price received by the pump owner net of all taxes. The retail pump price stacks the producer price, the excise, and the ad valorem VAT,

$$p_f^c \;=\; (1+v)(p_f^p + \tau_f), \tag{2}$$

and the total tax wedge is $\tau_f^{\text{tot}} \equiv p_f^c - p_f^p = v\,p_f^p + (1+v)\tau_f$.

The cut reduced τ_f by $\Delta\tau_f$. At p_f^p held fixed, Equation (2) implies a mechanical retail-price reduction of $(1+v)\Delta\tau_f$ and a mechanical VAT-revenue reduction of $v\Delta\tau_f$ per litre.[9] The pass-through coefficient ρ_f, defined relative to the post-VAT mechanical reduction, governed the split: $\Delta p_f^c = -\rho_f(1+v)\Delta\tau_f$ at the pump and $\Delta p_f^p = (1-\rho_f)\Delta\tau_f$ for the pump owner.[10] The total tax wedge $\tau_f^{\text{tot}} = (1+v)\tau_f + v\,p_f^p$ therefore fell by

$$\Delta\tau_f^{\text{tot}} \;=\; (1+v)\Delta\tau_f - v(1-\rho_f)\Delta\tau_f \;=\; (1+v\rho_f)\Delta\tau_f, \tag{3}$$

combining the mechanical excise reduction with the VAT reduction on the post-cut producer price.

3.2 Welfare

We parameterise the reform by $\alpha \in [0,1]$, with $\alpha = 0$ the pre-cut policy and $\alpha = 1$ the post-cut policy. Along the path the per-litre excise is $\tau(\alpha) = \tau - \alpha\,\Delta\tau$, consumer and producer price changes are $\Delta p^c(\alpha) = -\rho(1+v)\alpha\,\Delta\tau$ and $\Delta p^p(\alpha) = (1-\rho)\alpha\,\Delta\tau$, and quantity $Q(\alpha) = Q^0 - \varepsilon\,Q^0\,(\Delta p^c(\alpha)/p^c(0))$ moves along iso-elastic demand with $\varepsilon \equiv -p\,Q'(p)/Q$ the baseline elasticity.[11]

[8] European Union (2006), Article 78(a).

[9] For Italian petrol at the 2026 baseline ($p^c \approx 1.82$, $\tau \approx 0.673$ EUR/L), $p^p \approx 0.819$, giving $\tau^{\text{tot}} \approx 1.00$ EUR/L. Diesel is similar. Appendix C discusses carve-outs.

[10] From Equation (2), $\Delta p^c = (1+v)(\Delta p^p + \Delta\tau)$. Substituting $\Delta p^c = -\rho(1+v)\Delta\tau$ gives $\Delta p^p = (1-\rho)\Delta\tau$.

[11] For the purpose of this section we suppress the fuel subscript f. We implicitly treat diesel and gasoline as independent goods, a seemingly reasonable assumption given the short-run nature of the policy we consider here.

Consumer surplus, producer surplus, and government revenue are

$$\mathrm{CS}(\alpha) = \int_{p^c(\alpha)}^{\infty} Q^d(p)\, dp, \tag{4}$$

$$\mathrm{PS}(\alpha) = m(\alpha)\, Q(\alpha), \tag{5}$$

$$G(\alpha) = \tau^{\mathrm{tot}}(\alpha)\, Q(\alpha), \tag{6}$$

where $m(\alpha) \equiv p^p(\alpha) - c$ is the per-litre retail margin. Under the assumption of flat residual supply, wholesale marginal cost c is constant over the policy-relevant quantity range, so m varies along the reform path only through $p^p(\alpha)$. By the envelope theorem applied to the consumer's expenditure-minimisation problem, $d\mathrm{CS}/d\alpha = -Q(\alpha)\, dp^c/d\alpha$; differentiating Equations (5) and (6) directly,

$$\frac{d\mathrm{CS}}{d\alpha} = -Q(\alpha)\, \frac{dp^c}{d\alpha} = Q(\alpha)\, \rho(1+v)\, \Delta\tau, \tag{7}$$

$$\frac{d\mathrm{PS}}{d\alpha} = Q(\alpha)\, \frac{dp^p}{d\alpha} + m(\alpha)\, \frac{dQ}{d\alpha} = Q(\alpha)\, (1-\rho)\, \Delta\tau + m(\alpha)\, \frac{dQ}{d\alpha}, \tag{8}$$

$$\frac{dG}{d\alpha} = -(1+v\rho)\Delta\tau\, Q(\alpha) + \tau^{\mathrm{tot}}(\alpha)\, \frac{dQ}{d\alpha}. \tag{9}$$

Adding Equations (7) to (9), the inframarginal-litre transfers cancel and the welfare derivative reduces to the wedge between consumer marginal value and wholesale marginal cost, applied to the induced quantity expansion,

$$\frac{dW}{d\alpha} = \frac{d\mathrm{CS}}{d\alpha} + \frac{d\mathrm{PS}}{d\alpha} + \frac{dG}{d\alpha} = \left[\tau^{\mathrm{tot}}(\alpha) + m(\alpha)\right] \frac{dQ}{d\alpha}, \tag{10}$$

where we use $p^c = p^p + \tau^{\mathrm{tot}}$, so the full welfare wedge $p^c - c$ decomposes as $\tau^{\mathrm{tot}} + m$ – the sum of the fiscal wedge and the retail margin. We do not impose $m = 0$ because under flat supply $\rho < 1$ is consistent with a non-zero retail margin.[12] Equation (10) generalises the efficiency formula of Kleven (2021, Proposition 2) to a market with a non-fiscal wedge. While under perfect competition tax-induced price changes are pure transfers and the welfare wedge equals the tax rate alone, imperfect pass-through and a positive retail margin imply the welfare wedge is the sum of the fiscal wedge and the markup, and incidence affects efficiency through the latter (Weyl and Fabinger 2013).

3.3 Sufficient Statistics

Integrating Equation (10) from $\alpha = 0$ to $\alpha = 1$ gives the welfare change along the reform path. Approximating the integral by the trapezoid rule,

$$\Delta W \;\approx\; \tfrac{1}{2}\left\{ \left.\frac{dW}{d\alpha}\right|_{\alpha=0} + \left.\frac{dW}{d\alpha}\right|_{\alpha=1} \right\} \;=\; \tfrac{1}{2}\big\{[\tau^{\mathrm{tot}}(0) + m(0)] + [\tau^{\mathrm{tot}}(1) + m(1)]\big\}\, \Delta Q, \tag{11}$$

where under iso-elasticity the trapezoid average of $dQ/d\alpha$ equals ΔQ to leading order; the residual is third-order in $\Delta\tau$.[13] The wedge enters at its mid-point value

$$\overline{\tau}^{\mathrm{tot}} + \overline{m} \;\equiv\; \tfrac{1}{2}\big\{[\tau^{\mathrm{tot}}(0) + m(0)] + [\tau^{\mathrm{tot}}(1) + m(1)]\big\} \;=\; \left[\tau^{\mathrm{tot}}(0) + m(0)\right] - \tfrac{1}{2}\rho(1+v)\Delta\tau,$$

[12] Under flat residual supply, full pass-through ($\rho = 1$) and perfect retail competition ($m(0) = 0$) are equivalent at first order. Our empirical evidence rules out the first; both must therefore be relaxed jointly, and carrying the retail margin $m(0)$ explicitly is the correct accommodation. The welfare derivation needs $m(0)$ only as an observable retail-margin scalar; its structural interpretation as a function of conduct and demand curvature is not used to obtain any welfare quantity in what follows. Appendix B formalises this claim and derives the structural determinants of ρ and m in the Weyl and Fabinger (2013) framework.

[13] Iso-elasticity ($\varepsilon \equiv -p\, Q'(p)/Q$ constant along the path) is the natural local assumption for a months-long policy window with retail-price variation of order 10%. The meta-analytic short-run elasticities we import (Section 4.1) are themselves estimates of ε at the prevailing price level, and we take them as fixed at the baseline value. Larger reforms or wider price ranges would require the elasticity-change term in Kleven (2021), Proposition 4.

where we use $\tau^{\text{tot}}(\alpha) + m(\alpha) = p^c(\alpha) - c = p^c(0) - \rho(1+v)\alpha\Delta\tau - c$.

Substituting $\Delta Q = -\varepsilon\, Q^0\, (\Delta p^c/p^c(0)) = \varepsilon\, Q^0\, \rho(1+v)\Delta\tau/p^c(0)$,

$$\Delta W \;\approx\; \varepsilon\, Q^0\, \frac{\rho(1+v)\Delta\tau}{p^c(0)} \Big[\tau^{\text{tot}}(0) + m(0) - \tfrac{1}{2}\rho(1+v)\Delta\tau\Big]. \tag{12}$$

Consumer surplus, producer surplus, and revenue along the trapezoid. Applying the trapezoid rule to Equations (7) to (9) under the same iso-elasticity assumption,[14]

$$\begin{aligned}
\Delta \text{CS} &\;\approx\; \overline{Q}\, \rho(1+v)\Delta\tau, &(13)\\
\Delta \text{PS} &\;\approx\; \overline{Q}\,(1-\rho)\Delta\tau \;+\; \overline{m}\,\Delta Q, &(14)\\
\Delta G &\;\approx\; -(1+v\rho)\Delta\tau\,\overline{Q} \;+\; \overline{\tau}^{\text{tot}}\,\Delta Q, &(15)\\
\Delta W &\;=\; \Delta\text{CS} + \Delta\text{PS} + \Delta G \;\approx\; \big(\overline{\tau}^{\text{tot}} + \overline{m}\big)\,\Delta Q, &(16)
\end{aligned}$$

where $\overline{Q} \equiv Q^0 + \frac{1}{2}\Delta Q$, $\overline{m} = m(0) + \frac{1}{2}(1-\rho)\Delta\tau$, and $\overline{\tau}^{\text{tot}} = \tau^{\text{tot}}(0) - \frac{1}{2}(1+v\rho)\Delta\tau$ are the path-mean quantity, margin, and tax wedge.[15] Each of Equations (13) to (15) has the same two-term anatomy: an inframarginal flow on the path-mean pre-cut volume $\overline{Q}$ and an induced-quantity flow on ΔQ. Equation (13) has no induced-quantity term because of the envelope condition: at the consumer's optimum the marginal litre is valued exactly at the price paid, so the consumer-surplus gain on induced consumption is a third-order triangle. Equation (14) splits between the inframarginal rectangle $\overline{Q}(1-\rho)\Delta\tau$ – the higher pump-net price paid on existing volume, zero only under full pass-through $\rho = 1$ – and the margin-on-induced rectangle $\overline{m}\,\Delta Q$, which is non-zero whenever $m > 0$ at the baseline. Equation (15) mirrors this structure: the mechanical revenue loss on $\overline{Q}$ at the post-cut wedge $(1+v\rho)\Delta\tau$, and the revenue collected on induced consumption at the path-mean tax wedge $\overline{\tau}^{\text{tot}}$ (the behavioural fiscal externality). Adding Equations (13) to (15) the inframarginal terms cancel pointwise along the path and the residual is the wedge-times-induced-quantity object of Equation (16), which reproduces Equation (12).

In conclusion, Equation (12) shows that changes in welfare ΔW and in its components $\Delta\text{CS}, \Delta\text{PS}, \Delta G$ depend on seven scalars: $(\varepsilon, \rho, p^c(0), m(0), Q^0, \Delta\tau, v)$. Four of these are directly observed: $(p^c(0), Q^0, \Delta\tau, v)$. The pass-through estimates of Section 2 pin down ρ. Section 4 provides sensitivity analysis with respect to the demand elasticity ε and retail margin m.

4 Welfare analysis

This section operationalizes the welfare decomposition from Section 3: Section 4.1 catalogues the empirical inputs, and Section 4.2 presents the results.

4.1 Empirical inputs

Equation (12) requires, per fuel: the pre-cut baseline quantity Q^0, observed directly; the pre-cut tax structure $(\tau, v, \tau^{\text{tot}})$ and consumer price $p^c(0)$, observed directly; the pass-through coefficient ρ, from the border DiD of Section 2; the demand elasticity ε at the baseline price; the pre-cut retail margin $m(0) \equiv p^p(0) - c$, where c is the wholesale marginal cost held constant over the policy-relevant quantity range (Assumption 1). Instead of estimating ε and $m(0)$, we provide ranges for both and display how welfare-relevant quantities vary within these ranges.

[14] Figure A5 displays the pre-cut and post-cut equilibria of Equation (2) in the (Q, p) plane.

[15] At the 2026 petrol point estimates ($p^c(0) \approx 1.82$ EUR/L, $\tau^{\text{tot}}(0) \approx 1.00$ EUR/L, $m(0) \approx 0.03$ EUR/L, $\rho \approx 0.83$, $\Delta\tau = 0.20$ EUR/L), the wedge correction $\frac{1}{2}\rho(1+v)\Delta\tau \approx 0.099$ EUR/L is about 10% of the full welfare wedge $\tau^{\text{tot}}(0) + m(0) \approx 1.03$ EUR/L.

