The Effect of Mergers on Consumer Prices: Evidence from Gasoline Wholesale Distributors in Brazil

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Preliminary Draft, Comments Welcome

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August, 2025

Abstract

This paper evaluates the competitive effects of four major mergers in Brazil's gasoline wholesale distribution sector between 2007 and 2012, a period of less stringent antitrust laws in which firms could complete transactions before notifying the antitrust authority. Using detailed price and volume data and a difference-in-differences design, I compare markets differentially exposed to each merger with control regions defined by rival distributors and local downstream competition. On average, I find no significant impact on retail gasoline prices, but this masks important heterogeneity across regions and along the vertical chain. In markets with intense retail competition, downstream firms compress their margins to offset increased upstream market power, protecting consumers at the expense of retailers' profitability. Where retail markets are more concentrated, retailers instead absorb efficiency gains or amplify upstream price effects, so that consumer prices remain largely unchanged while market power and rents are reallocated within the supply chain. These results show that focusing solely on consumer prices can underestimate both harm and benefit in vertically structured markets, and they illustrate how Brazil's pre-2012 ex post notification regime limited the scope for timely intervention even when competitive concerns emerged ex post.
Keywords: Post-Merger Evaluations, Fuel Markets

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1 Introduction

Mergers, acquisitions, and joint ventures are some of the most common ways that firms pursue to consolidate their presence and dominance in markets. To antitrust authorities, merger restropective analyses have become an essential tool for evaluating the effectiveness of antitrust enforcement and informing future policy decisions, particularly in industries where market concentration can directly impact consumer welfare (Ashenfelter, Hosken and Weinberg, 2013, 2014; Hosken, Olson and Smith, 2018). The choice of gasoline retail markets as a setting for this retrospective analysis is particularly compelling given their importance to economic activity, the frequency of merger activity in fuel distribution sectors globally, and the direct transmission of competitive effects to millions of consumers through daily price variations (Hastings, 2004; Hastings and Gilbert, 2005). The implications of inadequate merger enforcement in these markets extend beyond immediate consumer harm to broader macroeconomic effects through transportation costs, while the consequences of overly restrictive policies can stifle efficiency-enhancing consolidation and investment in distribution infrastructure (Knittel and Tanaka, 2021; Jacobsen and Van Benthem, 2015).

This paper provides the first comprehensive retrospective evaluation of horizontal mergers in Brazil's gasoline distribution sector, examining four major concentration acts that occurred under the country's pre-2012 antitrust framework. We analyze how these transactions affected retail prices and margins, with particular attention to the mediating role of downstream market structure in determining the ultimate distribution of merger-related welfare effects between consumers and firms.

Our analysis draws on a unique dataset combining weekly retail gasoline prices from Brazil's National Petroleum Agency (ANP) with detailed information on wholesale prices, fuel volumes, and market structure indicators spanning 2008-2012. The dataset covers approximately 70% of Brazil's total gasoline consumption and includes comprehensive information on retailer characteristics, geographic location, and brand affiliations, enabling precise identification of treatment

and control groups across diverse market conditions.

Methodologically, we employ a difference-in-differences approach that exploits the discrete timing of merger events and geographic variation in their effects to identify causal impacts on market outcomes (Hastings, 2004; Ashenfelter and Hosken, 2010). Our identification strategy relies on the assumption that treated and control retailers would have evolved similarly absent the mergers, which is plausible given that all firms in our sample operated under identical regulatory environments and faced similar macroeconomic conditions. We strengthen this identification by using multiple control groups – including both main competitors and unbranded retailers – and implementing robustness checks that exclude periods immediately surrounding merger dates to address potential confounding events.

Our findings reveal substantial heterogeneity in merger effects across transactions and geographic regions. The Ipiranga split, driven by regulatory intervention, generated small but significant consumer benefits through price reductions. The Ipiranga-Texaco acquisition created upstream market power that was absorbed by downstream retailers rather than passed through to consumers, demonstrating how competitive retail markets can serve as a protective buffer. The Ipiranga-DNP acquisition in less competitive northern markets allowed retailers to capture efficiency gains rather than passing them to consumers, while the Shell-Cosan joint venture showed mixed effects reflecting the diverse competitive conditions across its national scope.

Most notably, we document an asymmetric transmission mechanism whereby competitive downstream markets effectively prevent the pass-through of both upstream cost increases and efficiency gains to consumers. While this mechanism can protect consumers from anticompetitive price increases, it simultaneously prevents them from benefiting from merger-generated efficiencies, creating a systematic bias in how vertical market structures mediate the welfare effects of horizontal consolidation.

This paper makes several important contributions to the mergers and acquisitions literature. First, we provide new evidence on the role of downstream market structure in mediating upstream merger effects, demonstrating that the same competitive forces that protect consumers from harm

can prevent them from benefiting from efficiencies (Hosken, Olson and Smith, 2018). Second, we introduce a joint analysis of price and margin effects that reveals important distributional consequences masked by traditional approaches focusing solely on consumer prices (Ashenfelter, Hosken and Weinberg, 2013, 2014). Third, we contribute methodologically by showing how geographic heterogeneity in market structure can be exploited to understand the conditions under which concentration effects are transmitted to final consumers. Finally, our analysis represents the first comprehensive retrospective evaluation of multiple merger cases in Brazil's fuel distribution sector and among the first systematic post-merger evaluations conducted in a major Latin American economy, offering insights relevant to antitrust authorities in developing countries with concentrated distribution networks and heterogeneous regional market conditions.

The remainder of this paper is organized as follows. Section 2 provides institutional background on Brazil's gasoline distribution industry and the evolution of competition law that shaped the regulatory environment for our studied transactions. Section 3 describes the four merger cases selected for analysis, detailing their strategic rationale and regulatory treatment. Section 4 presents our data sources and the construction of key variables used in the empirical analysis. Section 5 outlines our econometric methodology and identification strategy. Section 6 presents our main results on price and margin effects, including an analysis of how these vary across different market structures. Section 7 concludes with a discussion of policy implications and directions for future research.

2 Background

2.1 Industry Background and the Evolution of Competition Law in Brazil

In Brazil, gasoline is produced or imported by a refiner, most likely Petrobras,[1], which is then transported to a wholesale distribution center. There are two types of gasoline: type A and type C. The latter is the pure gasoline produced by refineries and distributed to wholesalers. The former is a mixture composed of a percentage of anhydrous ethanol, destined for final consumers. Wholesale distribution centers are responsible for the preparation of this blended gasoline and its distribution.

Most of the production is offshore, with refineries located close to the coast or in strategic locations. Type A gasoline is transported to distribution centers by roads (trucks), railroads, water (especially cabotage sailing), and pipelines. Type C gasoline is transported to retailers only by trucks and, usually, within the same state.

There are two types of retailers, branded and unbranded, which dictate the type of relationship and contracts with distributors. Branded retailers will work under exclusivity contracts, selling products from one specific distributor and using their brand. Usually, these are long-term contracts and can include loans (from distributors) to upgrade or adapt the gas station to meet the distributors' branding and requirements. Unbranded retailers are independent brands with no exclusivity contracts. They can buy fuel from one or more distributors and usually work under short-term contracts, allowing them to switch suppliers more easily.

It is important to highlight that distributor firms are prohibited from owning their own retailers. Although vertical integration is allowed across fuel extraction, production, and distribution, it is not allowed between these sectors and the downstream retail segment. [2]

Differentiation in fuel markets tends to be limited. The National Petroleum Agency (ANP)

[1] As of 2025, Petrobras produces approximately 85% of all gasoline in Brazil. Although the firm is publicly traded, the federal government retains majority ownership, maintaining control over the company's strategic decisions.

[2] Among the three largest competitors, Petrobras used to be vertically integrated until 2021, Raizen has a refinery in Argentina, and Ipiranga is focused only on distribution.

supervises retailers to ensure minimum quality and compliance with requirements. Amenities such as branded convenience stores, fuel quality guarantees, and brand-specific products (additive [premium] gasoline, lubricants, and others) are among the main sources of differentiation among retailers.

In 1997, the Brazilian Congress approved the Petroleum Law (law 9,478/1997), which created the National Petroleum Agency. This law established regulations for new agents and ended Petrobras' monopoly on oil extraction, production, and refinery. The new regulations created an environment that promoted the expansion of the number of agents distributing liquid fuels, in particular, natural gas, gasoline, and diesel. While natural gas expansion is aimed at diverse industries and the generation of electricity, the distribution of diesel and gasoline is aimed at gas stations and the transportation sector.

The oil distribution sector, particularly for diesel and gasoline, went through many changes in the twenty years following the Petroleum Law. Initially, there was an expansion of activities, with close to 200 firms operating at the beginning of the 2000s. After 2005, this segment faced a series of mergers and acquisitions, concentrating activities and markets up to 2017. In 2010, there were around 150 firms that distributed gasoline, a number that was reduced to about 130 in 2017.

