Tariffs and Climate: The Environmental Cost of Excluding Chinese EVs

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I. Introduction

Electric vehicles (EVs) are central to decarbonization efforts, yet their adoption is shaped by trade policy. In recent years, the United States has imposed steep tariffs on Chinese-made EVs, rising from 25% in 2018 to 100% in 2024. While framed as industrial policy, these restrictions have environmental consequences that remain underexamined. This paper uses a panel of international sales data, tariff rates, and emissions assumptions to estimate the climate cost of unrealized EV purchases and monetize this gap using standard social cost of carbon metrics.

II. Background, Policy, and Political Context

Both the Trump and Biden administrations imposed tariffs on Chinese EVs citing national security and industrial competitiveness, not climate alignment. The Biden administration's 2024 increase to 100% coincided with Inflation Reduction Act subsidies for domestic producers, doubling down on protectionist strategy while excluding low-cost imports.

The resulting exclusion carries measurable climate consequences. As an example, BYD, China's world-leading EV producer scaled rapidly in Europe where trade barriers were modest, selling over 100,000 EVs by 2024. In contrast, BYD sold zero consumer vehicles in the U.S., where tariffs restricted entry. Each EV sale avoids an estimated 35 metric tons of CO_2 over its lifetime (ICCT, 2023), but this abatement is only realized if the EV displaces an internal combustion vehicle (ICV). If, instead, a BYD sale would have replaced another EV (e.g., a Chevy Bolt), the net emissions savings would be negligible. Our estimates assume a substantial share of forgone BYD sales would have replaced ICVs, making them upper-bound climate cost estimates.

This context frames our analysis: tariffs on clean technologies distort more than prices, they distort decarbonization. We explore this mechanism empirically and estimate the emissions and climate cost of blocking key EV entrants from U.S. markets.

III. Economic Mechanism and Welfare Implications

Tariffs on EVs function as a reverse Pigouvian tax, discouraging clean technology adoption by raising prices. Higher import costs shift consumers from EVs to ICVs, delaying decarbonization. Figure 1 shows the standard deadweight loss triangle, but EVs are not neutral goods: they displace emissions. We highlight a second loss, the *climate triangle*, which captures forgone environmental gains.

Figure 2 illustrates this using stylized prices: a tariff-induced jump from $28,000 to $35,000 reduces sales, creating measurable emissions losses. The size of this externality depends on (1) EV–ICV emissions differences, (2) demand elasticity, and (3) the social cost of carbon (SCC). Unlike traditional inefficiency, this is a climate loss.

To empirically estimate the magnitude of this distortion, we implement a fixed-effects panel regression across five automakers and three regions. This model isolates the causal impact of tariffs on EV sales while controlling for brand-specific and regional variation. The regression provides our baseline estimate of forgone adoption, which we later convert into environmental damages using the following identity:

$$\begin{aligned}\text{Climate Cost} = \text{Forgone EVs} & \\ &\times \text{Emissions per EV } (tCO_2) \\ &\times \text{SCC } (USD/tCO_2)\end{aligned}$$

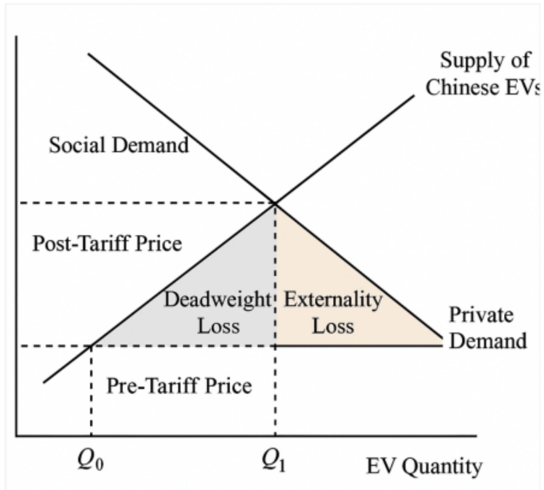

Figure 1. Welfare loss from EV tariffs, including standard deadweight loss and additional climate externality.