Demand elasticity. We consider a sensitivity grid $\varepsilon \in \{0.05, 0.10, \ldots, 0.40\}$ applied to both fuels. The lower end covers EU panel estimates of 0.10–0.13 (Pock 2010) and inelastic US high-frequency estimates (Hughes, Knittel, and Sperling 2008); the upper end covers the meta-analytic short-run averages of 0.33–0.34 in Brons et al. (2008) and Huntington, Barrios, and Arora (2019) and the US high-frequency estimates of 0.27–0.37 in Coglianese et al. (2015), Kilian and Zhou (2024), and Levin, Lewis, and Wolak (2017). We set the headline calibration at $\varepsilon = 0.30$, near the meta-analytic central tendency; no Italian-specific short-run estimate exists to discipline the choice further, and no station- or aggregate-level quantity data covering the cut window is publicly available to estimate ε from the policy itself.[16]

Retail margin. The margin $m(0) = p^p(0) - c$ grid is $\{0.000, 0.025, \ldots, 0.175\}$ EUR/L. The lower end reflects dealer net margins of 0.03–0.04 EUR/L reported by Italian retailer federations for self-service stations.[17] The upper bound of 0.175 sits just above the gross industrial network margin of 0.156–0.165 EUR/L published by the Italian fuel retailers' federation, computed as the MASE pre-tax wholesale-plus-distribution price minus the Platts CIF Med wholesale benchmark.[18] We treat the gross figure as a slack upper bound on $m(0)$ because it bundles physical distribution, the biofuel blending obligation ($\approx$0.05–0.07 EUR/L), the dealer's net margin, and any economic markup into a single residual.[19]

4.2 Welfare Decomposition

Aggregating the welfare components across $f \in \{\text{petrol}, \text{diesel}\}$ and across different excise regimes, Table 1 reports each component over the cut window for the two fuels separately and jointly, alongside the implied marginal value of public funds $\text{MVPF} \equiv (\Delta\text{CS} + \Delta\text{PS})/|\Delta G|$ (Finkelstein and Hendren 2020) for cross-policy comparability.[20]

The table assumes $\varepsilon = 0.30$ and $m(0) = 0.03$ EUR/L for both fuels. Baseline quantity is the average Italian gross inland delivery (Eurostat `nrg_cb_oilm`) for March–April over 2022–2024, pro-rated to the 43-day cut window.[21] The lower panel reports the counterfactual $\rho = 1$: the entire private-surplus gain on existing volume accrues to consumers.

Our estimates show the EUR 107 million net welfare gain coexisted with a fiscal cost of EUR 841 million over the 43-day window — roughly double the EUR 417 million the parliamentary

[16] The lower bound of 0.05 sits inside the US 2001–2006 range of 0.034–0.077 (Hughes, Knittel, and Sperling 2008) and below the publication-bias-corrected median in Havranek, Irsova, and Janda (2012). We use the same grid for diesel because the short-run literature does not robustly separate the two fuels.

[17] Confcommercio provincial branches in Sondrio and Vicenza report dealer take-home of 3–4 c/L self-service (Confcommercio Sondrio 2024; Confcommercio Vicenza 2024).

[18] FIGISC-Confcommercio, "Margini industriali lordi rete – medie annue 2015–2025 e mensili 2025," published 4 October 2025 at `figisc.it`. The 2024 annual averages are 0.156 EUR/L (branded-self-service petrol) and 0.154 EUR/L (diesel); 2025 (Jan–Sep) figures are 0.165 and 0.153.

[19] No Italian primary source itemises physical distribution separately: the AGCM 2023 market study (*Indagine conoscitiva IC54*) and the federation's composition series both define "margine lordo" as the bundled object. The closest isolated EU figure is the UK's UKPIA/RAC Foundation breakdown, which reports delivery and oil-company costs of roughly 0.02–0.03 EUR/L.

[20] Two conventions in the MVPF definition deserve comment. First, the numerator includes producer surplus alongside consumer surplus, following the general formulation in Finkelstein and Hendren (2020) where the "willingness to pay" is the total private benefit accruing to the policy's beneficiaries. Under the alternative consumer-only convention $\text{MVPF} = \Delta\text{CS}/|\Delta G|$, the diesel MVPF falls below 1 at the headline calibration because imperfect pass-through routes a substantial share of the private gain to producers. Second, the denominator is net government cost $|\Delta G| = |\Delta G^{\text{mech}} + \Delta G^{\text{behav}}|$, which offsets the mechanical revenue loss with the behavioural fiscal externality (tax revenue collected on induced consumption).

[21] The rebate-offset slice Q^{comm} is the share of the diesel base subject to the commercial-diesel carve-out, under which qualifying hauliers recovered the excise cut quarterly through a tax credit. Induced quantity change is $\Delta Q_f = -\varepsilon(\Delta p^c_f/p^0_f)Q^0_f$ on the non-rebated slice and uses the haulier's net-of-rebate price change on Q^{comm}. Constant-quantity flows on the rebated slice contribute $-\rho(1+v)\Delta\tau + \Delta\tau$ to the per-litre net consumer-cost change, the same $(1-\rho)\Delta\tau$ to per-litre $\Delta\text{PS}^{\text{ifm}}$, and only $-v\rho\Delta\tau$ to the per-litre mechanical revenue line.

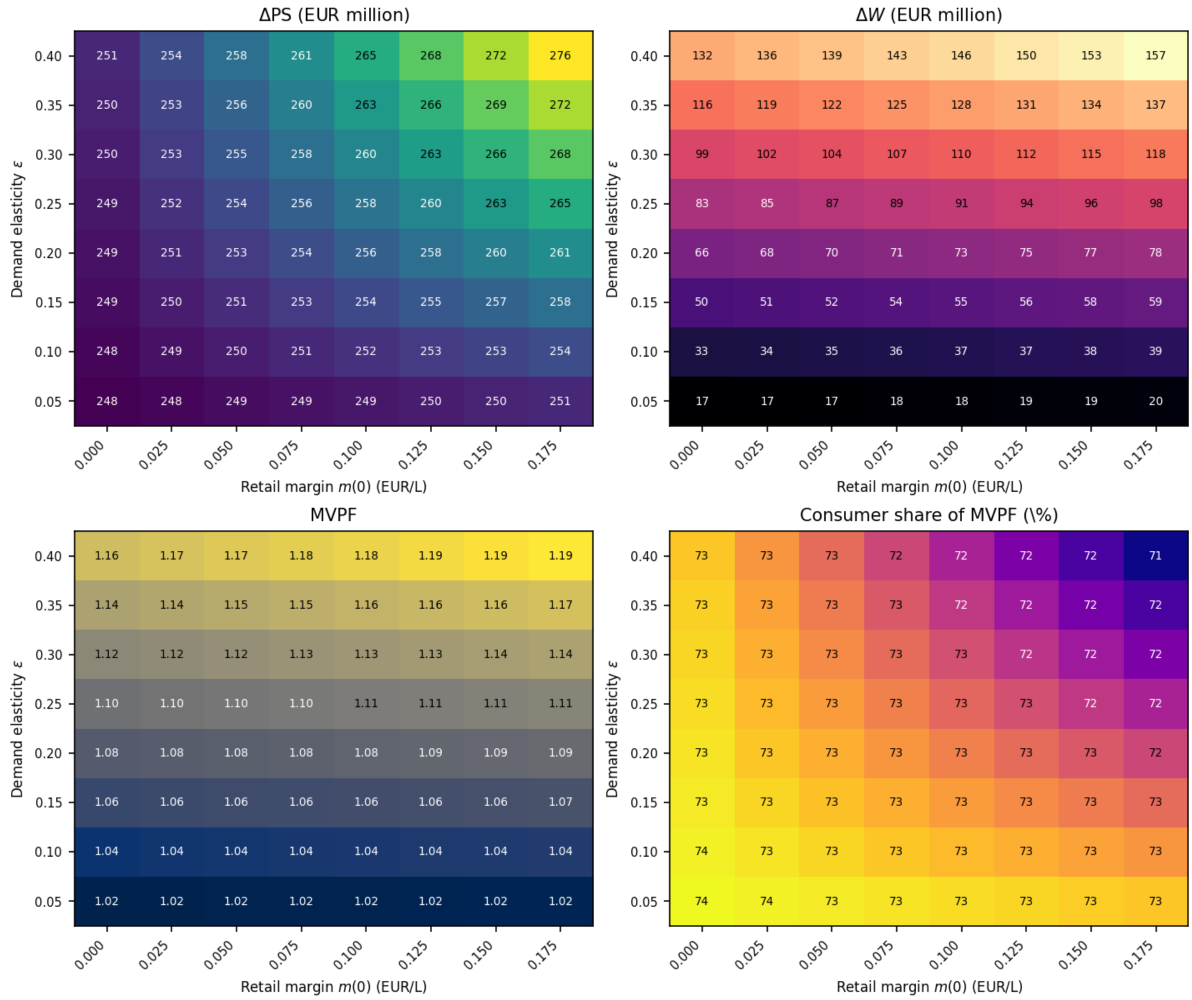
Table 1: Excise Cut Welfare Decomposition

	Petrol	Diesel	Total
Inputs			
Pass-through ρ	0.830 (0.010)	0.744 (0.021)	–
Compensated own-price elasticity ε	0.300	0.300	–
Baseline retail price $p^c(0)$ (EUR/L)	1.819	2.033	–
Tax wedge τ^{tot} (EUR/L)	1.001	1.040	–
Retail margin $m(0) \equiv p^p - c$ (EUR/L)	0.030	0.030	–
Path-average wedge $(p^c - c)_{\text{avg}}$ (EUR/L)	0.930	0.979	–
Baseline quantity (billion L)	1.386	3.328	4.714
of which: rebate-offset slice Q^{comm} (billion L)	0.000	0.799	0.799
Welfare decomposition at estimated ρ (EUR million)			
Induced quantity change (billion L)	0.046	0.066	0.112
Consumer surplus gain ΔCS	280.7 (3.4)	444.7 (17.2)	725.4 (20.6)
Producer surplus gain ΔPS	49.3 (2.8)	173.8 (14.1)	223.1 (16.9)
Mechanical revenue loss	-327.8 (0.6)	-614.9 (3.1)	-942.7 (3.7)
Behavioural fiscal externality	40.9 (0.5)	60.6 (2.3)	101.4 (2.8)
Net government revenue ΔG	-286.9 (0.1)	-554.3 (0.8)	-841.2 (0.9)
Net welfare ΔW	43.0 (0.5)	64.2 (2.3)	107.3 (2.8)
Marginal value of public funds	1.150 (0.021)	1.116 (0.055)	1.127 (0.043)
share to consumers (%)	85.1 (0.6)	71.9 (0.9)	76.5 (0.9)
share to producers (%)	14.9 (0.6)	28.1 (0.9)	23.5 (0.9)
Counterfactual at full pass-through $\rho = 1$ (EUR million)			
Induced quantity change (billion L)	0.056	0.096	0.152
Consumer surplus gain ΔCS	338.1	652.3	990.5
Producer surplus gain ΔPS	1.7	2.9	4.6
Mechanical revenue loss	-338.1	-652.3	-990.5
Behavioural fiscal externality	49.0	88.3	137.3
Net government revenue ΔG	-289.1	-564.0	-853.1
Net welfare ΔW	50.7	91.2	141.9
Marginal value of public funds	1.175	1.162	1.166
share to consumers (%)	99.5	99.6	99.5
share to producers (%)	0.5	0.4	0.5

Note: All amounts are in EUR million (unless stated otherwise) over the 19 March – 30 April 2026 cut window (43 days) and aggregate the petrol and diesel markets separately and jointly. Parenthetical values in the estimated-ρ panel are delta-method standard errors with respect to the pass-through estimate, conditional on the chosen $(\varepsilon, m(0))$; SE on ρ is from the border DiD clustered at the province/département level. Figure 3 displays the full sensitivity of welfare quantities across the $(\varepsilon, m(0))$ grid, including the MVPF range of 1.02–1.19. See Section 4.2 for discussion of table entries.

dossier scored for the original 20-day window (Servizio Studi di Camera e Senato 2026). We estimate the VAT amplification on the pump pass-through and the behavioural fiscal externality on induced consumption to offset EUR 101 million of fiscal costs. The fuel supply chain captured a substantial share of the private gain: 15% on petrol and 28% on diesel, driven by the higher price charged on inframarginal fuel consumption.

Figure 3: Welfare Sensitivity to ε and $m(0)$ (Petrol + Diesel)



Note: Four aggregate welfare quantities (petrol + diesel) over the 19 March – 30 April 2026 cut window, on the joint sensitivity grid of elasticity ε and pre-cut retail margin $m(0)$. Headline calibration $(\varepsilon, m(0)) = (0.30, 0.03)$. Pass-through ρ held at the 2026 border-DiD estimate (Section 2). Per-fuel panels in Appendix C.

Sensitivity to ε and $m(0)$. Figure 3 displays four aggregate (petrol + diesel) welfare quantities on the joint $(\varepsilon, m(0))$ grid of Section 4.1: producer surplus, net welfare, MVPF, and the consumer share of private gains.[22] The figure shows that net welfare is chiefly driven by ε: moving from 0.05 to 0.40 raises ΔW by an order of magnitude, while doubling $m(0)$ at fixed ε adds only a few EUR million. A similar result holds for MVPF, which ranges from 1.02 at low ε to 1.18 at $\varepsilon = 0.40$ — everywhere above the lump-sum MVPF = 1 benchmark. The consumer share of welfare gains is essentially flat across cells because private surplus is dominated by the constant-quantity

[22] See Appendix C for per-fuel breakdowns.

rectangles $\rho(1+v)\Delta\tau\, Q^0$ (consumers) and $(1-\rho)\Delta\tau\, Q^0$ (producers), neither of which depends on ε or $m(0)$.

