FTC Staff Technical Report (December 21, 2004)

Robustness of the Results in GAO's 2004 Report Concerning Price Effects of Mergers and Concentration Changes in the Petroleum Industry

I. Introduction

At the request of Congress, the Government Accountability Office (GAO) undertook a broad study of the effect of mergers and changes in concentration in the petroleum industry. The resulting final report, titled *Effects of Mergers and Market Concentration in the U.S. Petroleum Industry* ("GAO Report" or "Report") was released in May 2004. The Report examined the eight industry mergers between 1994 and 1999. The Report provided 28 estimates of the effects of these mergers on wholesale prices of branded or unbranded gasoline for three gasoline types or specifications–conventional gasoline, reformulated gasoline ("RFG") and California Air Resources Board ("CARB") gasoline. The Report found that most mergers were associated with wholesale price increases, although the results were mixed. In sixteen cases, the Report found a positive and statistically significant price effect ranging from 0.4 to 6.9 cents per gallon ("cpg"). In seven cases, the Report found a negative and statistically significant effect, ranging from about -0.4 to -1.8 cpg. No statistically significant effect was found in the five other cases.

The GAO Report also examines relationships between wholesale price and concentration. The Report generally found positive, statistically significant correlations between Petroleum Administration Defense District ("PADD")-level refinery capacity concentration and wholesale prices. Ten estimates, covering the three fuel types and different geographic regions, were provided, all involved either conventional or RFG gasoline. In seven cases historically observed increases in concentration during the 1990s were associated with wholesale price increases ranging from 0.15 cpg to 1.3 cpg. Increases in concentration were associated with much larger increases in CARB gasoline prices (about 7 cpg for branded gasoline and 8 cpg for unbranded), although this result was less statistically significant than those for the seven estimations for conventional and RFG gasoline. Finally, the Report did not find a statistically significant effect of concentration on prices for unbranded conventional gasoline in the Eastern U.S. (PADDs I, II and III.).

The findings of the GAO Report have been widely interpreted to imply that petroleum mergers and changes in concentration during the 1990s were generally harmful to consumers. Accordingly these findings potentially have important implications for public policy, particularly for antitrust enforcement. However, the weight that any study should be accorded in informing public policy must depend, among other things, on the extent that its findings are robust to methodologically plausible alternative econometric specifications. The purpose of this Technical Report is to assist Conference Panelists by testing the robustness of a baseline model that represents our understanding of the methodology employed in the GAO Report. These robustness checks involve examining the empirical results of alternative approaches to controlling for the many factors affecting gasoline price other than mergers and concentration and with differing assumptions relating to statistical properties of the data. This technical report does not analyze all potentially important robustness checks of the GAO Report's empirical methodology. For example, we do not analyze market definition used in the GAO Report to construct market concentration for its price concentration study, or the endogeniety of concentration.

To undertake this robustness study, FTC staff purchased the same wholesale price data from the Oil Price Information Service (OPIS) that were used by the GAO researchers. We have limited our robustness analyses to the CARB and RFG gasoline specifications for budget reasons.[1] However, these two gasoline specifications are of particular interest due to the frequently voiced concerns about competitive conditions in the sale of gasoline in California and the fact that, in RFG, the GAO Report found a positive and statistically significant price effect in the Exxon/Mobil merger, despite broad, FTC-required divestitures in RFG areas to address antitrust concerns. More importantly, it is possible to explore many important robustness issues with the data for these two gasoline specifications.

Sections II and III of this report describe the data set and modeling issues in establishing the baseline against which our robustness checks will be compared. Our baseline represents our attempt to duplicate the GAO Report's empirical findings.

[1] As with the GAO Report, our baseline analyses of RFG includes only RFG with MTBE as an oxygenate and excludes localities using RFG with ethanol as an oxygenate.

To help establish this baseline, we had a series of very helpful exchanges with GAO researchers to understand key decisions made in constructing the data set used in their report and to seek clarification of various technical issues that were not transparent to us in the GAO Report itself. GAO researchers answered our specific questions about the data and methodological decisions and provided us with written documentation to clarify certain issues such as the identification of merger-affected and non-affected terminal racks.