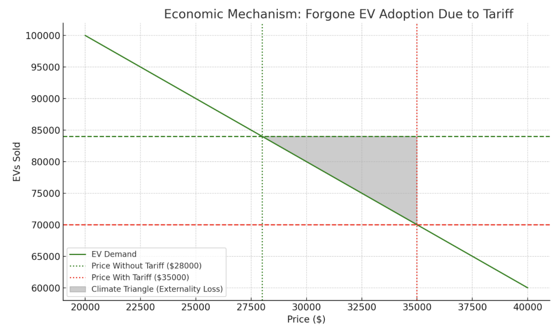

Figure 2. Tariff-driven price increase reduces EV sales, generating climate externality loss.

Here, 35 metric tons represents lifetime avoided CO_2 per EV (ICCT, 2023), and $56 is the baseline SCC per ton (U.S. Interagency Working Group, 2023). This formula links the empirical drop in EV adoption directly to welfare losses.

While the regression serves as our main identification strategy, we also include stylized counterfactual and elasticity-based models to provide interpretive scaffolding and scale. We simulate a scenario where BYD, excluded from the U.S. market, sells one-third of its European volume in the U.S., using a conservative benchmark based on market structure and precedent (GoodCarBadCar, 2023). This counterfactual supports and contextualizes the regression estimates. Tariffs are treated not only as trade tools but as climate-relevant policies with measurable externalities.

IV. Data and Methodology

We construct a novel panel dataset of annual electric vehicle (EV) sales by brand, region, and year from 2017 to 2024 to estimate the impact of tariffs on EV adoption. The dataset spans five global automakers—Tesla, BYD, Volkswagen, Hyundai, and NIO—across three key regions: the United States, Europe, and Canada. These firms represent a mix of Global manufacturers, offering differential exposure to trade policy regimes and enabling a clean identification strategy.

Data Construction. EV sales figures were sourced from automaker investor filings, industry aggregators (GoodCarBadCar for the U.S.; ACEA for the EU), and regional press releases. For Chinese firms, we relied on English-translated Chinese EV trackers and European registration data. We excluded commercial-only EVs (e.g., BYD buses) to focus exclusively on the consumer market. Volkswagen and Hyundai sales were cross-validated with ACEA data and public earnings summaries, then disaggregated to isolate passenger EVs. All data were cleaned and aggregated at the brand-region-year level to ensure consistency across observations.

Tariff Assignment. Tariff rates were coded based on official schedules and policy announcements. The U.S. imposed a 25% tariff on Chinese EVs beginning in 2018, rising to 100% in 2024. Canada maintained a baseline 6.1% rate, while the EU imposed a standard 10% tariff, increased to 27.4% for BYD in mid-2024 (European Commission, 2024). Each brand-region-year observation is matched with the prevailing tariff rate and a binary indicator for tariff exposure.

Strengths and Limitations. Our dataset offers several advantages. First, by spanning five brands with heterogeneous exposure to tariffs—including both legacy (Tesla, Volkswagen, Hyundai) and emerging (BYD, NIO) automakers—we capture a broad cross-section of the global EV market. Second, the inclusion of three distinct regions with different trade regimes (the U.S., EU, and Canada) introduces rich policy variation, which is critical for identifying the effect of tariffs. Third, constructing the panel from multiple independent sources—automaker filings, industry aggregators, and international press—allows for cross-validation and robustness.

However, several limitations remain. Brand-level aggregation masks model-level heterogeneity in price, range, and consumer targeting, which could influence elasticity estimates. For firms like BYD that do not currently operate in the U.S. passenger EV market, our counterfactual estimates necessarily rely on assumptions drawn from foreign market behavior (e.g., Europe), which may not fully account for U.S.-specific demand frictions like brand perception or dealership networks. Additionally, while we code tariffs at the brand-region-year level, we do not observe firm-specific compliance strategies (e.g., local assembly, joint ventures), which may partially mitigate tariff impacts.