5 Conclusion

This paper studied the welfare effects of the March 2026 Italian fuel excise cut. We found substantial evidence of imperfect passthrough, with pump prices falling by 83% for petrol and by 74% for diesel over the 43-day window from 19 March to 30 April 2026. In the sufficient-statistics framework of Kleven (2021), these estimates deliver a net welfare gain of EUR 107 million. Imperfect pass-through routes a substantial share of the welfare gain to producers: consumers capture 85% of the petrol gain and only 72% of the diesel gain, with the asymmetry flat across reasonable values of demand elasticity and retail margins. We estimate EUR 841 million in foregone revenue over 43 days, in line with the EUR 417.4 million expenditure scored in the parliamentary dossier for the first 20 days (Servizio Studi di Camera e Senato 2026).[23]

Three caveats qualify the welfare assessment. First, the welfare figures are purely fiscal: Appendix C.3 estimates the environmental externalities from induced consumption at roughly EUR 67 million (CO_2 at a social cost of carbon of \$185/tCO_2 plus local pollutants), which would absorb roughly three-quarters of the net welfare gain. Second, the analysis does not address the distributional incidence of the cut across households; because fuel expenditure rises with income among car owners, the consumer-surplus gain accrues disproportionately to higher-income households. Third, the decree's Article 1 imposed ancillary provisions — a daily price-reporting obligation, a ban on intra-day price increases, and a price-surveillance mandate — whose independent effect on pass-through and retail conduct is not separately identified here.

We end by discussing our MVPF estimate, 1.13, above the zero-deadweight-loss lump-sum benchmark (1) but well below many of the estimates collected by Hendren and Sprung-Keyser (2020). As discussed by Finkelstein and Hendren (2020), MVPF pools consumer and producer surplus into a single beneficiary-side numerator and does not distinguish which of the two captured the gain. That is the right accounting when the planner is indifferent between euros accruing to households and euros accruing to refiners. The evidence points in the direction that the Italian government was not indifferent. The decree's title pointed at "urgent measures on petroleum prices" and its accompanying technical report forecast a 0.25 EUR/L pump-price reduction at the consumer. The legislative design revealed a planner whose welfare weight on consumer pass-through was strictly above its weight on refining margins. Under such a planner the operative statistic is the consumer share of the private surplus, and in that sense our findings suggest the policy may have fallen short of its intended purposes.

[23] The dossier bundled the LPG excise cut (0.10 EUR/kg), which we drop; at Italian road-fuel LPG deliveries of $\approx$ 127 kt/month the LPG slice contributed EUR 8–10 million. The dossier's fiscal line was close to the pure mechanical excise loss with no VAT-amplification or behavioural-externality term; our calculation adds VAT amplification ($\approx$ EUR 135 million on 43 days) and offsets the behavioural fiscal externality (EUR 101 million).

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A Border-Station Difference-in-Differences: Additional Material

This appendix collects supplementary material for the border DiD of Section 2: the cents-per-litre companion to the body event study, a ring-level decomposition of the cross-border spillover and pass-through by distance, and the 2022 event with its parallel-trends caveat.

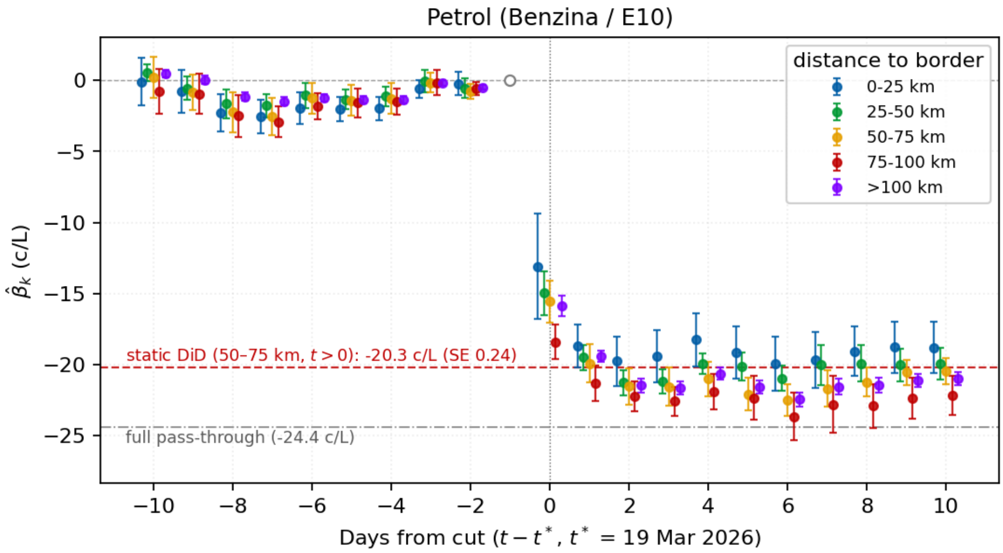
2026 event study in cents per litre. Figure A1 is the cents-per-litre companion to the body event study (Figure 2): the same coefficients, plotted in raw units rather than rescaled by the mechanical cut.

Cross-border spillover and pass-through by distance. The headline restriction to the 50–75 km band rests on the claim that French stations near the border respond to the Italian cut — the control-group contamination of Section 2. Figure A2 verifies this with a ring-level decomposition. For each 25 km ring between 0 and 100 km, we estimate three objects with 95% province / département-clustered CIs: the within-France band-vs-interior DiD (panel 1), the within-Italy band-vs-interior DiD (panel 2), and the cross-border IT–FR DiD expressed as pass-through ρ (panel 3). The interior reference are areas between 100–300 km from the border; all regressions use two-way (station, day) fixed effects. The within-country panels overlay two events: the Hormuz cut window ($k \in [-10, +10] \setminus \{0\}$ around 19 March 2026) and a pre-Hormuz placebo window centred 40 days earlier ($k \in [-50, -30] \setminus \{-40\}$, approximately 28 January – 17 February 2026). The placebo identifies any pre-existing distance gradient in posted prices, so the difference between the Hormuz and Placebo ring estimates within a band is a triple-difference (DDD) estimate of the cut-induced band-specific effect, net of pre-existing trend.

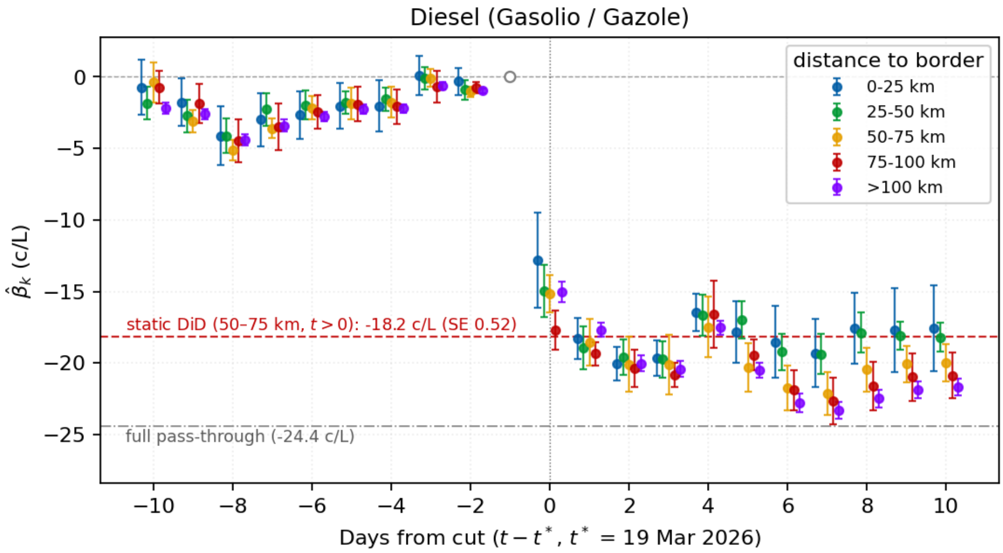
The French panel shows the spillover decaying with distance: the 0–25 and 25–50 km rings are significantly more negative than the 100–300 km reference, the 50–75 km ring is statistically indistinguishable from zero on both fuels, and the 75–100 km ring is a small but statistically significant *positive* deviation on petrol (and indistinguishable from zero on diesel) — consistent with French stations 50–75 km from the border being clean of the cross-border refueling spillover, and stations 75–100 km away exhibiting a mild margin-recovery response. The placebo bands sit at zero across all rings on both fuels, ruling out pre-existing trend as a driver. The Italian panel hovers around zero across all rings for petrol, supporting uniform pass-through across distance. For diesel, the 50–75 and 75–100 km Italian rings drop modestly below zero in the Hormuz window while the placebo at the same bands is flat, suggesting mild treated-side band heterogeneity for diesel. Because the headline IT–FR DiD compares Italian and French stations in the same 50–75 km band, both this treated-side heterogeneity and band-specific cost shocks common to both sides are part of the band-specific estimand rather than a bias in it. The pass-through panel plateaus at the 50–75 km band; the 75–100 km estimate is slightly higher on petrol, reflecting the positive French deviation in that ring, and we report the 50–75 km headline accordingly.

2022 excise cut comparison. Figures A3 and A4 apply the same specification to the 22 March 2022 cut (DL 21/2022), with the post-period capped at 31 March 2022 to keep the French *remise carburant* (18 c/L from 1 April 2022) outside the comparison. The static DiD ($t > 0$, cut date dropped) comes in at -30.5 c/L on petrol and -34.0 c/L on diesel, or $\widehat{\rho}^{\text{petrol}}_{2022,\text{DiD}} = 1.00$ and $\widehat{\rho}^{\text{diesel}}_{2022,\text{DiD}} = 1.11$ relative to the 2022 mechanical reduction $\Delta\tau = -30.5$ c/L. The diesel estimate exceeds physical full pass-through, and both sit above the 2022 synthetic control estimates of 90% petrol and 81% diesel (Table A2). The pre-period coefficients explain why: they are non-zero and trend into the cut — roughly $+2$ to $+3$ c/L at $k = -6$ and $k = -5$ on petrol, and swinging from about -8 c/L at the far leads to positive values near the cut on diesel — so the

Figure A1: Border Event Study, Cents per Litre (2026)



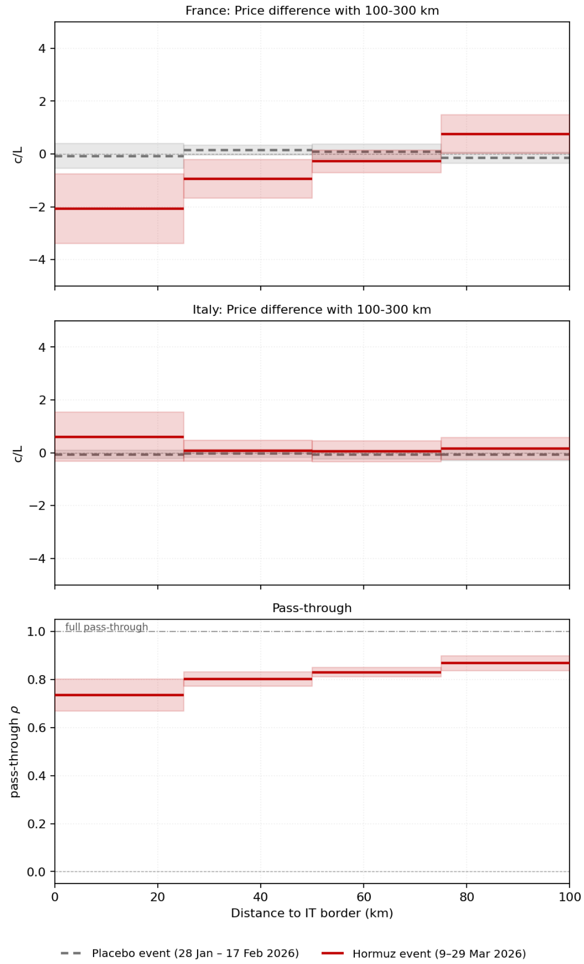
(a) Petrol



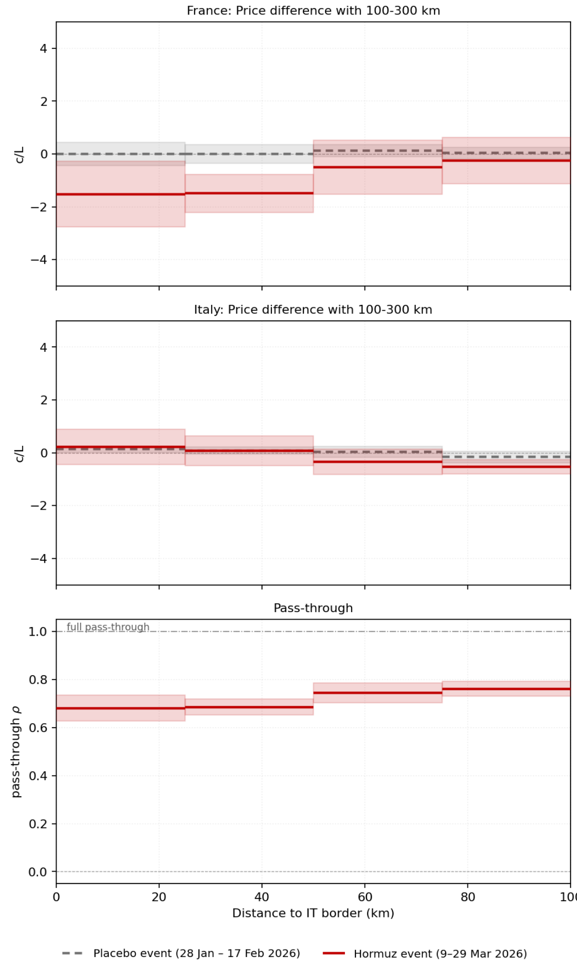
(b) Diesel

Notes: As Figure 2 but coefficients are in cents per litre rather than per cent of the mechanical cut. Grey dash-dot is full pass-through (−24.4 c/L); red dashed is the static-DiD pooled coefficient (−20.3 c/L for petrol, −18.2 c/L for diesel; $t > 0$, cut date dropped). Two-way (station, day) fixed effects; SE clustered by province (IT) / département (FR), giving 9 Italian and 18 French clusters in the 50–75 km panel. *Source*: MIMIT daily 08:00 prices, Etalab carry-forward feed; author elaboration.