Our baseline statistical results, though very close, do not precisely match the corresponding results in the GAO Report itself. There may be various reasons for the difference between our baseline and the results of the GAO Report. For example, construction of a data set for an empirical analysis is a complicated process. Data sources are collected with different frequency (e.g., monthly, weekly, annually) and many data sets are partially incomplete (not all data are available in all time periods). Further, many economic variables are "conceptual" in that they must be created by the researcher and are not simply provided by a data vendor. The authors of the GAO Report probably had to make dozens of different decisions in defining variables, dealing with missing data, and combining data collected with different frequency in constructing the data set used in their merger and price concentration studies. As a practical matter, it would be difficult for any researcher to enumerate or transmit literally every assumption made in the construction or manipulation of a data set. In addition, confidentiality restrictions and agency protocols precluded GAO staff from providing us certain of their data inputs and their programming codes. Subtle differences in our coding and construction of these data may thus also be a source of the differences between our baseline and the GAO Report results.

Section IV discusses and empirically examines identification issues relevant to the empirical methodology used in the GAO Report. In this section, we estimate a difference in difference model for the RFG study. We also vary the assumptions about the timing of merger effects in the CARB study. Finally, we examine whether the findings of the GAO Report are affected by removing all the control variables. The results in the GAO Report are not robust to alternative identification assumptions and the control variables have little effect on the results in the GAO Report.

II. Baseline: Construction of the Data Set

This section describes our recreation of GAO's data. This data recreation is based on the GAO Report and additional information given to the FTC staff by the GAO staff (see Appendix 1). We also provide some comments on some of the conceptual choices made in the GAO Report regarding the definition of some of the estimation variables.

A. Data Sources and Time Period.

We use the same five data sources used in the GAO Report. OPIS is the source for which firms post wholesale prices at given product terminal racks at a point in time and the posted prices. The Department of Energy's Economic Information Agency (EIA) is the source for market concentration, gasoline inventories, refinery utilization, and gasoline consumption data. Information on the timing of mergers comes from either the FTC or Thomson Financial. Inflation indices come from the Economic Report of the President.[2] Analyses of RFG prices are based on data from March 2, 1995 through December 31, 2000, (see GAO Report p. 122). GAO researchers's analysis of CARB gasoline prices uses data from May 16, 1996, though December 31, 2000 (see Report Table 16, p. 134).

B. Selection of Terminal Racks

The GAO Report examines the wholesale pricing of gasoline at various racks throughout the United States. Some racks sell a single type of gasoline (for example, conventional or CARB) while other racks offer multiple specifications of gasoline, most often both conventional and RFG. In presenting its regression results (Report Tables 21-28), the GAO Report states the number of rack locations included in each regression and each table corresponds to one of three types of gasoline: CARB, conventional, or RFG. The GAO Report itself does not state which racks are selling a particular specification of gasoline, nor does the Report provide information on how many potential racks were excluded or the reasons why particular racks were excluded. Additional documentation was provided to FTC

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[2] See GAO Report Table 13.

staff by the GAO staff contains a list of the rack locations used for the conventional, RFG and CARB analyses (see Appendix 1). GAO staff also told FTC staff that rack locations were omitted from the estimations when there was not a posted weekly price for two or more consecutive weeks for a given formulation.

According to the OPIS data, 28 rack locations reported selling branded RFG gasoline (with MTBE) and 26 rack locations reported selling unbranded RFG gasoline during the sample period. GAO researchers' econometric requirement of a balanced panel implies inclusion only of cities with complete data sets, that is, a reported price for each week in the sample period.[3] This balanced panel requirement results in the exclusion of drop 6 branded and 7 unbranded racks from the GAO Report estimations. The racks dropped from both the branded and unbranded RFG study are: Newark, New Jersey (the primary rack supplying the New York City metropolitan area); Covington, Kentucky (a large rack supplying RFG gasoline to the suburbs of Cincinnati, Ohio located across the Ohio River from Kentucky); Warren, New Jersey; the New York state racks of Long Island, New York, New York City, Mt. Vernon/Westchester; and the Gulf Coast rack in Texas.[4] Consequently, the Report's empirical analysis only examines pricing for a fraction of the RFG cities in the United States.[5]