V. Results

To quantify the environmental cost of tariffs on clean technology diffusion, we use a fixed-effects panel regression as our primary identification strategy and supplement it with two supporting methods: a BYD-based counterfactual and a stylized elasticity model. Our common logic is straightforward: tariffs raise prices, higher prices reduce EV adoption, and lower adoption delays decarbonization.

Regression-Based Estimates (Baseline)

Our main estimates come from a panel regression across five automakers (Tesla, BYD, Volkswagen, Hyundai, NIO) and three regions (U.S., Europe, Canada), controlling for brand, region, and year fixed effects:

$$\begin{aligned} EV\_Sales_{irt} = {} & \beta_0 + \beta_1 \, TariffApplied_{irt} \\ & + \beta_2 (TariffApplied_{irt} \times Tesla_i) \\ & + \gamma_i + \delta_r + \theta_t + \epsilon_{irt} \end{aligned}$$

As shown in Table 1, the coefficient $\beta_1 = -58{,}470$ suggests that tariffs are associated with a reduction of approximately 58,470 EVs annually. The Tesla interaction term $\beta_2 = 121{,}800$ points to significant brand-specific insulation, likely due to Tesla's U.S. production base and brand strength. Tesla's preference in recorded regions is unsurprising, as Teslas are not sold in China, owing to reciprocal tariffs and government security concerns.

While not statistically significant at conventional levels, the point estimates remain economically meaningful. Disaggregating the total, we estimate that BYD alone may have lost between 26,000 and 37,000 annual U.S. sales.

Counterfactual Benchmark: BYD Market Entry

To triangulate our regression findings, we construct a counterfactual scenario in which BYD enters the U.S. market absent tariff barriers. We conservatively assume BYD would have captured one-third of its European sales volume from 2021–2024, yielding an estimated 53,667 forgone EVs.

This 1:3 benchmark accounts for structural frictions: limited brand recognition, sparse charging infrastructure, and heightened geopolitical scrutiny. Demand-side constraints further reinforce its conservativeness. Small vehicles comprise just 8.2% of U.S. auto sales compared to 19% in Europe (IEA, 2023), diminishing market fit for BYD's compact EV portfolio. Cross-industry parallels also exist—Chinese smartphone brands hold 32% of the European market but remain below 10% in the U.S., with Xiaomi at just 3.3% as of May 2025 (Statista, 2024).

This counterfactual aligns closely with the regression-based range of 26,000–37,000 forgone BYD sales and helps substantiate the broader pattern of tariff-induced adoption loss. Sensitivity scenarios at 10% and

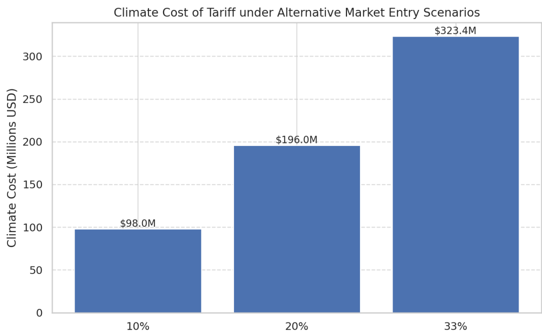

Figure 3. Climate cost of forgone EV sales under alternative BYD market entry scenarios (as a percentage of European sales). Estimates reflect lifetime emissions forgone (35 tons/EV) and a social cost of carbon of $56/ton.

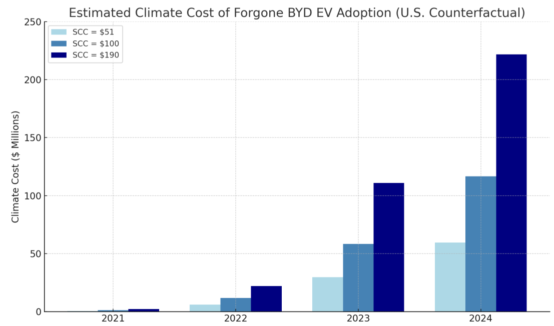

Figure 4. Estimated *annual* climate cost of forgone BYD EV adoption under varying SCC assumptions.