Figure A2: Cross-Border Spillover and Pass-Through by Ring



(a) Petrol

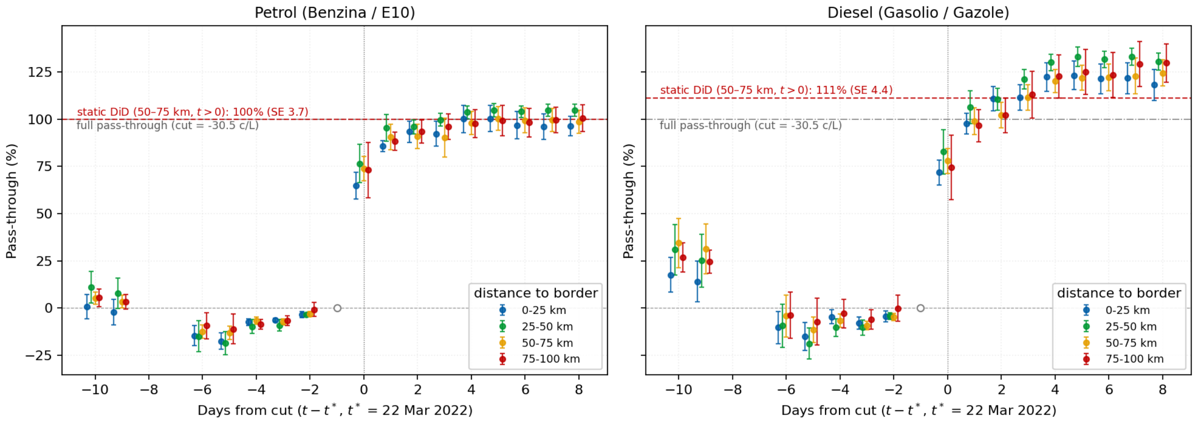


(b) Diesel

Notes: Ring DiD estimates with 95% province / département-clustered CIs, drawn as horizontal segments with shaded CI bands over each ring's distance range. Panels 1 and 2 plot the within-country band-vs-interior DiD coefficient (c/L) for the Hormuz cut window (solid red) and a pre-Hormuz placebo window (dashed grey); the reference ring is 100–300 km. Panel 3 plots IT–FR DiD per ring expressed as pass-through $\rho = -(\text{IT–FR DiD})/\Delta\tau$ over the Hormuz window only. All regressions use two-way (station, day) fixed effects. *Source*: MIMIT daily 08:00 prices, Etalab carry-forward feed; author elaboration.

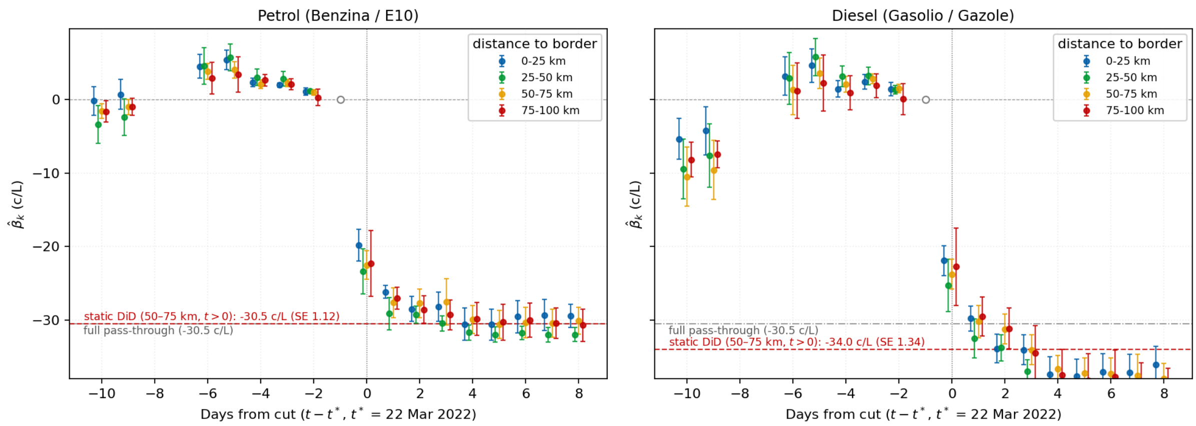
post-period magnitudes are measured against a non-parallel base.[24] A plausible mechanism is the Russia/Ukraine wholesale run-up to the 22 March 2022 cut: Italian and French stations entered the window with different inventory positions and price-setting frequencies, producing divergent pre-period retail paths that the country-level synthetic control absorbs through its donor pool but a single IT-FR pair cannot. The border DiD therefore requires that Italian and French retailers face symmetric wholesale-cost movements over the event window — a condition satisfied in 2026 (Figure A9 shows Italian and French without-tax prices tracking each other closely in the pre-cut weeks) but violated in 2022 by the asymmetric speed at which the Russia/Ukraine wholesale spike reached the two countries' retail networks.

Figure A3: Border Event Study, Pass-Through (2022)



Notes: As Figure 2 but for the 22 March 2022 excise cut (DL 21/2022, $\Delta\tau = -30.5$ c/L). Window $k \in [-10, +9]$ (post-period capped at 31 March 2022 to exclude the French *remise carburant* from 1 April 2022). Pre-period coefficients sit visibly above zero and trend toward the cut, flagging a parallel-trends violation. Two-way (station, day) fixed effects; SE clustered by province (IT) / département (FR).

Figure A4: Border Event Study, Cents per Litre (2022)



Notes: As Figure A3 but in cents per litre rather than per cent of the mechanical cut.

[24]Two pre-period days ($k = -8$, $k = -7$; 14–15 March 2022) are missing from the MIMIT archive and appear as gaps in the figure.

B Model Foundations

The welfare formula of Section 3 takes the pass-through coefficient ρ, the demand elasticity ε, and the retail margin m as data inputs. This appendix discusses the maintained assumptions, shows that the welfare formula does not require a structural model of retail conduct, and reconciles the estimated $\rho < 1$ with the iso-elastic demand assumption used for welfare integration. The underlying framework follows Weyl and Fabinger (2013) and Adachi and Fabinger (2022); Kleven (2021) provides the sufficient-statistics perspective.

B.1 Assumptions

We maintain three assumptions: flat residual supply, symmetric retail conduct with a fixed conduct parameter $\theta \in [0, 1]$, and smooth demand.

Assumption 1 (Flat residual supply)**.** *The wholesale marginal cost c faced by Italian retailers is constant over the relevant quantity range.*

Italy accounts for roughly 13% of EU-27 road motor-fuel consumption—third after Germany and France (Eurostat `nrg_cb_oil`, 2023)—and sources fuel at Mediterranean cargo-market prices that are integrated with the broader European wholesale complex through continuous ARA–Mediterranean arbitrage. The relevant residual supply elasticity facing Italian retailers is therefore that of the wider European market, not of domestic refining capacity alone. A demand response of any magnitude consistent with our estimated elasticities is too small to move the wholesale price within the horizon of the cut. Genakos and Pagliero (2022) provide direct evidence for this maintained assumption in European retail fuel markets, finding constant marginal costs and a conduct parameter that does not vary with quantities.

The Strait of Hormuz disruption (March–April 2026) temporarily steepened the European residual supply curve: diesel crack spreads reached multi-year highs and refinery throughputs fell. Both of our pass-through designs difference Italian pump prices against foreign controls—French border stations in the spatial DiD (Section 2) and EU donor countries in the synthetic control (Appendix D)—that are exposed to the same Mediterranean and European wholesale price movements. A uniform shift in the wholesale cost c therefore cancels in the treatment–control difference, and ρ remains interpretable as the retail-layer pass-through coefficient even when the wholesale level is rising. The identifying assumption is not that residual supply is flat at every point in time, but that the Hormuz shock did not differentially affect wholesale costs in Italy relative to the control units—a plausible condition given the integrated Mediterranean sourcing structure of European fuel supply.

B.2 Welfare sufficiency

Under these assumptions, the standard Weyl–Fabinger pass-through formula delivers $\rho^* = 1/[1 + \theta(1 - \sigma)]$, where $\sigma \equiv -Q(P^c)''/(P^c)'$ is the demand curvature (Weyl and Fabinger 2013, Proposition 2), and the Lerner condition pins down the retail margin as $m/(p^p + \tau) = \theta/\varepsilon$. The welfare effect of the excise cut, however, can be computed from $(\rho, \varepsilon, m, p^c, Q^0, \Delta\tau, v)$ without specifying θ, σ, or n. The key observation is that $\tau^{\text{tot}} + m = p^c - c$: the welfare wedge equals the gap between the consumer price and wholesale cost, regardless of how that gap decomposes between taxes and markups. The structural parameters (θ, σ, n) determine *which* (ρ, m) pair the market delivers in equilibrium, but once ρ is estimated and m is calibrated from industry data, the welfare formula uses them as data (Adachi and Fabinger 2022, Proposition 1).

This is a special case of the sufficient-statistics framework for imperfect competition developed by Adachi and Fabinger (2022), who derive welfare formulas for general tax structures (unit and ad valorem) under symmetric and heterogeneous oligopoly. Kleven (2021) identifies three pillars of the sufficient-statistics approach: (i) small reforms, (ii) government policy as the only source of market imperfection, and (iii) high-level restrictions that reduce the number of elasticities to be estimated. Our setting relaxes pillar (ii)—there is a retail margin from imperfect competition—but the extension is straightforward: carrying m as an additional observable adds one data input without requiring a structural model of retail conduct. The finite-reform trapezoid approximation of the body (Equation (12)) relaxes pillar (i) at the cost of an approximation error that is third-order in $\Delta\tau$.

Remark 1 (Constant pass-through). The trapezoid approximation requires ρ^* to be approximately constant over the reform path—a 10% retail-price variation for the 2026 episode. ρ^* is exactly constant when the demand curvature σ does not vary with quantity, which holds for iso-elastic demand ($\sigma = 1 + 1/\varepsilon$) and for linear demand ($\sigma = 0$). For general smooth demand, σ varies with Q and ρ^* varies along the path by $O(\Delta\tau)$. Since the welfare change ΔW is itself $O(\Delta\tau^2)$, the welfare error from the path-variation of ρ^* is $O(\Delta\tau^3)$—the same order as the trapezoid approximation error.

B.3 Reconciling pass-through with iso-elastic demand

Under flat supply with imperfect competition ($\theta > 0$), pass-through below unity requires demand curvature $\sigma < 1$—that is, aggregate demand more concave than the iso-elastic benchmark at the equilibrium quantity (Weyl and Fabinger 2013, pp. 528–530). The estimated $\rho \approx 0.6$–0.8 (Section 2) and the industry-calibrated $m \approx 0.03$–0.15 EUR/L (Section 4.1) are individually consistent with this condition.

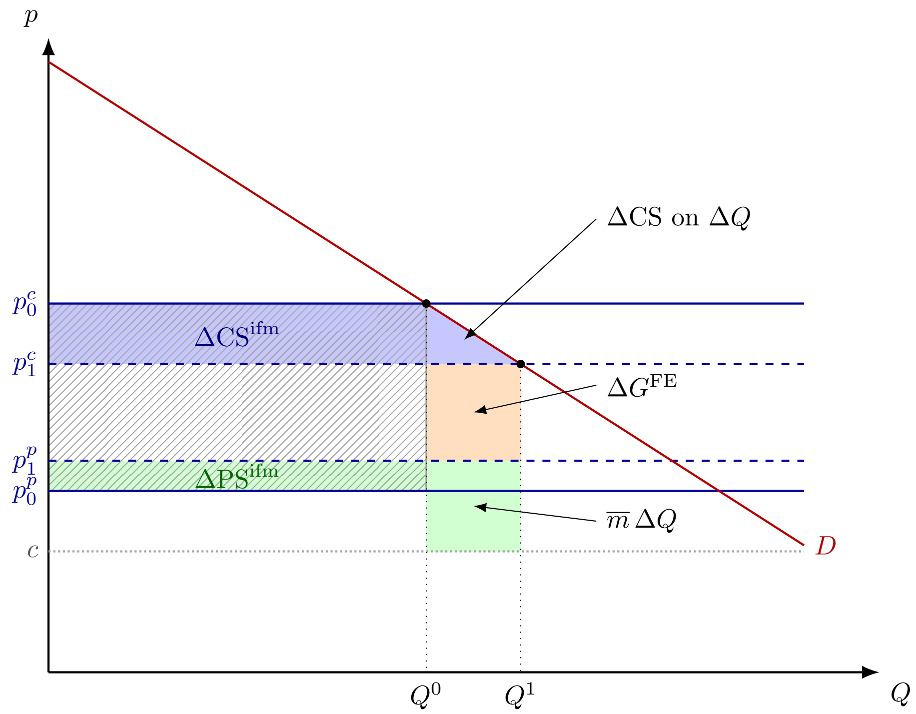
This is not a contradiction with the iso-elastic demand assumed for welfare integration in the body. The welfare formula (Equation (12)) uses ε to compute ΔQ from Δp^c and ρ to compute Δp^c from $\Delta\tau$; the demand curvature σ never enters. The body's iso-elasticity is an assumption about the local shape of demand over the reform path (a 10% price variation), not a commitment to a global functional form that would have to satisfy $\sigma = 1 + 1/\varepsilon$ at all quantities. The sufficient-statistics approach is what makes this possible: ρ and m enter the welfare formula as measured objects, not as structural functions of $(\varepsilon, \theta, \sigma)$.