OPIS reports data at the level of OPIS specific rack locations. In some cases an OPIS rack location corresponds to a metropolitan area, e.g. Louisville; in other cases it corresponds to a city or a set of gasoline terminals in close proximity but possibly located in different cities, e.g. Metro Dallas. For this reason, we shall refer to the OPIS geographic designations as "locations," not cities. Table 1 shows the rack locations for RFG analysis as well as the

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[3] If only one week in a sequence was missing, GAO researchers used linear interpolation to generate a price for the missing week. If 2 or more consecutive weeks of data were missing, GAO researchers dropped the rack from its sample.

[4] The unbranded RFG rack in Springfield, Massachusetts is also dropped from the study. In addition, because GAO researchers' analysis does not include RFG with ethanol, the Chicago metropolitan area and Milwaukee, Wisconsin are dropped from the analysis.

[5] Approximately 1/3 of all RFG is consumed in the areas not included in the Report's analysis. (EIA, Petroleum Marketing Annual, various years, Table 48)

merger overlaps used in the GAO Report. Tables 2 and 3 show the frequency of the number of firms posting at each RFG rack for branded and unbranded gasoline respectively.

OPIS rack locations do not necessarily correspond to distinct economic markets. Many OPIS rack locations are located very close together, and some are certainly located within the same metropolitan area. For example, in the sample of rack locations used in the GAO Report estimations analyzing branded RFG prices, five of the 22 OPIS rack locations are in metropolitan Dallas.[6] One of the OPIS-reported Dallas racks, Dallas Metro, is simply the aggregation of the four local Dallas racks. Thus price observations from the Dallas Metro rack do not add any information to the observations from the four individual Dallas racks included in the data set. If the individual racks in Dallas were actual markets, one of them would be a monopoly most weeks, while a second terminal usually only has three firms posting prices (Tables 2 and 3). Similar to the situation in Dallas, racks in Philadelphia, Pennsylvania and Paulsboro, New Jersey are included as separate observations despite both being located within the Philadelphia metropolitan area (Paulsboro is just across the river from Philadelphia in New Jersey).

Turning to CARB gasoline, OPIS reports on a total of 14 rack locations posting branded and unbranded gasoline prices for CARB gasoline in California. There are complete, balanced panels for 13 cities selling branded gasoline.[7] The GAO report states that it used data from six OPIS rack locations in analyzing branded CARB prices and seven rack-locations in analyzing unbranded CARB prices [8] Table 4a contains a list of all of the CARB racks reporting price data used by in the CARB merger event study in the GAO Report. Table 4b contains a list of the cities not used in the GAO Report in the CARB merger event study but used in our robustness checks.

The OPIS data also include information on various characteristics of gasoline which correspond to different environmental requirements for gasoline. In particular, OPIS records

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[6]OPIS refers to these racks as: Dallas/Fort Worth, Dallas/Arlington, Dallas/Grapevine, and Dallas/Southlake and Dallas Metro.

[7]The only CARB rack not containing a complete (balanced) panel of data during the Report's CARB studies time period is Barstow.

[8]See *GAO Report*, Tables 23 and 28.

whether CARB gasoline contains an oxygenate (MTBE) and the "reid-vapor-pressure" (RVP) of gasoline.[9] Seven of the fourteen racks posting CARB gasoline sell gasoline containing MTBE throughout the year. The other seven racks only sell CARB gasoline with MTBE during the winter months. Thus, every rack location posting CARB gasoline in the winter is selling CARB with MTBE. Environmental regulations also require that gasoline have different minimum RVP depending on the seasons. The RVP of CARB gasoline sold at *every rack* in California changes seasonally. No rack in California sold the same specification of gasoline throughout a calendar year over the sample period.

GAO researchers chose to analyze CARB gasoline prices at racks selling CARB gasoline containing MTBE throughout the year. This decision rule yielded six rack-cities posting a complete panel of CARB prices for branded gasoline (Colton, Imperial, Los Angeles, Sacramento, San Diego, and Stockton) and seven racks posting unbranded CARB gasoline (Barstow, Colton, Imperial, Los Angeles, Sacramento, San Diego, and Stockton).