These distribution centers supplied fuel to over 41,000 retail stations, approximately 53.3% of which were branded and 46.7% unbranded, with an uneven spatial distribution throughout the country. Specifically, while the Southeast region – home to 85 million people and with an area of 925,000 km^2 – accounted for 38% of all fuel retailers, the North region, with a population of 18.6 million and covering 3.85 million km^2, only hosted 9% of retailers. This disparity highlights the uneven distribution of retailers per unit area, with the Southeast region exhibiting a much higher retailer density. The lower retailer density in the North region reduces accessibility to fuel retail services and may also increase the market power of the few retailers operating in the region.

A topic of significant interest in antitrust is whether the concentration of retailers in certain locations has any implications for competition, particularly with regard to mergers in the up-

stream segments, which, in Brazil, are dominated by a few firms.[3] Up until 2017, the Brazilian antitrust authority had never blocked a merger in the liquid fuel distribution sector.[4] Before 2012, the agency's enforcement approach was considerably more lenient.

Until 2012, the Brazilian Antitrust Office (CADE) evaluated mergers and acquisitions in an *a posteriori* framework. Under the previous law (8.884/1994), firms could notify the authorities of a merger only after it had been concluded, which made the agency's task more difficult, especially in cases where the merger could have anticompetitive effects.[5] The new competition defense law (Law 12.529/2011) altered this scenario by requiring that all mergers with significant market concentration be notified to CADE prior to their completion. It also granted CADE greater autonomy to conduct economic analysis and enhance the efficiency of case adjudication.

The four transactions analyzed in this paper—Ipiranga and BR Distribuidora, Ipiranga and Texaco, Ipiranga and DNP, Esso and Cosan—happened before the new competition law was implemented and therefore occurred in a less stringent regulatory environment. The first case refers to Ipiranga's sale of assets to BR Distribuidora, which, at that time, was part of Petrobras. This transaction was treated as an acquisition, which generated significant concentration that could result in a welfare loss for consumers. To mitigate the impact, CADE allowed the sale of all assets from the North and Northeast regions (representing only 25% of Ipiranga's assets), while it denied the sale of assets in other regions to BR Distribuidora.

The second case, Ipiranga's acquisition of Texaco, marked the return of Ipiranga's operations in the North and Northeast regions through the purchase of Texaco's assets. Regionally

[3] As of 2017, the four largest firms were BR (27.7%), Ipiranga (19.4%), Raízen (18.4%), and Alesat (3.4%).

[4] The first merger denied was between Ipiranga and Alesat, in August 2017. Although the marginal increase in concentration was relatively small, it has been argued that Alesat, the fourth-largest company in the segment, played a crucial role in disrupting concentration and fostering competition in the markets in which it operated. Although CADE refused to recognize Alesat as a *maverick firm*, it accepted the arguments that led to this conclusion and ultimately denied the merger.

[5] For instance, the Nestlé-Garoto case was a particularly complex merger in the chocolate industry, as the merger was finalized before the authorities were notified. The case sparked significant debate due to its high market concentration and the potential to reduce competition, as well as create barriers to entry for new competitors. In assessing the merger's efficiencies, CADE concluded that these would not be sufficient to prevent abuse of market power by the merged entity or to mitigate price increases and consumer harm. The case involved extensive litigation and judicial contestation, lasting 21 years, and was only concluded in 2023 with a series of remedies imposed by CADE to address the anticompetitive effects and restore competition in the relevant markets.

speaking, this was a transfer of assets rather than an increase in market share. While it did not increase market concentration in those regions, it involved a shift in the management and control of key distribution centers. The third case involves Ipiranga's acquisition of DNP assets. Although this transaction led to a small increase in concentration, it was concentrated in the North region, where retailer competition was less intense than in other parts of the country. Lastly, the transaction between Esso and Cosan, which involved the formation of Raízen, was a merger that focused on assets in the South and Southeast regions—largely the largest consumer markets with a higher number of retailers in the downstream segment.

3 Cases Selected for Analysis

Before detailing the selected cases, it is necessary to clarify the terminology used throughout this paper. The term concentration acts — or simply concentrations — refers to events where two or more firms combine operations, whether through a merger, an acquisition of assets or control, or the formation of a joint venture. Concentration acts involve changes in the market structure by consolidating previously independent competitors or assets under shared or single ownership. This terminology follows the established usage in Brazilian and European competition policy frameworks and is adopted throughout this paper for conciseness.

This study focuses on two types of concentration acts: (i) acquisitions of assets or control, and (ii) the formation of joint ventures. Although each type involves some degree of consolidation between firms, they differ in important structural and operational aspects, as summarized below.

A merger occurs when two or more firms combine their operations into a single new entity, with none of the original firms continuing as independent market participants. All assets, liabilities, and operations are consolidated under the new firm, which assumes full control of the combined business activities. In Brazil, in the liquid fuel market, the most noticeable example of a merger in the 2000s would be the combination of Ale Combustíveis and Satélite, two firms in the distribution sector that combined activities in February 2007 to create a unified firm: Alesat.

The reason why this paper does not focus on this case is that the assets of each firm had minimal overlap. The operation was mostly in complementary markets, which turned both Ale and Satélite from regional to national-level distributors.

An acquisition, by contrast, involves one firm purchasing assets, shares, or control of another firm. Typically, the acquiring firm continues to operate under its existing brand, while the acquired assets are integrated and may be rebranded under the acquirer's ownership and management.

Finally, a joint venture refers to a collaborative agreement in which two or more firms create and jointly control a separate business entity. In this arrangement, the parent firms maintain their independent operations but share control, governance, and profits over the newly created enterprise, usually focused on developing or commercializing specific products or services in a particular market. Although a joint venture represents a class of cooperative agreement,[6] authorities generally allow it provided that it generates pro-competitive benefits – such as promoting innovation, creating efficiencies, or facilitating the diffusion of technology – and does not lead to competition harms, such as enabling market coordination, excluding competitors, foreclosing access to essential inputs, or creating excessive market power.

The cases selected for analysis in this paper include examples of each of these last two types of concentration acts. They were chosen based on their relevance to the Brazilian fuel distribution market, the timing of their consummation prior to the 2012 reform of antitrust laws, and the availability of data to measure their post-concentration effects.

The choice of fuel markets relates to the relative importance of this sector in terms of public policy and the transformations it has suffered in the past 30 years. From the end of Petrobras' monopoly over extraction and production, the expansion of distribution players and their subsequent concentration, to policies affecting fuel markets directly (fuel price controls) or indirectly (automobile's sales tax reduction), the level of concentration in the wholesaler distribution seg-

[6]Other examples allowed by competition authorities such as CADE, the FTC, and the European Commission include research and development collaborations, production agreements, and standardization initiatives.

ment had deep impacts on consumers' welfare and indirect effect on many markets through their impact on transportation costs.

The Brazilian Antitrust Authority (CADE) has released two major reports on the fuel markets (Cade (2014) and Cade (2022)), focusing on both the retail and distribution segments. In these reports, CADE emphasizes that market concentration in the retail segment can arise either from concentration acts among retailers themselves or from concentration acts in the immediate upstream segment, among distributors that maintain brand exclusivity contracts with retailers. In the former case, concentration occurs through the ownership of retail establishments, while in the latter, it occurs through the consolidation of distributor brands under which some retailers operate.[7] In the distribution segment, between 1996 and 2021, there were 50 concentration cases judged by CADE, of which only one — the proposed acquisition of Alesat by Ipiranga in 2017 — was denied. Most cases (38) were approved without any restrictions.

3.1 Acquisition of Ipiranga's Assets by BR Distribuidora (Petrobras)

In 2007, Ipiranga's assets were strategically split among three major companies—Ultrapar, Petrobras, and Braskem—in a transaction valued at approximately US$4 billion, making it the largest merger or acquisition ever reviewed by CADE in Brazil's fuel and petrochemical markets, and one of the largest private-sector deals in the country's history. As part of the deal, Petrobras acquired Ipiranga's fuel distribution and retail assets in the North, Northeast, and Midwest regions, significantly expanding its downstream presence in markets where it previously had limited penetration.

The operation was structured to avoid excessive concentration at the national level. Ultrapar retained Ipiranga's operations in the South and part of the Southeast, where it was already established, while Braskem absorbed Ipiranga's petrochemical units. This geographic segmentation helped secure regulatory approval and provided a model for how large horizontal mergers

[7] It is important to emphasize that, in Brazil, distributors are prohibited from owning retail outlets, although they are permitted to hold exclusivity contracts with retailers.

in regulated sectors could be structured to mitigate antitrust risks.