C Model: Additional Material

C.1 Incidence: Graphical Representation

Figure A5 renders the pre-cut and post-cut equilibria of Equation (2) in the (Q, p) plane. Horizontal lines from the bottom up mark the wholesale marginal cost c, the pre-cut pump-net price p_0^p, the post-cut pump-net price p_1^p, the post-cut consumer price p_1^c, and the pre-cut consumer price p_0^c. The gap $m_0 \equiv p_0^p - c$ is the pre-cut retail margin, the gap $p_0^c - p_0^p$ is the pre-cut tax wedge τ_0^{tot}, and equilibrium quantity Q^0 sits at the intersection of demand D and the consumer-price line at p_0^c.

Figure A5: Incidence of an Excise Cut under Imperfect Pass-Through



Note: Welfare components of the excise cut under imperfect pass-through ($\rho < 1$) and a perfectly elastic residual wholesale supply at c. The initial retail margin is $m_0 \equiv p^p_0 - c$. The cut decreases the consumer price by $\rho(1+v)\Delta\tau$, from p^c_0 to p^c_1, and increases the pump-net price by $(1-\rho)\Delta\tau$, from p^p_0 to p^p_1. Equilibrium quantity expands from Q^0 to Q^1 along D. *Inframarginal transfers*: the blue rectangle $\Delta\mathrm{CS}^{\mathrm{ifm}} = \overline{Q}\rho(1+v)\Delta\tau$ is the consumer surplus gain from lower price on Q^0; the green rectangle $\Delta\mathrm{PS}^{\mathrm{ifm}} = \overline{Q}(1-\rho)\Delta\tau$ is the increased producer surplus from increased prices. The hatched area is the mechanical revenue loss $(1+v\rho)\Delta\tau\,\overline{Q}$, which equals $\Delta\mathrm{CS}^{\mathrm{ifm}} + \Delta\mathrm{PS}^{\mathrm{ifm}}$. *Induced-quantity welfare*: the region between D and c over $[Q^0, Q^1]$ is the trapezoid efficiency object $(\overline{\tau}^{\mathrm{tot}} + \overline{m})\,\Delta Q$, decomposed into three: (a) the blue triangle below D and above p^c_1 is $\Delta\mathrm{CS}$ on induced consumption; (b) the orange rectangle between p^p_1 and p^c_1, $\overline{\tau}^{\mathrm{tot}}\Delta Q$, is the revenue collected on induced consumption at the post-cut tax wedge; (c) the green rectangle between c and p^p_1, $\overline{m}\,\Delta Q$, is the retail margin gain on induced consumption, contributing to $\Delta\mathrm{PS}$ via the margin-on-induced channel of Equation (14). Path-mean quantities $\overline{Q}$, $\overline{\tau}^{\mathrm{tot}}$, $\overline{m}$ are the trapezoid averages defined in Section 3.3.

C.2 Scope

First, we treat retail prices as exogenous to Italian fuel demand: the cut moves the consumer price along the residual supply curve faced by Italian retailers, and we do not feed the induced quantity response back onto the wholesale price.[25] Second, Section 3 does not account for fuel carve-outs to simplify exposition: we however account for these carve-outs in our calculations. Third, the welfare metric used in this paper is purely fiscal.

Commercial-diesel carve-out The diesel base is not homogeneous in fiscal exposure: heavy-duty hauliers ($\geq$ 7.5 t, Euro 5+), taxis, scheduled passenger transport, and a few similar categories pay the standard excise at the pump and recover a per-litre rebate quarterly under Article 24-ter of the Italian excise duty code (*DECRETO LEGISLATIVO 26 Ottobre 1995, n. 504* n.d.). The DL 33/2026 implementation reduced this rebate one-for-one with the standard cut: the Q1 2026 schedule published by the Italian Customs Agency set the rebate at EUR 269.68 per 1,000 L for consumption between 1 January and 18 March, falling to EUR 69.68 per 1,000 L for consumption from 19 March to 31 March – a contraction of 200 per 1,000 L $= \Delta\tau$ exactly (Agenzia delle Dogane e dei Monopoli 2026).[26] On the slice of diesel volumes eligible for this rebate – denote its share s_R – the cut was therefore neutralised at the haulier's net rate: the pump-price drop $\Delta p^c = -\rho(1+v)\Delta\tau$ was more than offset by the rebate contraction $+\Delta\tau$, so the haulier faced a small *increase* in net cost per litre of $[\Delta\tau - \rho(1+v)\Delta\tau]$ and the Treasury lost only the VAT-on-pump-price wedge $-v\rho\Delta\tau$ rather than the full $-(1+v\rho)\Delta\tau$. We aggregate diesel as the sum of two segments: a non-rebated fraction $1 - s_R$ to which Equations (13) to (16) apply unmodified, and a rebated fraction s_R on which the consumer-side and mechanical-revenue line items use the haulier's net-of-rebate price change. We set $s_R = 0.24$, derived from the Italian Treasury's 2024 annual report on tax expenditures (Ministero Economia e Finanze 2024), which lists annual revenue foregone of EUR 1,142.6M for the Article 24-ter rebate; at the 2024 per-litre rebate rate this implies $\sim$ 5.33 bn L of rebated volumes against an annual automotive-diesel base of $\sim$ 22 bn L from the MASE motor-fuel consumption series.[27]

C.3 Environmental Externalities

Welfare changes in the main article do not account for the environmental externalities induced by the increased consumption of fuel as a result of excise cuts. This subsection provides a back-of-the-envelope calculation for those costs.

The Pigouvian correction per fuel f is

$$\Delta W_f^{\text{env}} \;=\; -\,\Delta Q_f \left(d_f^{\text{CO2}} + d_f^{\text{loc}} + d_f^{\text{cong}}\right), \tag{17}$$

where ΔQ_f is the induced consumption from Section 4.2, and $d_f^{\text{CO2}}, d_f^{\text{loc}}, d_f^{\text{cong}}$ are the per-litre marginal damages from carbon dioxide emissions, local air pollutants, and congestion. Davis (2017, p. 20) reports global consumption-weighted-mean marginal damages for road fuels across 156 countries: 0.09 USD/L (petrol) and 0.10 USD/L (diesel) from carbon dioxide at a social cost of carbon (SCC) of \$35/tCO_2, and 0.04 USD/L (petrol) and 0.20 USD/L (diesel) from local

[25] Italy accounts for roughly 13% of EU-27 road motor-fuel consumption (Eurostat `nrg_cb_oil`, 2023) and sources fuel at Mediterranean cargo-market prices integrated with the European wholesale complex; a demand response of any magnitude consistent with our estimated elasticities is too small to move the wholesale price within the horizon of the cut (see Assumption 1 and accompanying discussion).

[26] The per-litre rebate is set by ministerial decree at the start of each quarter as the differential between the standard excise rate and the commercial-use rate that Art. 24-ter targets. The cut decree did not modify the commercial-use rate, so the differential – and therefore the published rebate – mechanically contracted by $\Delta\tau$ over the cut window.

[27] Both source documents are included in the replication package: the MEF *Rapporto Annuale sulle Spese Fiscali 2024* (`data/raw/finanze/RSF-2024.pdf`) and the MASE automotive-diesel consumption series (`data/raw/sisen_mase/`), retrieved from `https://sisen.mase.gov.it/dgsaie/open-data`.

pollutants. The CO_2 damages scale linearly with the SCC (Davis 2017, p. 21). Updating from \$35/tCO_2 to the central estimate of \$185/tCO_2 (2020 USD, 2% near-term Ramsey discount) in Rennert et al. (2022, p. 687) — equivalent to €210/tCO_2 in 2026 prices — gives carbon damages of €0.54/L (petrol) and €0.60/L (diesel).[28] Adding the local-pollution component converted to 2026 EUR (€0.05/L petrol and €0.25/L diesel) gives a total climate-plus-local externality of €0.59/L for petrol and €0.85/L for diesel. Substituting into Equation (17) at the headline induced quantities of Table 1 gives an environmental externality of approximately EUR 67 million, about three-quarters of the fiscal-only ΔW; the welfare gain net of climate and local-pollution damages is around EUR 22 million. The congestion damage is conceptually large — Davis (2017, p. 20) reports 0.27 USD/L (petrol) and 0.26 USD/L (diesel), equivalent to €0.34/L and €0.33/L in 2026 EUR — but applies only to the share of induced consumption that corresponds to additional vehicle-kilometres, which our fuel-price elasticity does not separately identify. We therefore set $d^{\text{cong}} = 0$ in the central calibration and flag it as a potential additional externality of order tens of millions of euros. While the body retains the fiscal-only baseline so that the headline ΔW is comparable to other excise-incidence studies, this subsection should make it clear that, depending on the assumptions, environmental externalities may undo a substantial amount of the welfare gains from induced consumption.

C.4 Welfare Sensitivity by Fuel

Figures A6 and A7 break down the aggregate sensitivity of Figure 3 into petrol and diesel separately.

D Synthetic Control Analysis

This appendix reports a cross-country synthetic control estimate of the same pass-through coefficient identified by the border DiD of Section 2. The design uses weekly EU Oil Bulletin retail prices across a screened pool of EU member states; the identifying assumption is that the donor-weighted composite reproduces Italy's untreated price path. The synthetic control covers both the March 2026 cut and the analogous March 2022 episode (DL 21/2022, which cut excise by 0.25 EUR/L for eight months), whereas the border DiD is restricted to 2026 because the 2022 episode fails the parallel-trends check at the IT-FR border (Appendix A).

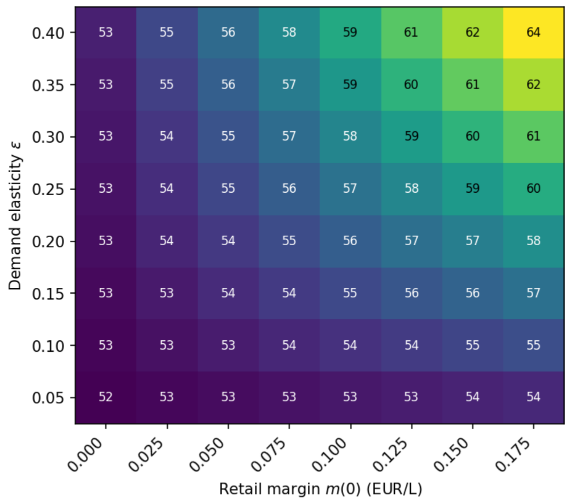
D.1 Data and donor screening

Governmental policies registry. We compile a registry of all candidate fuel-tax measures across the 27 EU states and the UK for each episode. For each country-fuel-episode triple the registry records the announced or in-force measure dates, the size of the change in EUR/L, the affected fuels, a description, and the source. The registry combines primary Italian *Gazzetta Ufficiale* entries for the Italian decrees, the Bruegel *National policies to shield consumers from rising energy prices* tracker (Sgaravatti et al. 2023) for the 2022 vintage, the ThinkEuropa 2026 explainer (ThinkEuropa.dk 2026) for the 2026 vintage, and a per-country fact-check layer that resolves dates and magnitudes against primary-language gazettes. We use the registry to screen donor candidates: any country with a fuel-price intervention overlapping the event window is excluded.

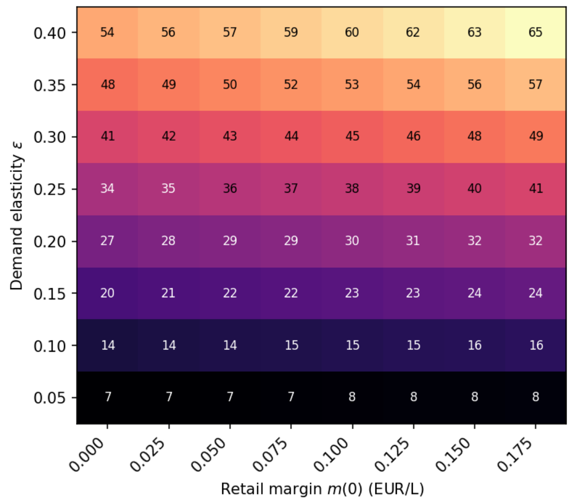
National petrol and diesel prices. The European Commission's Directorate-General for Energy (DG ENER) publishes weekly retail prices for Eurosuper 95, automotive diesel, and LPG

[28] U.S. CPI 2020 to 2026 (≈ 1.24) and EUR/USD exchange (≈ 0.92); applied throughout this subsection to convert Davis's 2014 USD inputs and Rennert's 2020 USD SCC to 2026 EUR.