Dropping from the data set those rack locations that require an oxygenate only for the winter eliminates half of the racks selling CARB in California (Bakersfield, Brisbane, Chico, Eureka, Fresno, San Francisco, San Jose). The excluded racks include those in the San Francisco Bay area, which is a major refining center, with almost 50% of the crude distillation capacity of California refineries that produce CARB gasoline.[10] The San Francisco refiners are also an important source of supply of gasoline for southern California. As discussed in more detail below, inclusion of the omitted racks in the estimation significantly changes the results from our baseline estimate for the Tosco-Unocal merger.

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[9] Reid-vapor-pressure ("RVP") is a measure of a gasoline's rate of evaporation. Because air temperatures are warmer during the summer, a different chemical blend is required to lower the evaporation rate to maintain air quality standards.

[10] Prior to their merger, Tosco and Unocal both owned and operated refineries in the San Francisco Bay area. Tosco also owned and operated a refinery in Southern California.

C. Variable Definitions and Frequency of Data

1. <u>Dependent Variable.</u>

The dependent variable in the GAO Report's merger and concentration estimations is defined to be the difference between the rack wholesale gasoline price and the spot price of West Texas Intermediate ("WTI") crude oil. In effect, this is a measure of the gross wholesale margin on gasoline sales. At any point in time, many firms are posting prices at the rack for a variety of types of gasoline, e.g., premium, diesel, or reformulated. GAO researchers reported "(w)e used the average rack prices at the rack cities…",[11] and Table 14 of the GAO Report states that the rack price is observed weekly. However, the GAO Report does not state how the average is calculated, e.g., is this the average calculated over all firms posting a branded (unbranded) price on a given day, or all firms posting a branded (unbranded) price in a given week. After discussions with OPIS, it became clear to FTC staff that GAO researchers had purchased the OPIS' weekly rack price report. According to OPIS, the weekly OPIS rack price report is not the average weekly price of branded and unbranded price of gasoline at the rack but the closing average price as of the Thursday in a given week; that is, the price is a *daily* price observed weekly.

GAO researchers deflated the wholesale margin by an annual price index. It is often appropriate to deflate time series data to take into account the potential impact of inflation. Typically, this would be done with a broad-based measure of inflation, such as the consumer price index (CPI), producer price index (PPI), or gross domestic product (GDP) deflator. In the context of this study, one may want to deflate the price difference between gasoline and crude oil prices to take into account changes in the cost of inputs other than crude oil prices. If the prices of these other inputs increase with inflation, firms may increase their gross margins to cover the increased input costs. The GAO researchers deflated the prices in their study using the Finished Goods Energy PPI sub-series. This series is much more volatile than the overall measures of inflation. For example, between 1999 and 2000, the Finished Goods Energy PPI increased 19.4 percent, while the overall PPI only increased by 1.8

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[11] Page 113, GAO Report.

percent.[12] In effect, use of this specific PPI deflator introduces the volatility of crude oil prices into the dependent variable. In section three of this report we test the sensitivity of using the Finished Goods Energy PPI as the deflator relative to the CPI.

2. Competition Variables.

a. Merger Variables

The GAO Report assigns merger indicator variables that define the rack locations affected by particular mergers.[13] The specific rule by which GAO researchers defined a competitive overlap was supplied to the FTC staff:

> A merger was assumed to affect a rack city if at the time of the merger both merging companies had posted gasoline prices for any formulation (conventional, RFG, or CARB) at the rack for at least 52 weeks immediately prior to the merger. The merger-affected rack city for each gasoline formulation was then identified, based on data availability. Then, for each gasoline formulation, the gasoline type (branded or unbranded) was also identified, based on data availability. (GAO staff communication, November 9, 2004).

Two firms are thus defined as competing at a rack if both firms post *any* form of gasoline price at *either* the branded or unbranded rack at any time in the year before the merger. For example, if Firm A sold only conventional gasoline at the unbranded rack in Houston and Firm B sold only RFG gasoline at the branded rack in Houston, the two firms would be defined as competing in Houston. Table 1 presents the rack locations used in the GAO Report RFG study and which cities GAO researchers treated as affected by which mergers.[14]

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[12]See Table B-66, *Economic Report of the President 2004*, p. 361.