CADE and the Ministry of Justice's economic bodies (SEAE and SDE) carefully evaluated the competitive effects of the asset division. In Petrobras's case, attention was focused on potential concentration in regional fuel retail markets, especially in municipalities where both BR and Ipiranga had strong presence. The deal ultimately allowed Petrobras Distribuidora to become more competitive in underserved regions without triggering the need for broader structural remedies at the national level.

3.2 Acquisition of Texaco's Assets by Ipiranga

In 2009, Ipiranga Produtos de Petróleo S.A. acquired the operations of Chevron in Brazil, including the Texaco brand. The transaction involved the purchase of Chevron Brasil Lubrificantes Ltda. and Chevron Brasil Ltda., encompassing Texaco's entire fuel distribution and retail activities in the country. As part of the deal, Ipiranga acquired retail contracts, distribution terminals, fuel inventories, and rights to the Texaco brand in Brazil. The consolidation involved two major players in the downstream fuel market, with Ipiranga already being one of the top distributors in the country. The scope of the transaction extended beyond retail fuel, also encompassing lubricants and industrial clients, although the primary competitive concerns focused on the retail gasoline and diesel segments.

The competition authority's analysis highlighted significant horizontal overlaps between Ipiranga and Texaco in several regions, particularly in the South and Southeast of Brazil. States such as Rio Grande do Sul, Santa Catarina, Paraná, and São Paulo were identified as having high levels of market concentration post-merger. In many municipalities, the transaction would substantially reduce the number of effective competitors, raising concerns about local market power, potential price increases, and reduced incentives for service quality and investment at the pump level. The merger raised red flags in areas where both firms had strong retail presence or supply relationships with branded and unbranded stations.

To address these concerns, the parties agreed to a set of remedies. These included the divestiture of assets or retail contracts in specific municipalities where the competitive effects were deemed most severe. Additionally, commitments were made to ensure non-discriminatory supply conditions for independent retailers and to preserve the possibility of market entry by rival distributors. These measures aimed to mitigate the risk of anti-competitive effects while allowing the broader transaction to proceed.

3.3 Acquisition of DNP's Assets by Ipiranga

In October 2010, Ultrapar, through its subsidiary Ipiranga, completed the acquisition of 100% of Distribuidora Nacional de Petróleo (DNP). The total transaction value was R$85 million, with R$47 million paid upfront in November 2010 and the remainder used for working capital adjustments. The deal officially closed and was consolidated from November 1, 2010.

The acquisition significantly bolstered Ipiranga's presence in Brazil's North region, adding approximately 110 service stations, increasing its regional volume by 40%, and elevating its market share to 14%, making it the second-largest fuel distributor in that region. This move complemented earlier expansion efforts—namely, the 2009 purchase of Texaco—and strengthened Ipiranga's strategic push into the North, Northeast, and Midwest, capitalizing on rapid regional demand growth.

Though smaller in scale compared to Ipiranga's landmark 2007 sale of assets to Petrobras, Braskem, and Ultrapar (a US$4 billion transaction), the R$85 million DNP deal was highly impactful at the regional level. It exemplified a targeted, efficient acquisition that leveraged local market momentum without unusual antitrust complexity.

3.4 Joint-Venture between Cosan and Shell

In early 2010, Cosan S.A. Indústria e Comércio and Shell International Petroleum Company Limited filed a notification with Brazilian competition authorities concerning the formation of

a joint venture. The operation, initially formalized through a Memorandum of Understanding (MoU), aimed to integrate their downstream operations in Brazil. This included the merger of fuel distribution businesses under the Esso (Cosan) and Shell brands, with the potential to evolve into binding agreements such as a Joint Venture Agreement and a Framework Agreement. The resulting entity would concentrate activities across the distribution of gasoline, ethanol, diesel, and compressed natural gas (GNV), as well as retail operations at service stations throughout the country.

The Brazilian Secretariat for Economic Monitoring (SEAE) issued multiple requests for detailed market data from stakeholders, including SINDICOM, ANP, and ABEGÁS, covering market shares and supply structure for both liquid fuels and natural gas, segmented by state and municipality. The SEAE emphasized concern over horizontal overlaps, especially in municipalities with populations over 200,000, where both Cosan and Shell operated retail fuel stations. It sought granular data down to the neighborhood level in these urban centers to assess the degree of concentration. Furthermore, legal representatives of Shell submitted supporting documentation, including translated powers of attorney and authorizations, to facilitate the review process.

This merger represented a significant concentration in Brazil's fuel distribution and retail sector, prompting SEAE to demand detailed calculations, methodologies, and public and confidential versions of all submissions. The authorities underscored that failure to comply with information requests could result in penalties. The transaction signaled a major step toward consolidation in the downstream oil sector and triggered close scrutiny due to its potential competitive implications across several regional markets.

4 Data

Retail Fuel Prices comes from Brazilian National Petroleum Agency (ANP). This data is obtained by a weekly survey from a set of representative cities, which comprises almost 70% of the total annual gasoline consumed in Brazil. We have information on retailers' brand name, day

of the survey and location. In addition to these, we also obtained the national registry of legal entities number (CNPJ), which allow us to follow the precise gas station over time.

Wholesaler Fuel Prices are also obtained from the survey mentioned above. This data is relevant to compute a gross margin for the the retailers, since represents the actual price paid by them. Other costs associated to the retailer activities are either fixed or negligible, having little to no influence in the analysis proposed here.

Petrobras (Refinery) Fuel Prices are obtained directly from Petrobras and represent the producer (refinery) prices. These prices vary by macro region and are also used for complimentary analysis.

Fuel Volumes are obtained from ANP and split into two different categories: retailer's and wholesalers' volumes. Retailer volumes are aggregated to city and month levels and represent the effective fuel sold to final consumers, being used here only for complimentary analysis. Wholesaler volumes are also in city and month level and represent the fuel sold by the wholesalers to the retailers. This later is split by wholesaler's brand, which allow us to (1) precisely check the period where firms effectively merged their activities, and (2) double-check the retailers' identification. We also use this wholesaler volume data for the concentration analysis using Herfindahl-Hirschman Index (HHI).

Macroeconomic data such as inflation, GDP and population comes from the Brazilian Institute of Geography and Statistics (IBGE).

5 Empirical Approach

5.1 Methodology

The methodology applied in this study follows the established literature on post-merger evaluations using a difference-in-differences (DiD) approach. This reduced-form methodology has become the standard approach for policy evaluation in merger retrospectives, as it allows for

the identification of causal effects by comparing outcomes between treated and control units before and after the merger event (Hastings, 2004; Ashenfelter, Hosken and Weinberg, 2013, 2014; Hosken, Olson and Smith, 2018).

The key identifying assumption underlying the DiD approach is that, in the absence of the merger, the treatment and control groups would have followed parallel trends. This assumption is particularly plausible in our setting because: (1) all retailers in our sample operate in the same regulatory environment and face similar macroeconomic conditions, (2) the timing of mergers was largely driven by strategic considerations at the corporate level rather than local market conditions, and (3) we include a comprehensive set of fixed effects to control for time-invariant heterogeneity.

The main methodological challenge in merger retrospectives lies in selecting an appropriate control group that provides a credible counterfactual for what would have happened to the merging parties' prices in the absence of the merger (Ashenfelter, Hosken and Weinberg, 2013). Following the established literature, we employ multiple control group strategies to test the robustness of our findings.

Our primary control group consists of two distinct types of retailers that provide varying degrees of competitive pressure on the merging parties:

1. **Main competitors:** Large branded retailers that compete directly with the merging parties in the same geographic markets. These firms face similar demand conditions and cost shocks but were not directly affected by the mergers under study. This approach follows Hastings (2004), who used competing branded stations as controls when analyzing the effects of independent station conversions.

2. **Unbranded retailers:** Independent gasoline stations that operate without exclusive contracts with any specific distributor. These retailers maintain flexibility to source gasoline from multiple suppliers and can switch brands based on wholesale price variations. As documented by Hastings (2004), independent retailers typically compete primarily on

price with limited non-price differentiation, making them particularly sensitive to changes in competitive dynamics. The inclusion of unbranded retailers as controls follows Slade (1986) and Netz and Taylor (2002), who demonstrate that independent retailers serve as important competitive constraints in gasoline markets.

This dual control group strategy allows us to test whether merger effects vary across different types of competitors and provides a robustness check on our main results. The variation in competitive intensity between branded and unbranded retailers enables us to examine how merger effects depend on the degree of product differentiation, following the theoretical framework developed by Anderson, De Palma and Thisse (1992).