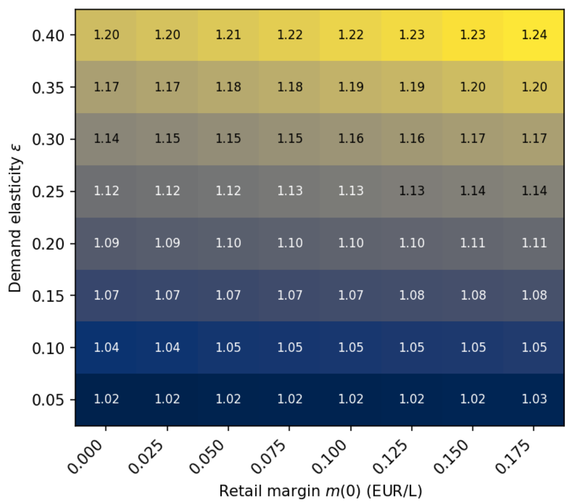
Figure A6: Welfare sensitivity across the $(\varepsilon, m(0))$ grid – petrol



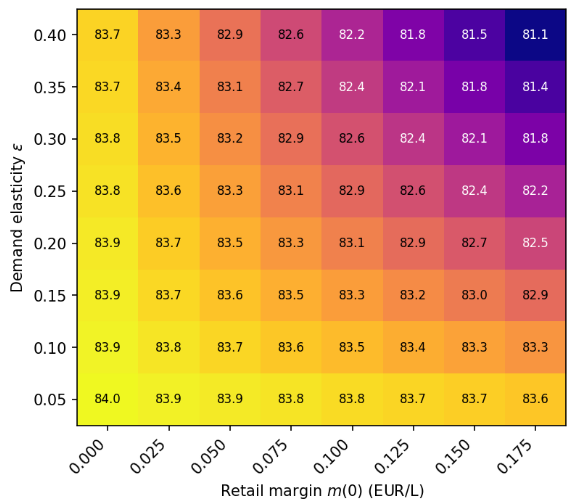
(a) ΔPS (EUR million)



(b) ΔW (EUR million)



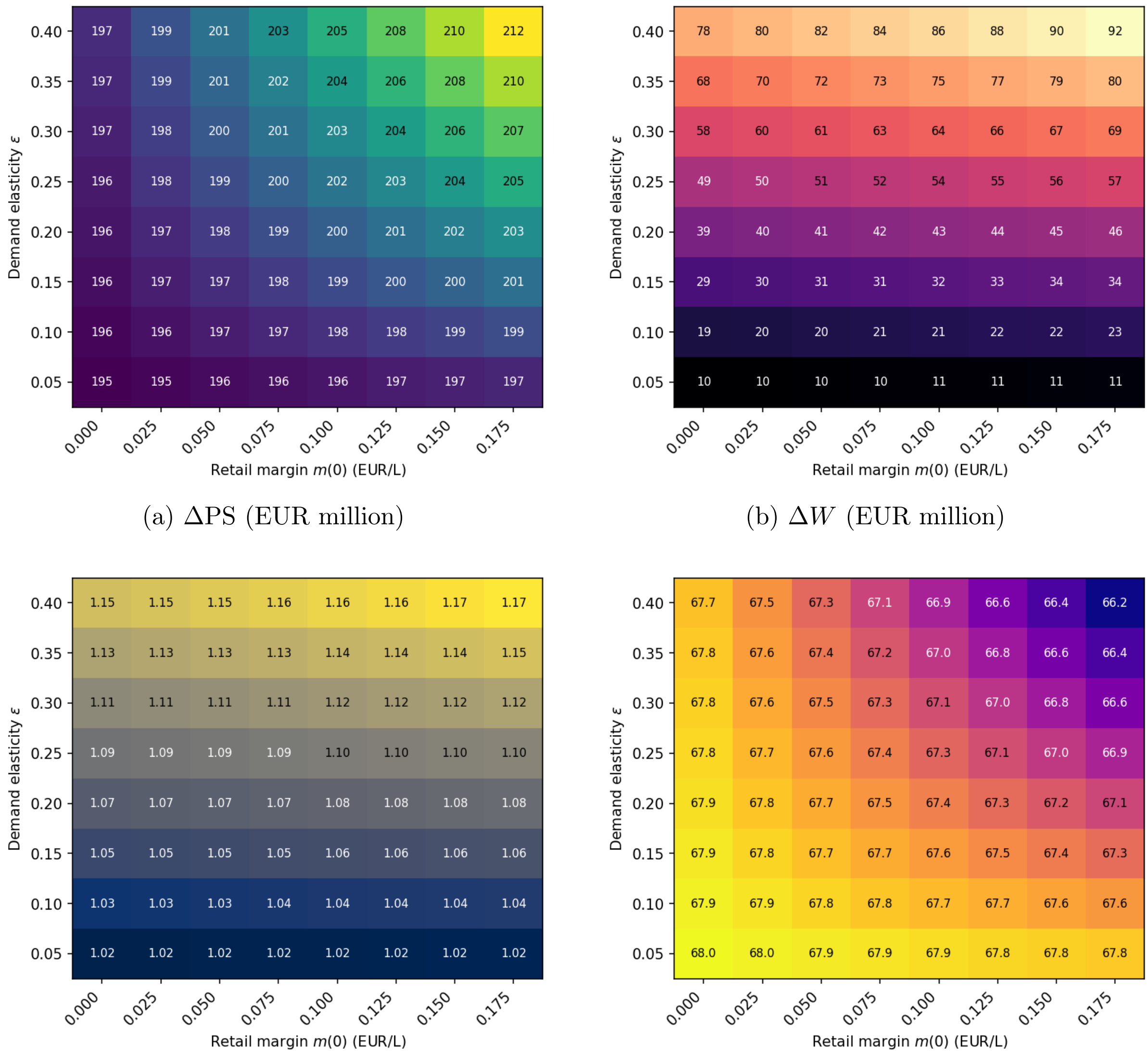
(c) MVPF (unitless)



(d) Consumer share (%)

Note: Petrol only. See Figure 3 for aggregate.

Figure A7: Welfare sensitivity across the $(\varepsilon, m(0))$ grid – diesel



(a) ΔPS (EUR million)

(b) ΔW (EUR million)

(c) MVPF (unitless)

(d) Consumer share (%)

Note: Diesel only. See Figure 3 for aggregate.

in every EU member state in its *Weekly Oil Bulletin*.[29] Each weekly observation reports, since January 2005, the average retail price both with all taxes and net of all taxes. We restrict to the 27 EU member countries and the UK.

Donor screening. Malta is dropped because its retail fuel prices have been administratively frozen by Enemed Ltd since 2020 and do not respond to international oil-price movements. Estonia is dropped from the 2022 episode because the Estonian diesel excise was raised on 1 May 2022, inside the post-treatment window. The pre-event window is shortened from 80 to 63 days (so the 2026 window starts on 2026-01-15) to place the 1 January 2026 Finnish CO_2 excise reduction and the partial reversal of the Dutch fuel-excise rebate strictly before the window, ensuring that the pre-treatment series for FI and NL are policy-stationary; the 2022 episode applies the same 63-day pre-window for symmetry. Table A1 reports the resulting pools.

Table A1: Synthetic-Control Donor Pool by Episode

Episode	$\lvert\mathcal{D}\rvert$	Donor countries (ISO-2)
2022 (DL 21/2022)	10	AT, BG, DE, DK, FI, GR, LT, LV, RO, SK
2026 (DL 33/2026)	9	BE, BG, DK, EE, FI, FR, LU, NL, SK

Notes: Donors are EU-27 + UK member states for which neither the Bruegel (Sgaravatti et al. 2023) nor the ThinkEuropa (ThinkEuropa.dk 2026) registry, nor a primary-source fact-check, records a fuel-price intervention overlapping the event window. Pools are identical across the petrol and diesel outcomes within each episode.

D.2 Estimator and estimates

Let $y^f_{c,t}$ denote the weekly retail price of fuel $f \in \{\text{petrol}, \text{diesel}\}$ in country c at week t, with $t = 0$ the implementation week of the Italian cut and pre-/post-treatment windows $\mathcal{T}_{\text{pre}}$ and $\mathcal{T}_{\text{post}}$. We estimate a per-fuel synthetic control: for each fuel separately, a donor-weight vector ω^f is chosen to fit Italy's pre-cut path,

$$\widehat{\omega}^f \;=\; \arg\min_{\omega \in \Delta^{|\mathcal{D}|}} \sum_{t \in \mathcal{T}_{\text{pre}}} \left(y^f_{\text{IT},t} - \sum_{c \in \mathcal{D}} \omega_c \, y^f_{c,t} \right)^2, \tag{18}$$

where $\Delta^{|\mathcal{D}|}$ is the unit simplex. The episode-level pass-through is

$$\widehat{\rho}^f_e \;=\; -\frac{1}{\Delta \tau^f_e} \cdot \frac{1}{|\mathcal{T}_{\text{post}}|} \sum_{t \in \mathcal{T}_{\text{post}}} \left[y^f_{\text{IT},t} - \sum_{c \in \mathcal{D}} \widehat{\omega}^f_c \, y^f_{c,t} \right] \tag{19}$$

We use $|\mathcal{T}_{\text{pre}}| = 9$ and $|\mathcal{T}_{\text{post}}| = 6$–$7$ weekly observations and report standard errors from the leave-one-out donor distribution.

Table A2 collects the per-fuel pass-through estimates. Petrol pass-through is $\widehat{\rho} = 0.90$ in 2022 and $\widehat{\rho} = 0.77$ in 2026; diesel pass-through is $\widehat{\rho} = 0.81$ in 2022 and $\widehat{\rho} = 0.61$ in 2026. All four point estimates lie below complete pass-through, but the 2026 coefficients are imprecise: neither rejects unity at conventional levels. The 2026 diesel estimate ($\hat{\rho} = 0.61$, SE $= 0.29$) is particularly wide, with a 95% confidence interval spanning roughly $[0.04, 1.18]$; with only 9 donor countries, the limited precision is an inherent feature of the design rather than a correctable shortcoming. Permutation-based RMSPE-rank tests (Appendix D.6) yield $p = 0.091$ for 2022

[29] https://energy.ec.europa.eu/data-and-analysis/weekly-oil-bulletin_en, file history_with_tax.xlsx, accessed 2026-04-25.

petrol and diesel (rank 1 of 11), $p = 0.100$ for 2026 petrol (rank 1 of 10), and $p = 0.200$ for 2026 diesel (rank 2 of 10).

The synthetic control point estimates sit below the border DiD of Section 2 on both fuels: petrol at 0.77 vs 0.83 and diesel at 0.61 vs 0.74. The two are not statistically distinguishable, but the systematic direction of the level difference warrants discussion. One reason for these differences is these estimates are based on weekly national-average prices, which smooth over station-level price-setting heterogeneity and average across the within-week adjustment path; both forces attenuate the measured pass-through relative to the daily station-level DiD, which captures the full price response within one to two days of the cut. Furthermore, with only 9 donor countries, the synthetic control counterfactual is also more sensitive to small unregistered policy adjustments or regulatory signals in any single donor that could pull the synthetic Italy away from its true untreated path. We therefore treat the border DiD as the headline and retain the synthetic control as a complementary check that rests on a non-nested identifying assumption (donor-weighted composite vs bilateral parallel trends) applied to disjoint data.

Table A2: Synthetic Control Pass-Through Coefficients (Per-Fuel Weights)

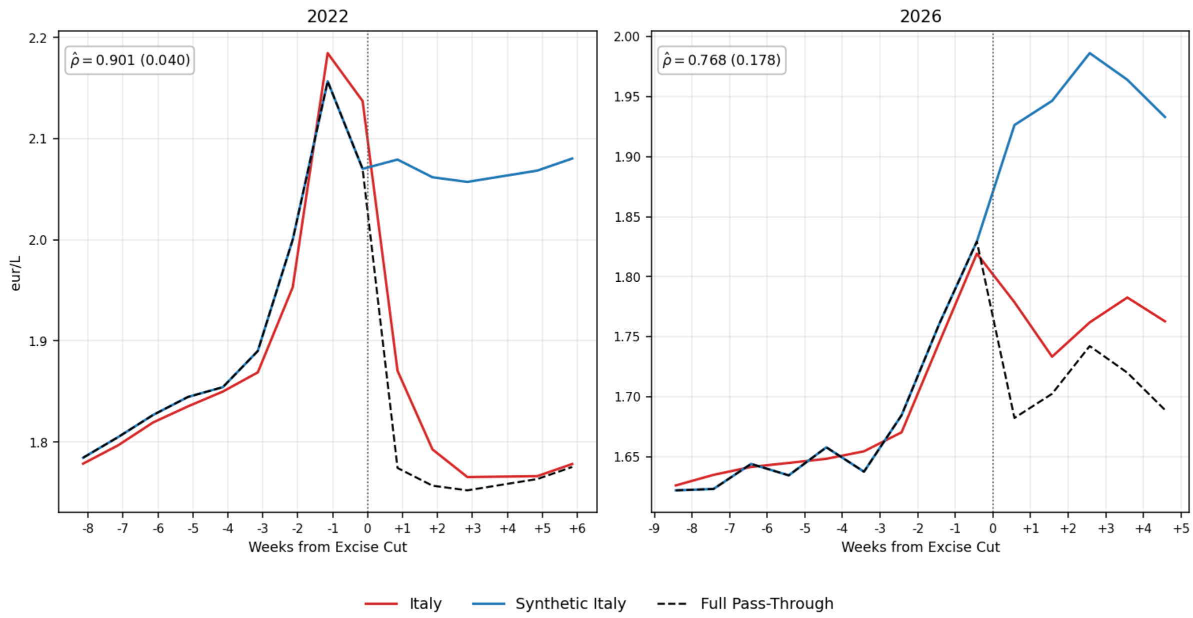
	Petrol		Diesel	
Episode	$\widehat{\rho}$	SE	$\widehat{\rho}$	SE
2022 (DL 21/2022)	0.901	(0.040)	0.810	(0.207)
2026 (DL 33/2026)	0.768	(0.178)	0.610	(0.291)

Notes: $\widehat{\rho}$ is the average post-cut deviation between the Italian retail price and the per-fuel synthetic counterfactual Equation (18), divided by the episode-specific post-VAT mechanical price change $\Delta\tau_e^f$ (0.305 EUR/L for 2022, 0.244 EUR/L for 2026). Standard errors are from the leave-one-out donor distribution. Pre-treatment window: 9 weekly observations (63 days); post-treatment window: 6–7 weekly observations (45 days).