Table 1—Regression Results: Tariff Effects on EV Sales (with Brand Interaction)

Variable	Estimate	Std. Error	t-Stat	P-Value
Intercept	47,652.75	3,023.81	15.76	<0.001
Tariff_Applied	–58,470.00	43,300.00	–1.35	0.185
Tariff_Applied × Tesla	121,800.00	85,700.00	1.42	0.164
Brand = Tesla	124,100.00	23,300.00	5.32	<0.001
Region = Europe	65,500.00	25,900.00	2.53	0.016
Region = US	133,900.00	26,600.00	5.03	<0.001

20% market capture yield proportionally smaller estimates (Figure 3), underscoring the robustness of our core conclusion.

Climate Cost of Forgone Adoption

Each EV avoids approximately 35 metric tons of CO_2 over its lifetime. Translating forgone adoption into environmental costs using three SCC benchmarks—$51, $100, and $190—we estimate:

- **Regression range (26,000–37,000 vehicles)**: 910,000–1.3M tons CO_2 → **$46.4M – $247M**
- **Counterfactual (53,667 vehicles)**: 1.88M tons CO_2 → **$95.9M – $356.9M**

As shown in Figure 4, climate costs scale sharply with SCC assumptions. All estimates are consistent with EPA benchmarks for lifetime vehicle emissions (EPA, 2022). Together, the regression and counterfactual analysis tell a consistent story: tariffs likely prevented tens of thousands of zero-emission vehicles from entering the U.S. market, producing a quantifiable environmental loss.

Stylized Elasticity Model: Back-of-the-Envelope Validation

To further validate our findings, we construct a simple elasticity model. Assuming:

- Price elasticity of demand: $\varepsilon = -1.5$ (derived from Li et al., 2017)
- Tariff-induced price increase: 25%

We estimate:

$$\frac{\Delta Q}{Q} = \varepsilon \cdot \tau = -1.5 \cdot 0.25 = -0.375$$

This implies a 37.5% drop in adoption. Applying this to two baseline periods:

- **Trump-era (2018–2020):** 100,000 forgone sales/year → 1.31M tons CO_2 → **$131M/year at SCC = $100**

- **Biden-era (2021–2025):** 60,000 forgone sales/year → 787,500 tons CO_2 → **\$78.75M/year**

Extrapolated over five years, cumulative damages reach **\$1B – \$2B**.

Interpretation and Synthesis

Across three methods—regression, counterfactual, and elasticity—we find consistent evidence that U.S. tariffs on EVs likely suppressed clean vehicle adoption. The regression anchors the analysis statistically (Table 1), the counterfactual offers a grounded benchmark, and the elasticity model scales the impact.

Tariffs may serve trade or geopolitical goals, but in climate-sensitive sectors they function as reverse carbon pricing mechanisms. Their environmental cost is measurable, economically significant, and should be considered when evaluating trade policy.

VI. Limitations and Future Research

While this analysis offers strong evidence that trade policy can impose real climate costs, several limitations remain. First, we do not capture potential innovation spillovers from Chinese EV entry. Firms like BYD could accelerate technological learning, drive down costs, and expand charging infrastructure—benefits not reflected in immediate adoption numbers. Second, our emissions estimates assume a static U.S. grid mix; in reality, declining carbon intensity means each marginal EV will likely avoid more CO_2 in the future, indicating that our carbon damage estimates are conservative in this regard.

We also abstract from variation in battery chemistry, material sourcing, and vehicle usage. These lifecycle factors can influence the true emissions profile of EVs, while also raising broader questions about the distributional impact of clean energy policies (Borenstein and Davis, 2016). Additionally, our analysis assumes forgone sales in the U.S. are not fully offset by sales in other countries. If Chinese EVs are diverted to more carbon-intensive markets, the global climate benefit could be diluted.

On the modeling side, our counterfactuals assume rational substitution, that consumers would adopt BYD vehicles absent tariffs. In practice, brand loyalty, awareness, and infrastructure compatibility matter. Our projections aim to remain conservative, but future work could model demand heterogeneity and behavioral frictions more explicitly.

Future research could address any number of these issues; as global climate ambitions grow, fully internalizing the environmental costs of trade policy will become increasingly urgent.

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