To address concerns about confounding events occurring simultaneously with the mergers, we implement two complementary temporal specifications:

1. **Full sample estimation:** We use a 12-month window around each merger (6 months before and after) to capture both short-term and medium-term price effects. This window length is chosen to minimize overlap between different merger events while providing sufficient observations for precise estimation.

2. **Event-time specification with "donut" periods:** Following Ashenfelter and Hosken (2010), we exclude observations from 2 months immediately before and after each merger to control for potential anticipation effects and contemporaneous shocks. This approach helps isolate the merger-specific effects from other market developments that might coincide with the merger timing.

For the price and margin regressions, we use weekly data, which allows us to have substantial variation and better capture the dynamics before and after the concentration acts. Our analysis focuses on four major cases in the Brazilian gasoline retail market, all occurring during the pre-2012 regulatory regime:

- **May 2008:** Ipiranga split – Following CADE's conditional approval of Petrobras's acquisition of Ipiranga, the company was split into two entities: Petrobras acquired operations in the central, north, and northeast regions, while Grupo Ultra (a new entrant to the liquid fuels market) acquired the south and southeast regions, maintaining the Ipiranga brand.

- **May 2009:** Ipiranga's acquisition of Texaco (Chevron) retail network, which represented the return of Ipiranga's brand presence in the central, north, and northeast regions. The overlap occurs mainly in the southeast region, where fuel distribution markets were already highly concentrated.

- **February 2011:** Ipiranga's acquisition of DNP (Distribuidora Nacional de Petróleo), reinforcing Ipiranga as a strong competitor in the north, especially in the Amazon area.

- **June 2011:** Shell-Cosan joint venture formation, creating Raízen, and consolidating it as the third largest distributor in Brazil.

All cases occurred under the more permissive pre-2012 antitrust framework, providing a consistent regulatory environment for comparison. The temporal spacing of these events allows us to study each case's effects while controlling for potential spillover effects from other consolidation activities.

5.2 Econometric Specification

Our baseline difference-in-differences estimating equation is:

$$\log(\text{Price}_{it}) = \alpha_i + \beta_t + \gamma \text{Merged}_{it} + \varepsilon_{it} \tag{1}$$

where Price_{it} is the retail gasoline price charged by retailer i on day t, α_i represents retailer fixed effects that control for time-invariant characteristics such as location, brand identity, and other station-specific factors, β_t captures daily time effects including macroeconomic shocks, oil

price movements, and seasonal patterns, and $Merged_{it}$ is an indicator variable equal to one for retailers involved in mergers in the post-merger period.

The coefficient γ identifies the average treatment effect of the merger on retail prices, under the assumption that treatment and control groups would have evolved similarly in the absence of the merger (parallel trends assumption).

Following Hosken, Olson and Smith (2018), we also estimate models using margins (markups) as dependent variables to provide a more complete picture of how concentration acts affect market structure and competitive conduct:

$$\text{Margin}_{it} = \alpha_i + \beta_t + \gamma \text{Merged}_{it} + \varepsilon_{it} \tag{2}$$

Our analysis uses retailer-level price data collected on a random day of each week, providing high-frequency observations while maintaining computational tractability. The sample period covers 2008-2012, encompassing all merger events under the pre-2012 regulatory regime. All standard errors are clustered at the municipality-month level to account for potential serial correlation within markets and time periods, following the recommendations of Cameron, Gelbach and Miller (2011) for difference-in-differences estimation with panel data.

This comprehensive methodological approach allows us to provide credible estimates of merger effects while addressing the main identification challenges inherent in merger retrospective studies.

6 Results

6.1 Price and Margin Effects of Mergers

Figures 2 and 3 present the main results from our difference-in-differences estimation of concentration effects on retail gasoline prices and margins, respectively. The joint analysis of both outcome variables provides crucial insights into the mechanisms through which these cases affect market outcomes and reveals how the competitiveness of downstream retail markets mediates the transmission of upstream merger effects to consumers.

6.1.1 Case 1: Ipiranga Split - Minimal Market Impact

The Ipiranga split shows modest effects on both prices and margins. Compared to the main competitors, the acquisition of Ipiranga's assets by Petrobras resulted in small but statistically significant price reductions of approximately 0.2%, accompanied by small and nearly significant margin decreases. Results with respect to unbranded retailers show no price or margin changes.

These minimal effects are consistent with the nature of this regulatory intervention. While the split prevented excessive concentration by blocking Petrobras's full acquisition of Ipiranga, the resulting market structure change was relatively modest. Meanwhile, in the south and southeast regions, the entry of Grupo Ultra represented only a change of ownership of the Ipiranga brand, with no impact on upstream concentration or any downstream effects.

The small price reductions suggest that the regulatory intervention was successful in preventing potential anticompetitive harm without significantly disrupting existing market dynamics. The alignment of small price and margin decreases indicates that the limited competitive benefits were appropriately passed through to consumers rather than captured by retailers.

6.1.2 Case 2: Ipiranga-Texaco Acquisition - Downstream Competition as Consumer Protection

The Ipiranga-Texaco acquisition presents a compelling case study of how downstream competition can protect consumers from upstream anticompetitive effects. While retail prices remained essentially unchanged for both main competitors and unbranded retailers, we observe substantial margin compression of approximately four percentage points.

This pattern strongly suggests that the merger generated upstream market power that increased wholesale costs for downstream retailers. However, the highly competitive nature of retail markets in the affected regions - which comprise more than 70% of Brazil's total gasoline consumption and include the most competitive metropolitan areas - prevented retailers from passing these cost increases through to consumers.

The significant margin compression indicates that retailers absorbed the upstream price increases at the expense of their own profitability. This downstream competitive pressure effectively served as a buffer that protected consumers from immediate price increases, demonstrating how retail market structure can mediate the transmission of upstream merger effects.

From an antitrust perspective, this case illustrates the complex interaction between upstream and downstream competition. While the merger appears to have created meaningful upstream market power (evidenced by the margin compression), the competitive retail environment prevented the full expression of this market power in consumer prices. However, this protection may not be sustainable in the long term if continued margin pressure leads to exit or reduced investment in retail markets.

6.1.3 Case 3: Ipiranga-DNP Acquisition - Efficiency Gains Captured by Retailers

The Ipiranga-DNP acquisition shows no significant price effects for consumers but evidence of margin increases for retailers, particularly against unbranded competitors. This pattern suggests a fundamentally different mechanism from the previous cases.

The absence of price increases, combined with margin improvements, indicates that any efficiency gains generated by the concentration act were captured by downstream retailers rather than passed through to consumers. This outcome likely reflects the structural characteristics of the affected markets, which were primarily located in northern Brazil, including the Amazon region.

These markets are characterized by geographic dispersion, higher transportation costs, and naturally lower levels of retail competition due to barriers to entry and the challenges of fuel distribution in remote areas. The less competitive downstream environment provided retailers with sufficient market power to capture efficiency gains rather than compete them away through lower prices.

The regional concentration of this case in less competitive markets helps explain why retailers were able to retain efficiency benefits. Unlike Case 2, where intense retail competition forced margin compression, the weaker competitive pressure in northern markets allowed retailers to maintain or even improve their margins while keeping prices stable.

6.1.4 Case 4: Shell-Cosan Joint Venture - Mixed Regional Effects

The Shell-Cosan joint venture shows no significant price effects but some evidence of margin increases, particularly against main competitors. The pattern is similar to Case 3 but with smaller magnitudes, which is consistent with the broader geographic scope of this transaction.

The joint venture encompassed states from all Brazilian regions, creating a mix of highly competitive markets (such as São Paulo and Rio de Janeiro) and less competitive regional markets. This geographic diversity likely explains the intermediate results - efficiency gains were partially captured by retailers but the presence of highly competitive markets in the sample limited the extent of this capture.

The absence of price effects suggests that any upstream efficiencies generated by combining Shell's international expertise with Cosan's extensive Brazilian distribution network were

not passed through to consumers. Instead, retailers in less competitive regional markets were able to capture these benefits, while intense competition in major metropolitan areas prevented significant price increases.

6.1.5 The Role of Downstream Market Structure and Implications for Antitrust Analysis

The heterogeneity in results across cases can be largely explained by differences in downstream market competitiveness in the affected regions:

Highly competitive markets (Case 2): In Brazil's most competitive regions, downstream competition was sufficient to prevent price increases even when upstream market power was created. However, this protection came at the cost of retailer profitability through margin compression.

Less competitive markets (Case 3): In geographically dispersed northern markets with higher barriers to entry, retailers had sufficient market power to capture efficiency gains rather than compete them away through lower prices.

Mixed competitive environments (Case 4): The combination of highly competitive and less competitive markets resulted in intermediate outcomes, with limited efficiency capture by retailers.