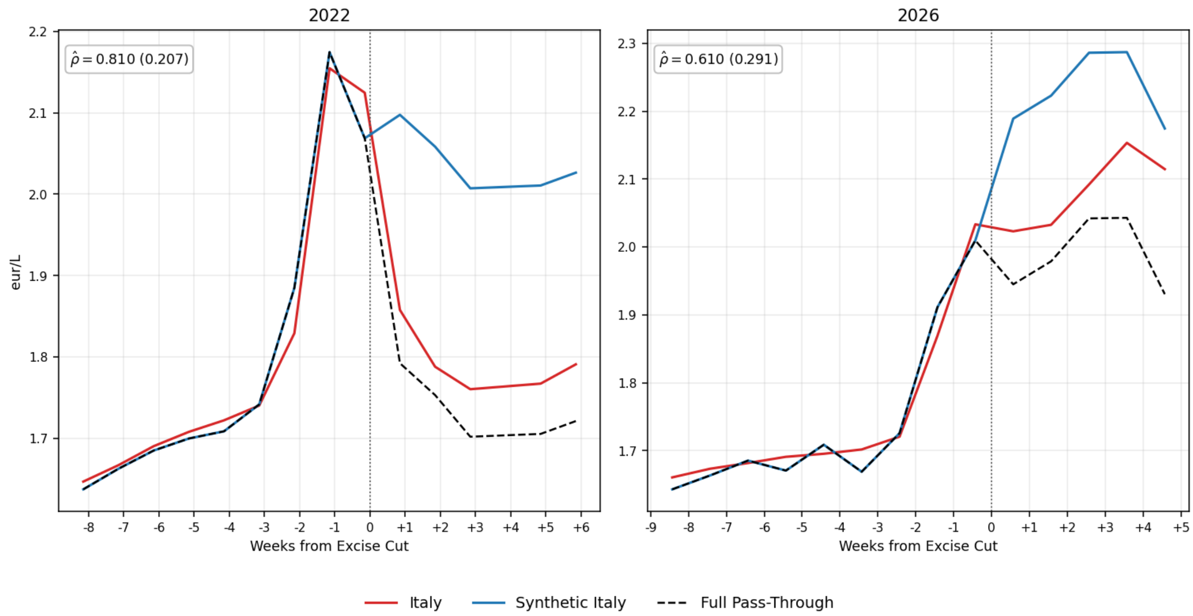
D.3 Coherence checks

Figures A9 and A10 plot Italian retail prices against the donor pool and the rest of the EU around the 2022 and 2026 cuts, separately for petrol and diesel and for the without-tax (wholesale-equivalent) and with-tax (consumer) series. The without-tax panel is a coherence check for cross-country comparability of the underlying wholesale series; Italy sits inside the donor envelope in both episodes and tracks the EU-wide level moves.

Figure A8: Synthetic-Control Event Study, Italy vs Synthetic Counterfactual



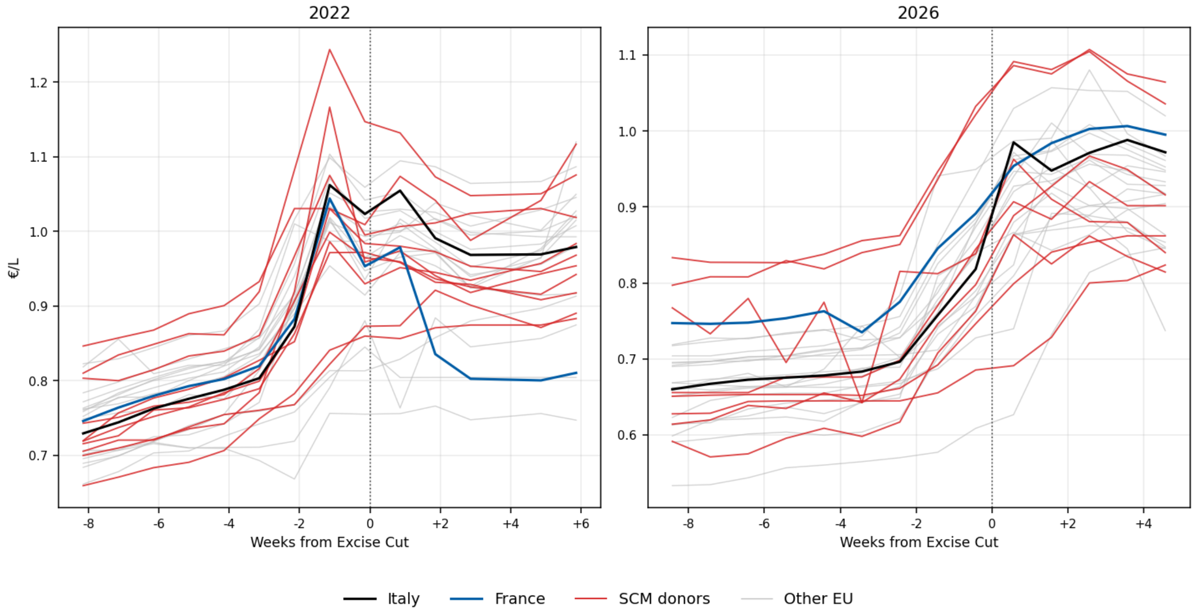
(a) Petrol



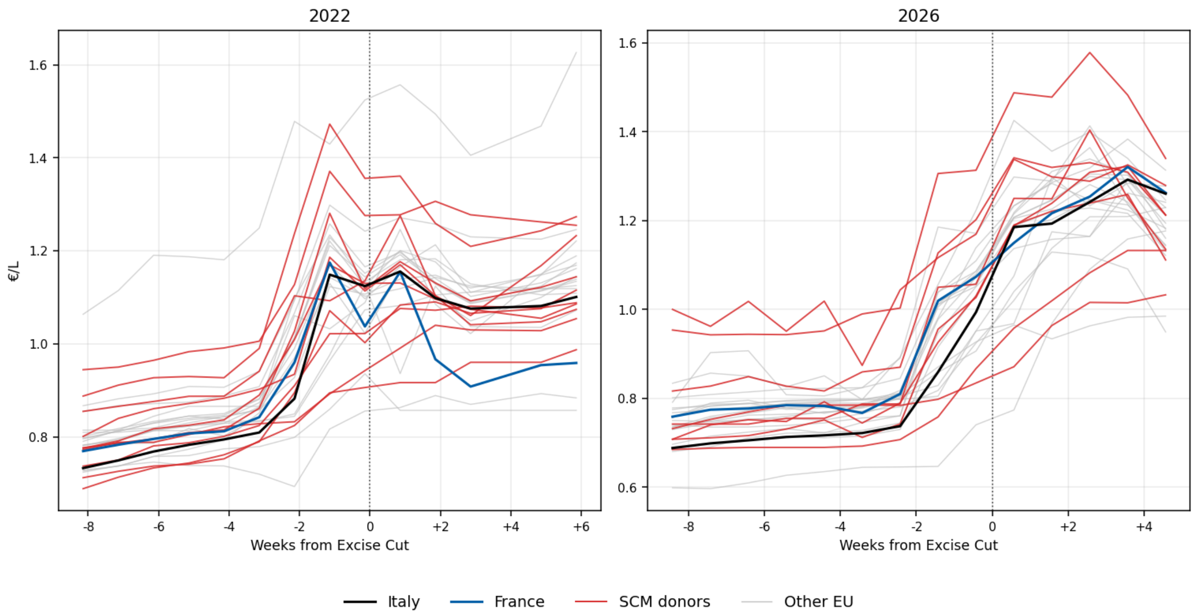
(b) Diesel

Notes: Panel (a) plots petrol, panel (b) diesel; within each panel the 2022 episode is on the left and 2026 on the right. Red is the Italian retail price, blue is the synthetic-Italy counterfactual under Equation (18), and the black dashed line is the full-pass-through reference (Italy minus $\Delta\tau_e^f$, with $\Delta\tau_{2022}^f = 0.305$ EUR/L and $\Delta\tau_{2026}^f = 0.244$ EUR/L). Each subpanel reports the implied $\widehat{\rho}$ in the top-left annotation. *Source*: EU Weekly Oil Bulletin; donor pool from Table A1; author elaboration.

Figure A9: Cross-Country Without-Tax Retail Prices, Italy vs Donor Pool



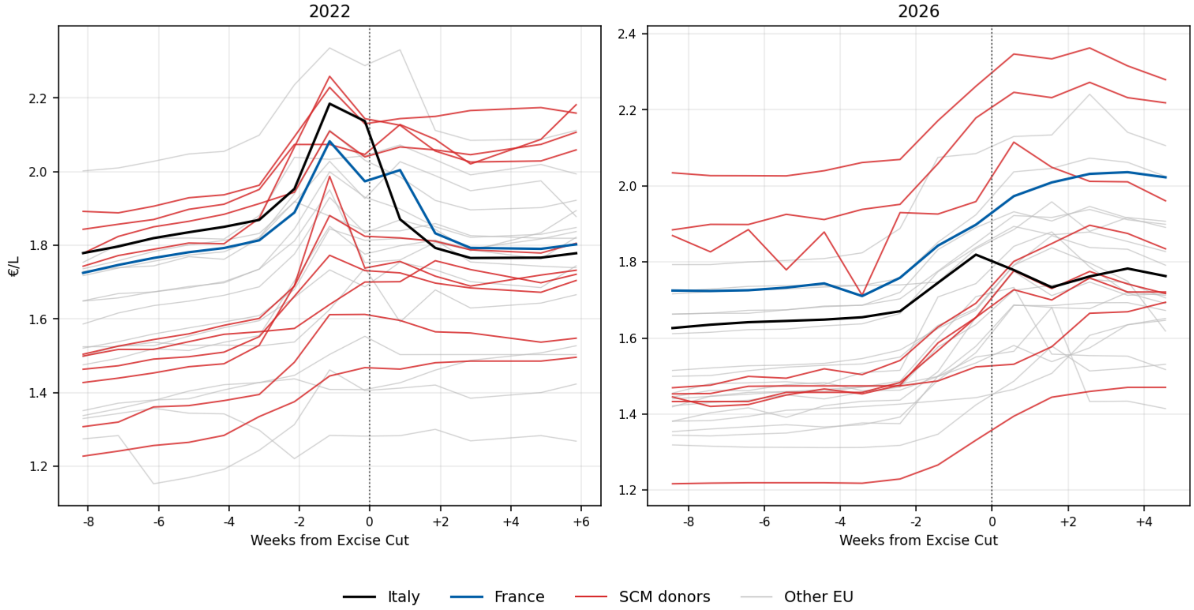
(a) Petrol



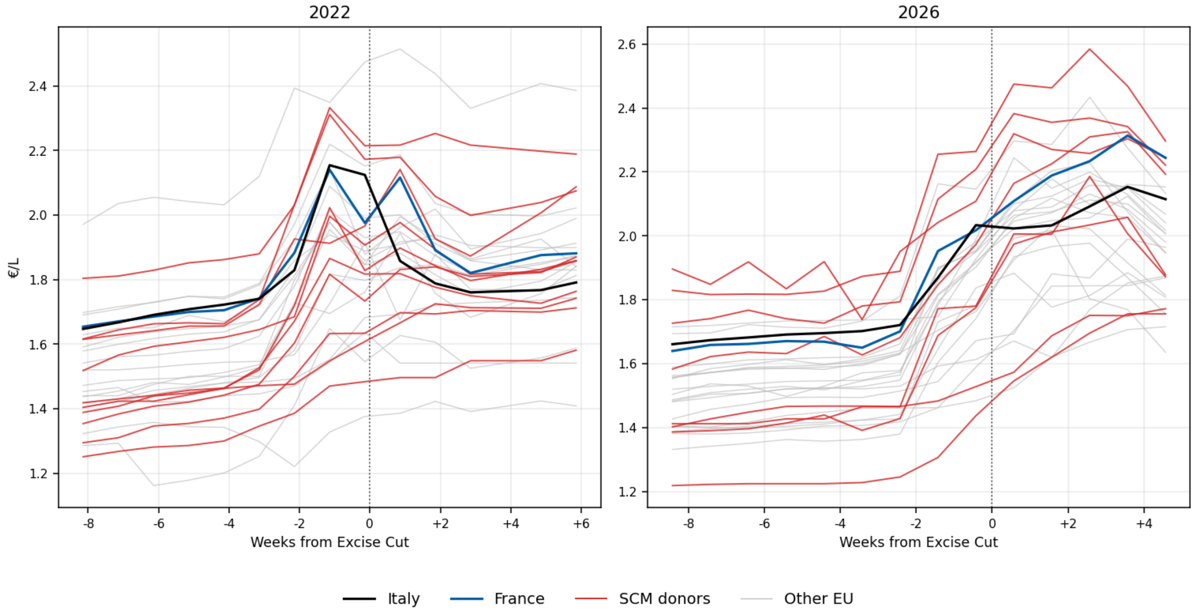
(b) Diesel

Notes: Without-tax retail prices (pre-VAT, pre-excise) for all EU member states around the 2022 and 2026 Italian excise cuts. Italy in black, France in blue, the synthetic control donor pool of Table A1 in red, the remaining member states in gray. The dotted vertical line marks the implementation date of the Italian cut. *Source*: EU Weekly Oil Bulletin; author elaboration.

Figure A10: Cross-Country With-Tax Retail Prices, Italy vs Donor Pool



(a) Petrol



(b) Diesel

Notes: With-tax retail prices (consumer, inclusive of VAT and national excise) for all EU member states around the 2022 and 2026 Italian excise cuts. Series and colour conventions as in Figure A9. *Source*: EU Weekly Oil Bulletin; author elaboration.