This pattern demonstrates that downstream market structure plays a crucial mediating role in determining how upstream merger effects are transmitted to consumers. Competitive retail markets can provide important consumer protection against upstream anticompetitive effects, but may not ensure that efficiency gains are passed through to consumers.

These results also provide several important insights for antitrust authorities regarding concentration evaluations in vertically related markets:

Geographic market definition matters: The variation in effects across regions with different competitive characteristics underscores the importance of careful geographic market definition in merger analysis. Mergers affecting primarily competitive markets may have different

welfare implications than those affecting less competitive regions.

Asymmetric transmission of upstream effects: While competitive downstream markets can protect consumers from upstream anticompetitive effects (Case 2), they may also prevent consumers from benefiting from upstream efficiency gains (Cases 3 and 4). This asymmetry is particularly pronounced in concentrated upstream markets, where efficiency gains from mergers are less visible to consumers compared to cost increases. Unlike highly publicized upstream cost shocks (such as refinery price increases that receive extensive media coverage and create consumer expectations for price adjustments), efficiency gains from concentration acts operate through opaque wholesale pricing mechanisms that lack transparency. This information asymmetry enables downstream retailers to capture efficiency benefits without consumer awareness or competitive pressure to pass them through. The result is a systematic bias where competitive retail markets effectively transmit upstream cost increases to protect producer margins but retain upstream cost savings to enhance retailer profitability, leading to an inequitable distribution of concentration-related welfare effects.

Importance of regional market analysis: The concentration of concentration effects in specific geographic regions with distinct competitive characteristics suggests that antitrust authorities should pay careful attention to regional variations in market structure when evaluating mergers in geographically dispersed industries.

Long-term sustainability concerns: The margin compression observed in Case 2 raises questions about the long-term sustainability of downstream competitive protection. Continued pressure on retailer profitability could lead to exit or reduced investment, potentially undermining the competitive protection over time.

These findings highlight the complexity of merger effects in vertically related markets and demonstrate the value of analyzing both price and margin outcomes to understand the full impact of horizontal mergers on market outcomes and welfare distribution.

7 Concluding Remarks

In this paper we analyzed four concentration acts, each involving at least one large firm in the wholesale distribution segment of fossil fuels in Brazil. All cases selected had regional or national relevance, and happened prior to the antitrust reform (2012). Under this previous regulatory regime, firms were allowed to merge (or acquire others) before notifying the authorities or waiting for approval.

The first of these cases was related to the split of Ipiranga's assets and purchase by Petrobras (BR). Despite the concerns raised, the Brazilian antitrust office (CADE) was successful in preventing an increase in concentrations that could lead to relevant unilateral price pressures. The limitation of the assets that Petrobras would be able to purchase did not significantly change the market structure of those regions. It even resulted in a slight price reduction to consumers.

The second case, Ipiranga-Texaco, happened in the largest fuel markets in Brazil. The result had an apparent success, with no price increase to final consumers. However, analyses of retail margins show that this apparent success was possible due to the high level of competition in the downstream segment, which reduced their profitability to prevent price increases to consumers. In other words, CADE's analysis of the acquisition per se was unsuccessful, creating excessive market power that allowed for an increase in prices in the wholesale segment. Consumers remained unharmed due to the degree of competitiveness among retailers.

The third case refers to a minor concentration in northern Brazil, a region represented mainly by the Amazon area. In this region, markets are more dispersed, the number of competing retailers is smaller than in the southern regions, and distribution costs are higher. This configuration gives a large market power to the downstream segment, which was able to capture all of the efficiency gains from the acquisition in the upstream market. Any resulting wholesale price reduction effects were not passed through to consumers, but absorbed my retailers in the form of higher margins.

The result of the last case (Shell-Cosan) represents a mix of cases 2 and 3. It was a national-

level joint venture, encompassing 21 states plus the federal district, of which all southern states (containing more competitive downstream markets) and many northern states (less competitive) were put together in this case. Similar to case 3, it resulted in no significant price increases to consumers, but small increase in retail margins.

These findings underscore the importance of examining not only the final impact on consumers but also the effects on all agents involved in a vertically integrated market. While consumer prices are often the focal point of antitrust scrutiny, our results show that critical distributional shifts – such as margin compression or expansion – may occur beneath the surface, masking an increase in harmful market power. These shifts reveal how cost burdens or efficiency gains are transmitted along the supply chain and whether welfare gains accrue to consumers, retailers, or upstream suppliers. A focus solely on consumer price outcomes risks underestimating both harm and benefit, especially in vertically structured markets with heterogeneous competitive conditions across regions.

More broadly, the study demonstrates the importance of institutional design in merger review policy. The pre-2012 Brazilian framework allowed for post-hoc notification, which in several cases enabled structural changes to materialize before a competitive assessment was conducted. This institutional delay may have limited the effectiveness of enforcement even in cases where competitive harm was identified ex-post. By combining detailed transaction-level data with regionally disaggregated analysis, this paper contributes a methodological template for retrospective merger evaluations in concentrated, multi-tiered industries. The evidence calls for nuanced, region-specific antitrust assessments that consider not only concentration levels, but also the ability of downstream market forces to constrain or amplify the effects of upstream consolidation.

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Figures and Tables

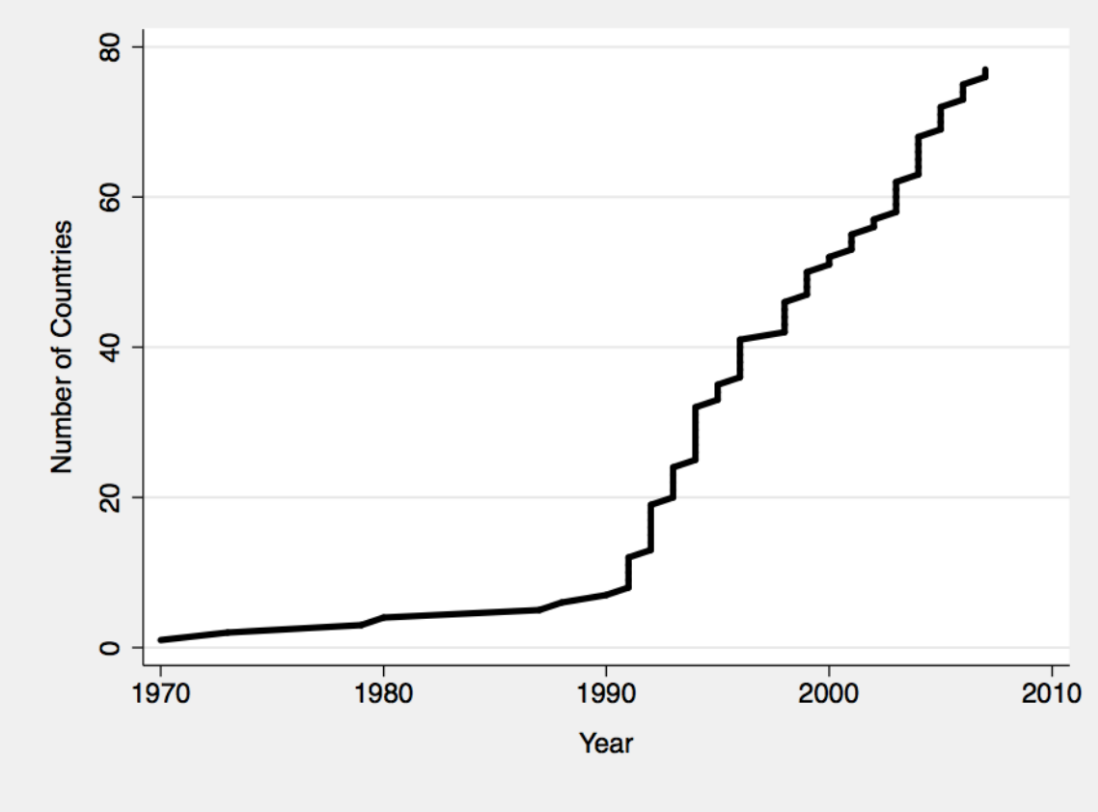

Figure 1: Adoption of Antitrust Laws in the Developing World

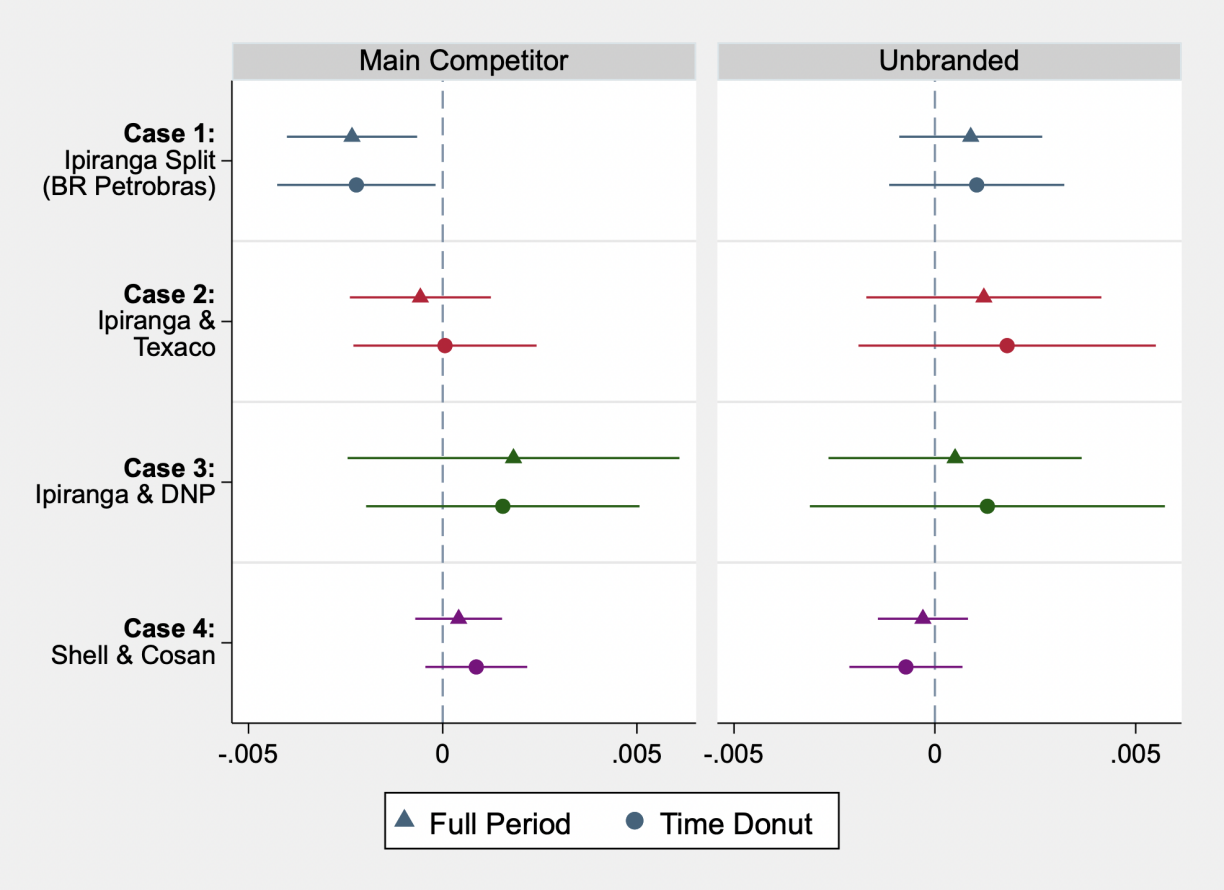

Figure 2: Difference-in-Differences Price Models

Notes: This figure shows the results from the difference-in-differences models using gasoline price as dependent variable. The panel on the left shows results using as control the respective main competitor, while the panel on the right uses unbranded retailers as control. Triangular marks represent full period regressions (12 months window), while circle marks represent donut time regressions (excluding 2 months around the merger to control for potential confounds at the time of the merger). All models use retailer-by-municipality and week-by-municipality fixed effects. Clustered by municipalities.

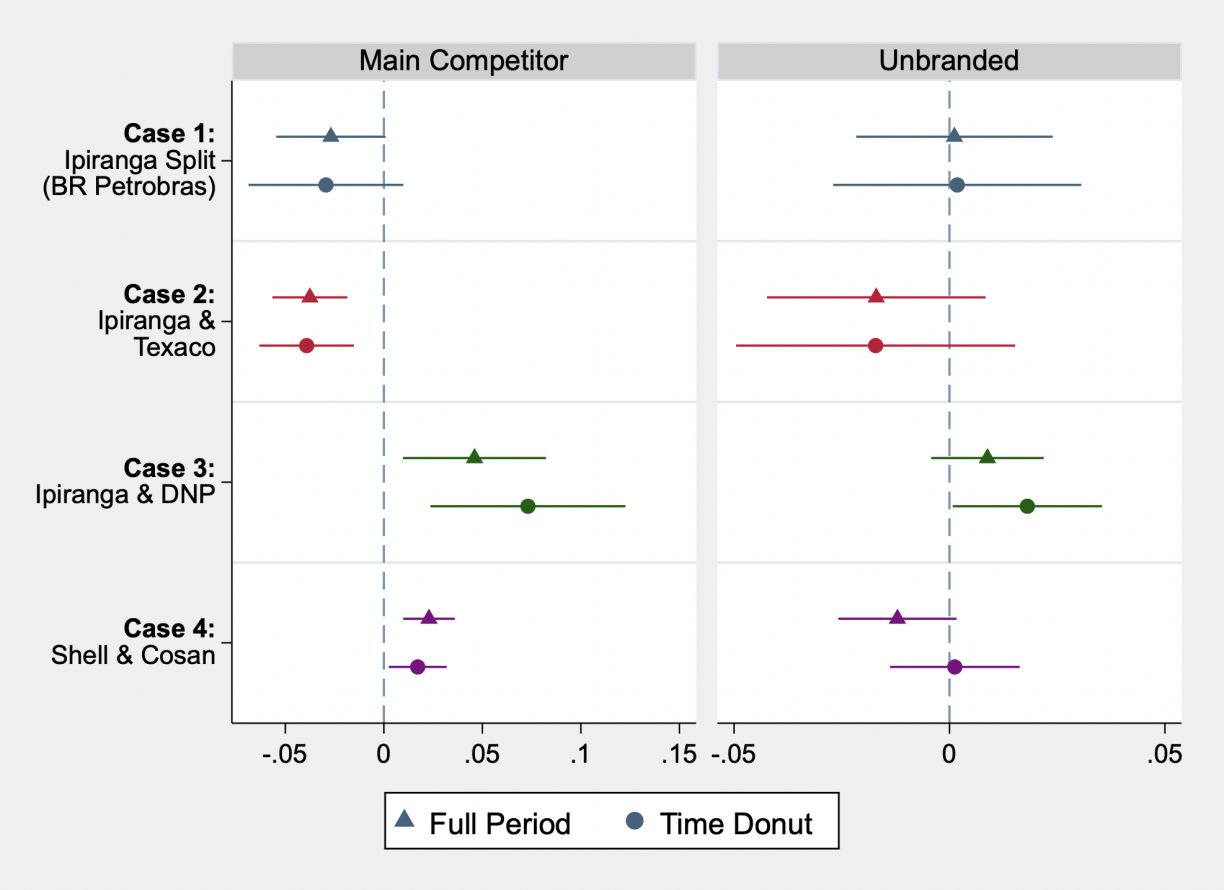

Figure 3: Difference-in-Differences Margin Models

Notes: This figure shows the results from the difference-in-differences models using gasoline margin as dependent variable. The panel on the left shows results using as control the respective main competitor, while the panel on the right uses unbranded retailers as control. Triangular marks represent full period regressions (12 months window), while circle marks represent donut time regressions (excluding 2 months around the merger to control for potential confounds at the time of the merger). All models use retailer-by-municipality and week-by-municipality fixed effects. Clustered by municipalities.