D.4 Donor weights

Table A3: Per-Fuel Synthetic Control Donor Weights, by Episode and Fuel

	2022		2026	
Donor (ISO-2)	Petrol	Diesel	Petrol	Diesel
AT	0.000	0.000	–	–
BE	–	–	0.184	0.419
BG	0.000	0.000	0.180	0.000
DE	0.472	0.118	–	–
DK	0.000	0.000	0.234	0.320
EE	–	–	0.000	0.000
FI	0.000	0.397	0.000	0.136
FR	–	–	0.071	0.000
GR	0.520	0.485	–	–
LT	0.000	0.000	–	–
LU	–	–	0.000	0.000
LV	0.007	0.000	–	–
NL	–	–	0.163	0.000
RO	0.000	0.000	–	–
SK	0.000	0.000	0.168	0.125
Total	1.000	1.000	1.000	1.000

Notes: Donor weights $\widehat{\omega}_c^f$ from the per-fuel Synthetic Control (level specification), allowing a different convex combination of donors for petrol and diesel within each episode. Donors not screened into an episode's pool are reported as "–". Weights are non-negative and sum to one within each (episode, fuel) cell. *Source*: author elaboration on EU Weekly Oil Bulletin.

D.5 Robustness: alternative specifications

Table A4 reports four Synthetic Control specifications: the per-fuel baseline of Equation (18) in levels and logs, and a multi-outcome variant that stacks petrol and diesel pre-treatment prices and selects a single donor-weight vector on the concatenated stack (following Sun, Ben-Michael, and Feller (2025)), also in levels and logs. The *log* variants fit the Synthetic Control on log retail prices and report $\widehat{\rho}^{\log}$ against the log denominator $-\log(1-\Delta\tau_e^f/\bar{p}_f^{\mathrm{IT,pre}})$, so that complete log pass-through still maps to unity. Following Sangani (2026), we use levels as the baseline: log-log specifications mechanically deliver $\hat{\rho}$ below one even when the level pass-through is complete when markups are roughly proportional to wholesale costs. Across the specifications the ordering is monotone — pass-through is higher for petrol than for diesel in both episodes, and higher in 2022 than in 2026 — and the qualitative finding of incomplete pass-through survives.

Table A4: Pass-Through Robustness: Per-Fuel vs. Multi-Outcome, Levels vs. Logs

		Petrol		Diesel	
Episode	Specification	$\widehat{\rho}$	SE	$\widehat{\rho}$	SE
2022	Multi-outcome, levels	0.901	(0.040)	0.810	(0.207)
	Multi-outcome, logs	0.818	(0.031)	0.703	(0.160)
	Per-fuel, levels	0.881	(0.033)	0.785	(0.110)
	Per-fuel, logs	0.805	(0.027)	0.674	(0.088)
2026	Multi-outcome, levels	0.768	(0.178)	0.610	(0.291)
	Multi-outcome, logs	0.646	(0.155)	0.461	(0.225)
	Per-fuel, levels	0.644	(0.064)	0.521	(0.384)
	Per-fuel, logs	0.555	(0.063)	0.351	(0.252)

Notes: $\widehat{\rho}$ from four Synthetic Control specifications. *Per-fuel, levels*: the baseline estimator of Equation (18), reproduced from Table A2. *Multi-outcome, levels*: a single donor-weight vector on the stacked petrol–diesel pre-period (Sun, Ben-Michael, and Feller (2025)). *Log* variants fit on $\log p$; $\widehat{\rho}^{\log}$ is the post-cut log-price deviation divided by the full-log-pass-through benchmark $-\log(1 - \Delta\tau_e^f/\bar{p}_f^{\mathrm{IT,pre}})$. All specifications use the donor pool of Table A1 and the 63/45-day pre/post windows. Standard errors are leave-one-out across donors. *Source*: author elaboration on EU Weekly Oil Bulletin.

D.6 Permutation inference

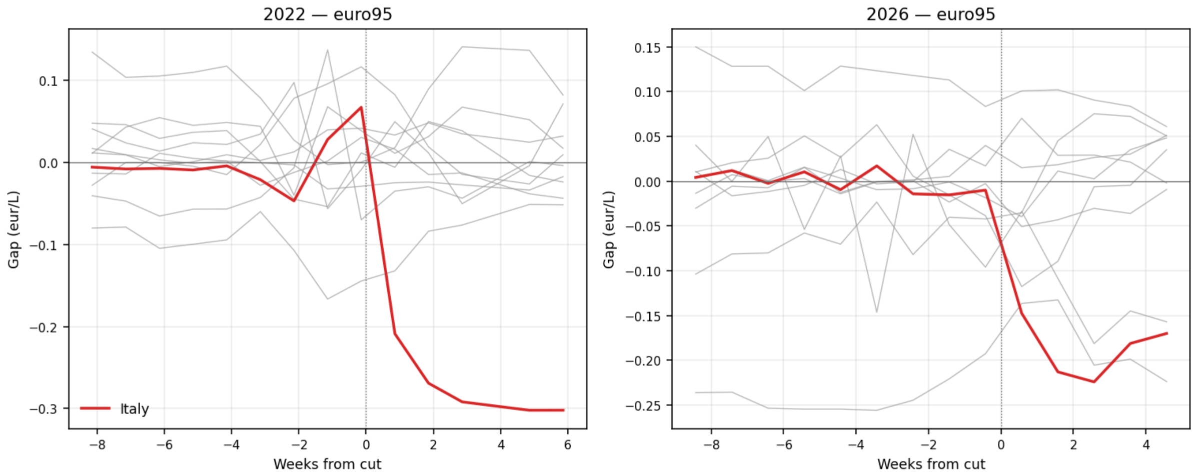
The leave-one-out standard errors reported alongside the point estimates are a stability check, not a test against a null of no treatment effect. We implement the placebo / RMSPE-ratio test of Abadie, Diamond, and Hainmueller (2010): for each donor j in the pool, the per-fuel Synthetic Control is refit pretending j is treated on the Italian cut date, with the remaining donors (excluding Italy) as the pool. The test statistic is the post/pre RMSPE ratio $R_j = \sqrt{\mathrm{MSPE}_j^{\mathrm{post}}/\mathrm{MSPE}_j^{\mathrm{pre}}}$, normalised so that a country with poor pre-treatment fit does not enter as a spurious placebo. Italy ranks first in three of the four (episode, fuel) cells at the resolution floor of the design ($p = 1/(N+1)$): $p = 0.091$ for both 2022 fuels (rank 1 of 11) and $p = 0.100$ for 2026 petrol (rank 1 of 10). For 2026 diesel Italy ranks second ($p = 0.200$), behind France; the French placebo's tight pre-fit (driven by the high donor-correlation regime that the early-March Hormuz shock induced in the pre-window) inflates the ratio denominator. Figure A11 overlays Italy's gap against all donor placebo gaps.

D.7 Policy registry: provenance and corrections

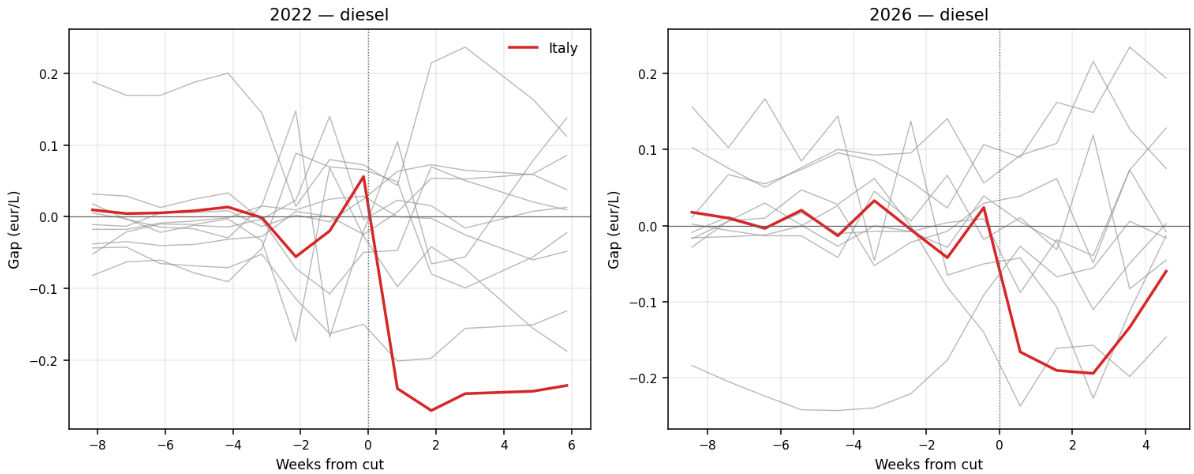
The registry of contemporaneous fuel-tax measures introduced in Appendix D.1 is built from a four-layer provenance hierarchy. For each country-fuel-episode triple we take the most reliable available date and magnitude according to the priority described below.

Layer 1 (parsed primary sources). The Italian rows are populated directly from the original *Gazzetta Ufficiale*: DL 21/2022 plus its four extensions, and DL 33/2026 with its single extension. Dates and magnitudes for these rows are the legal record and are never overwritten by subsequent layers.

Layer 2 (Bruegel registry). For the 2022 episode we draw on the Bruegel *National policies to shield consumers from rising energy prices* tracker (Sgaravatti et al. 2023), which itemises fuel-tax measures across all 27 EU members plus the UK. The tracker was last updated 31 July 2023.



(a) Petrol



(b) Diesel

Figure A11: Placebo Gap Trajectories

Notes: Italy's gap (red, bold) against all donor placebo gaps (grey) for each episode and fuel. Each placebo refit treats the named donor as the treated unit on the Italian cut date, with the remaining donors (excluding Italy) as the pool. *Source*: author elaboration on EU Weekly Oil Bulletin.

Several start dates appear to be the announcement date rather than the legal in-force date; some entries describe a tax-relief category in qualitative terms without numeric magnitudes. We retain the Bruegel metadata as a starting point and supplement it in Layer 4.

Layer 3 (ThinkEuropa snapshot). Bruegel ceased publishing tracker updates in mid-2023, so for the 2026 episode we extract a parallel registry from the ThinkEuropa *2026 Energy Crisis Response Tracker* explainer (ThinkEuropa.dk 2026, snapshot of 26 April 2026). Of the 29 rows in our 2026 registry, 26 originate from ThinkEuropa.

Layer 4 (per-country fact-check JSONs). For each country whose registry entry is load-bearing for our donor screen and whose secondary source is qualitative or uncertain, we run a per-country LLM-agent web search. The agent receives the registry row, the relevant primary-language gazette URL where known, and a fixed JSON schema demanding the verified start date, end date, magnitude in EUR/L, a primary-source URL, a confidence rating, and a short notes field explaining any correction to the secondary source.

These four layers are combined with a deterministic COALESCE priority: the Layer-4 fact-check date is used if present; otherwise the Layer-1 primary date; otherwise the Layer-2 or Layer-3 secondary date. Magnitudes follow the same hierarchy. A boolean `affects_general_retail` flag, populated by the fact-checker, suppresses entries that on inspection do not affect the at-pump retail price for the general consumer.

Per-country registry. Table A5 summarises the fact-checked registry for both episodes. Each cell reports a one-letter policy-type code and (where the at-pump magnitude is quantified) the absolute VAT-inclusive change in c/L. The full per-cell record, together with the registry-construction code, is maintained in the companion data repository *gasresponses* (`https://github.com/gfrt0/gasresponses`), one JSON per country-episode.

Table A5: Per-Country Fuel-Policy Registry: 2022 and 2026 Episodes

	2022 episode		2026 episode	
Country	Type	At-pump (c/L)	Type	At-pump (c/L)
AT	T	— / —	E+M	10.0 / 10.0
BE	E	17.5 / 17.5	—	— / —
BG	T	— / —	T	— / —
CY	E	8.3 / 8.3	E	9.9 / 7.1
CZ	E	7.4 / 7.4	E	10.0 / 10.0
DE	E	35.2 / 16.7	E	17.0 / 17.0
DK	T	— / —	—	— / —
EE	E	— / 14.5	—	— / —
ES	E	20.0 / 20.0	E+V	29.0 / 23.0
FI	B	5.0 / 12.0	E	2.7 / 2.4
FR	E	20.0 / 20.0	P	— / —
GR	T	— / —	E	20.0 / 20.0
HR	M	30.0 / 36.0	M	9.0 / 13.0
HU	M	41.0 / 56.0	E	6.2 / 6.6
IE	E	20.0 / 15.0	E	27.0 / 32.0
IT	E	30.5 / 30.5	E	21.3 / 24.4
LT	—	— / —	E	6.0 / 6.0
LU	E	7.5 / 7.5	—	— / —
LV	B	10.0 / 10.0	E	— / 8.6
MT	F	46.0 / 64.0	F	38.0 / 45.0
NL	E	20.9 / 13.4	—	— / —
PL	E+V	19.8 / 19.6	E+V	28.6 / 31.7
PT	E	24.7 / 27.3	E	5.6 / 10.3
RO	E	10.1 / 10.1	E	— / 7.1
SE	E	12.3 / 12.3	E	9.5 / 3.7
SI	M	6.0 / 13.0	E	5.9 / —
SK	—	— / —	—	— / —
UK	E	7.0 / 7.0	E	6.9 / 6.9

Notes: Type codes: **E** excise duty change; **V** VAT change; **M** margin / price cap; **T** targeted transfer (not at-pump); **F** administered retail-price regime; **P** private (non-government) cap; **B** biofuel blending mandate change; — no measure. Combinations join with + (e.g. E+V = excise and VAT cuts). At-pump magnitudes are absolute VAT-inclusive c/L changes (cuts and hikes both shown as positive). Magnitudes are shown as `petrol / diesel`; `--` marks an unaffected or unquantified fuel. Per-cell legal references, dates, and policy mechanisms are available in the companion data repository *gasresponses* (https://github.com/gfrt0/gasresponses). *Source*: author elaboration on national legal gazettes and ministry communications.