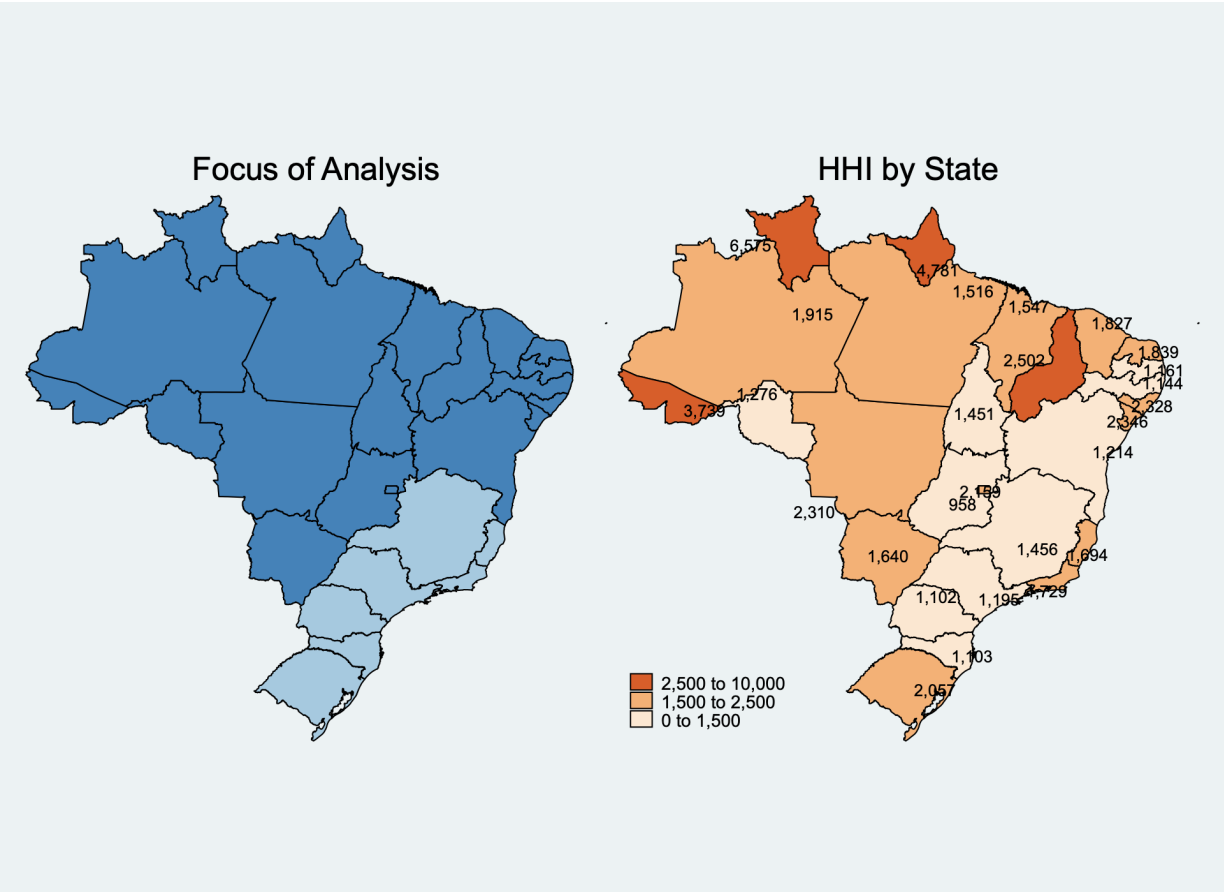

Figure 4: Geographic Overlap and Market Concentration – Case 01: Ipiranga Split

Notes: The left map shows the geographic presence of the merging firms. Dark blue states represent joint operations, medium blue states show presence by only one firm. The right map displays state-level HHI: darker areas denote more concentrated distribution markets. Several states in the North and Northeast exceed the 2,500 threshold, signaling high pre-merger concentration. Despite moderate overall concentration, the merger's regional intensity suggests varying competitive risks across states.

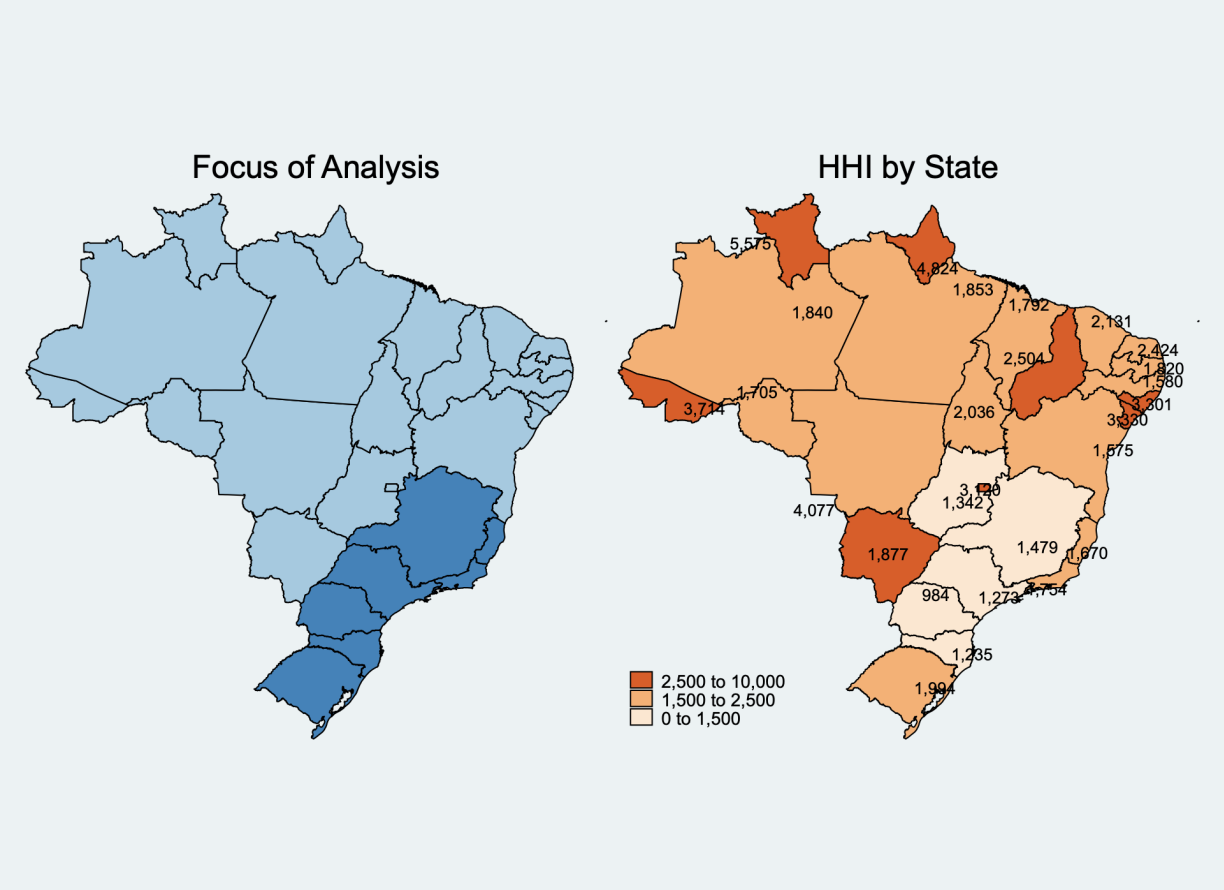

Figure 5: Geographic Overlap and Market Concentration – Case 02: Ipiranga and Texaco (Chevron)

Notes: The left panel highlights the merging firms' shared operations, concentrated in the Southeast and South regions (in dark blue). Lighter shades denote only one firm, hence no competition concerns. The right map shows HHI levels, with some states near or above 2,500. Most of the states affected by this merger show a low level of concentration.

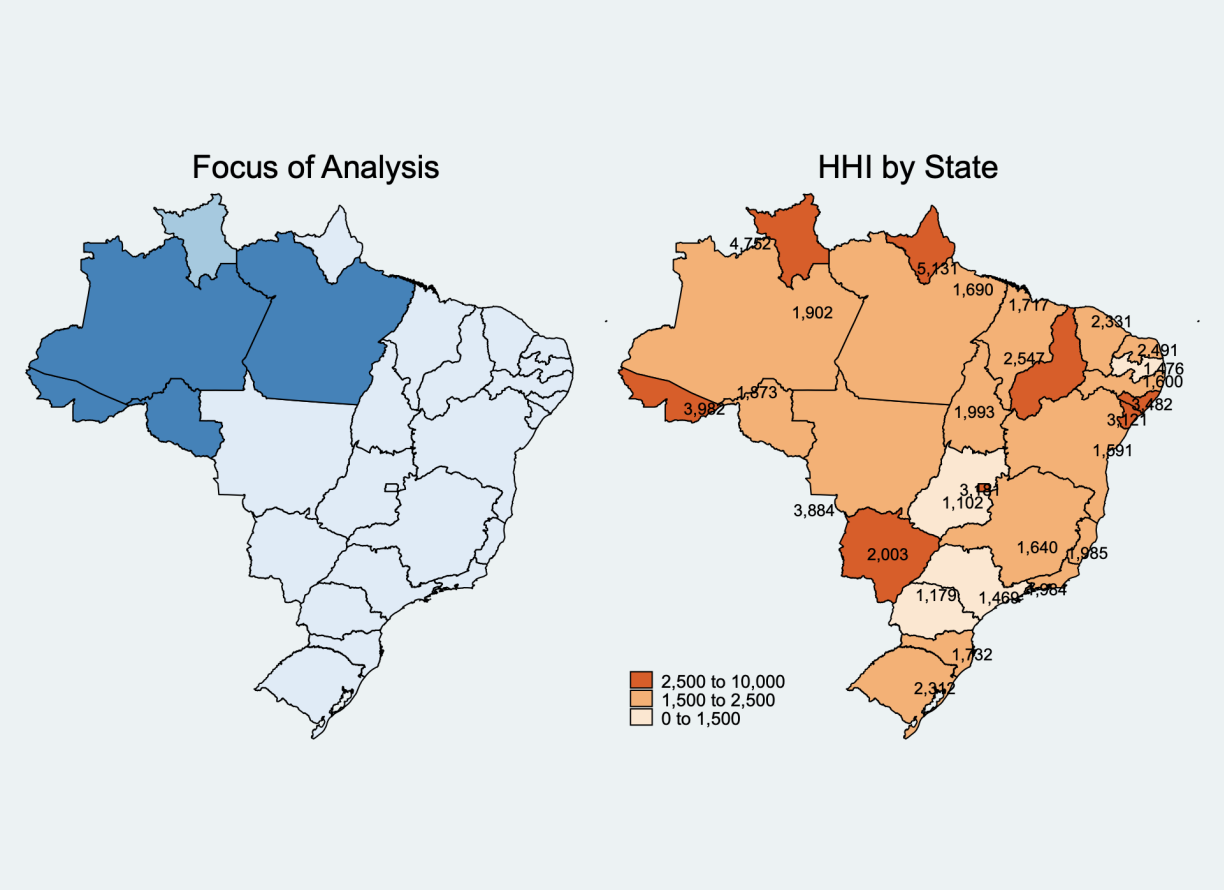

Figure 6: Geographic Overlap and Market Concentration – Case 03: Ipiranga and DNP

Notes: The map on the left indicates that the merging firms primarily operated in the North and parts of the Midwest. In contrast, the Southeast and South regions show no competition concerns. The right panel reveals that several of these operational states are already highly concentrated (HHI ¿ 2,500), raising potential red flags for antitrust enforcement in affected areas.

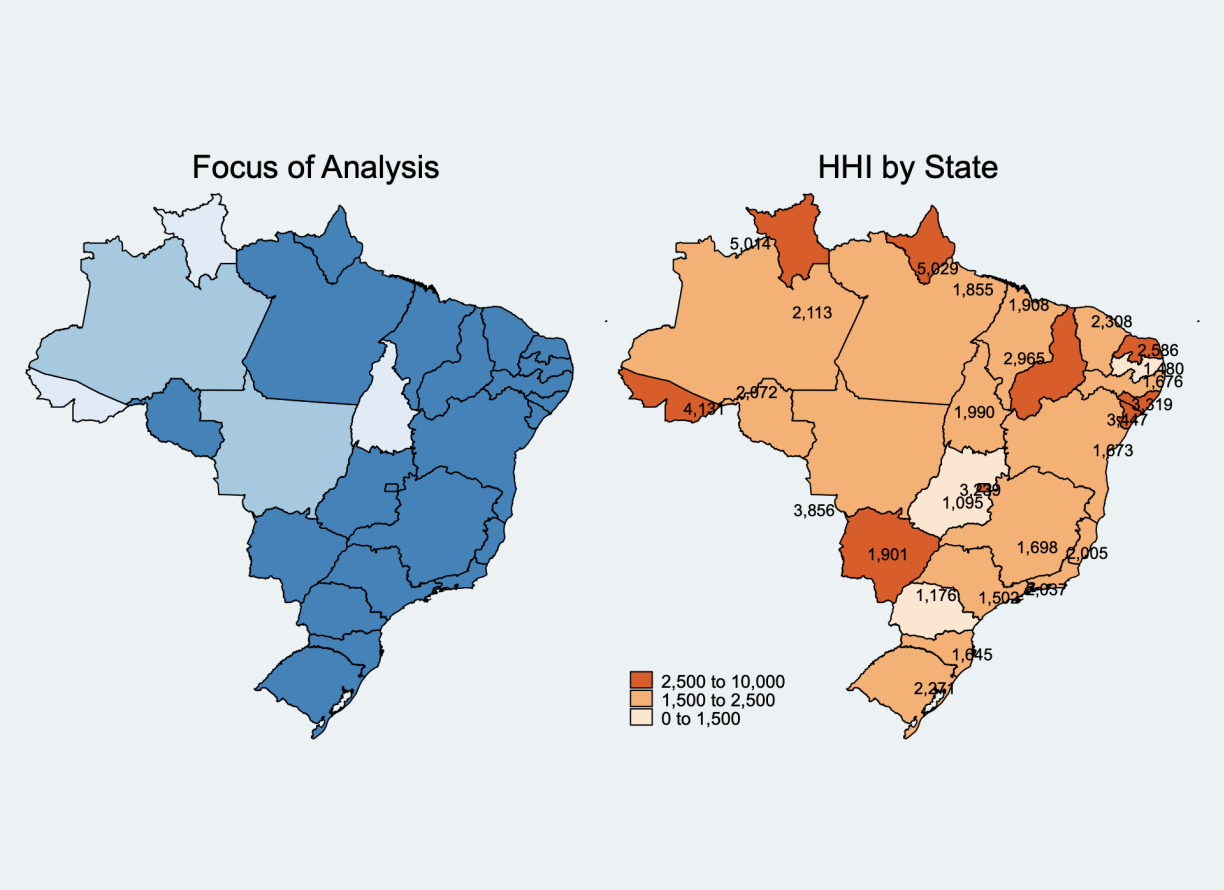

Figure 7: Geographic Overlap and Market Concentration – Case 04: Cosan and Shell

Notes: The map on the left illustrates the overlap in operations between the merging firms. Dark blue states indicate joint presence in distribution or retail segments; medium blue shows presence by only one firm; light blue indicates no presence. The map on the right shows the Herfindahl-Hirschman Index (HHI) by state: darker tones reflect higher concentration levels. According to antitrust guidelines, HHI values above 1,500 raise competitive concerns.

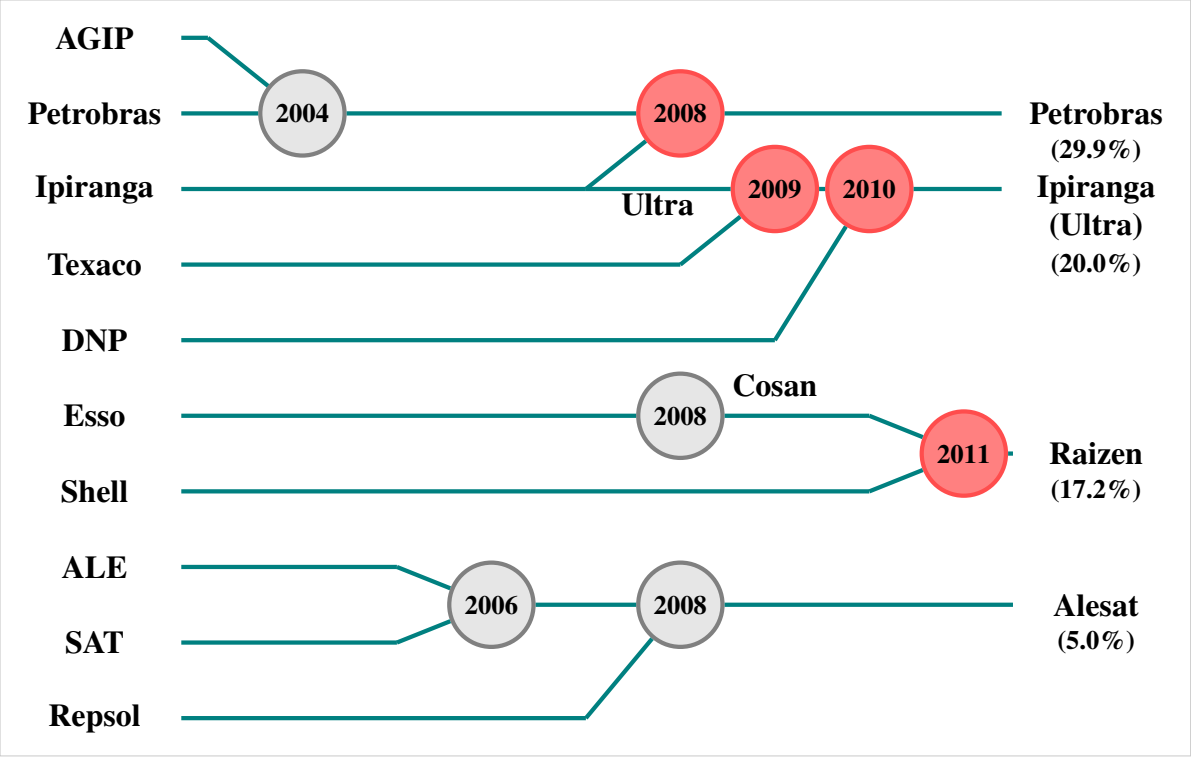

Figure 2.8: Timeline of main mergers and acquisitions between 2004 and 2011

Notes: This figure shows the largest mergers and acquisitions in the distribution fuel market between 2000 and 2012. The market share is calculated considering the national level market for December 2012. Data source: ANP.

Appendix A.1