[13] The merger dummies are defined on pp. 124-125 and are described in Tables 14 and 15 of the *GAO Report*.

[14]This decision rule may lead to misclassification in situations where firms participate in a region but do not post rack prices because they supply lessee retail dealers on a delivered tankwagon basis, sell gasoline at refinery gates under bulk contracts or own and operate retail outlets themselves. Thus they are selling gasoline in an area at retail but not at the rack. In addition, the GAO researchers are not consistent in how the deal with markets where the FTC required a divestiture following the merger. For example, the FTC required Exxon and Mobil to completely divest one of the merging firms branded marketing assets in the region corresponding to each rack included in the RFG

The merger variables are defined as indicator variables equal to 0 for the period before the merger is consummated, and equal to 1 for the period after the merger is consummated for those rack locations classified by GAO researchers as being affected by a merger. For example, the Marathon-Ashland indicator is equal to 0 prior to the joint venture (December 31, 1997) and 1 from the first observation in 1998 (January 5, 1998) through the end of the sample period (December 31, 2000) for those racks affected by the joint venture. [15]

The merger indicator variable for each merger is the same for the separate branded and unbranded estimations. The GAO Report estimates effects of mergers on wholesale margins separately for branded and unbranded gasoline. This approach might be justified because mergers in differentiated product markets can have different effects on different products. Many consumers view branded gasoline as superior to unbranded gasoline thus allowing branded sellers to charge some brand premium. An anticompetitive merger between two important brands might lead to a larger price increase for branded products than unbranded products. A merger of two substitutes leads to higher prices among products that are close (as opposed to distant) substitutes, see, e.g., Hausman et al. (1994)).

A reader of the GAO Report might then assume that merger effects for branded (unbranded) gasoline were estimated in rack cities where *both* of the merging parties sold

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study where Exxon-Mobil both posted prior to the merger, and as a result Exxon and Mobil did not merge their branded wholesale distribution assets in the RFG regions where they overlapped. GAO researchers however defined these racks locations as affected by the Exxon-Mobil merger. Exxon-Mobil was also required to divest one firms branded marketing assets and a refinery in California: the GAO Report however did not identify *any* rack in California as being affected by the Exxon-Mobil merger. This apparent absence of competitive overlap reflects the relative thinness of posted rack sales on the West Coast and differences in Exxon's and Mobil's marketing operations.

The type of fuel specification sold may also limit which firms participate in a market. RFG and conventional gasoline are different products. Refineries may need to invest significant resources to upgrade their plants to produce RFG gasoline. Refineries that produce RFG gasoline, however, typically also produce conventional gasoline. In contrast, some refiners producing conventional gasoline do not produce RFG gasoline. Thus, simply observing a firm posting a price for conventional gasoline at a rack location that posts RFG gasoline prices does not imply that that firm can also supply RFG gasoline at that rack. GAO researchers categorizes Total/UDS as competing at the Dallas Metro rack (although neither firm posts at the same rack in Dallas). According to OPIS data, however, during the sample period Total *never* sold RFG gasoline in the United States. However, as shown on Table 1,GAO researchers had an overlap between Total and UDS in RFG.

[15] For a description of what assets were involved in each transaction examined in the RFG and CARB studies see Appendix 2.

branded (or unbranded) gasoline.[16] This assumption would not be correct. More often than not refiners typically post gasoline prices at either the branded rack or the unbranded rack, not both. An inspection of the OPIS data shows large differences in the merging firms' participation at the branded and unbranded racks, see Tables 5 and 6. Shell never posted unbranded prices for CARB or RFG gasoline in the relevant rack locations during the sample period. Mobil, Texaco, Total and Amoco *never* sold unbranded RFG gasoline in the rack cities included in the analysis. Total and Ashland *never* sold branded RFG gasoline in the included rack cities. Marathon posted branded RFG gasoline prices at only one rack in the GAO Report (Louisville).[17]

b. *Concentration Measure*

Refinery crude oil distillation capacity data from the Energy Information Administration (EIA) are the basis of concentration measures. These data are used to

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[16]Exxon and Mobil, Shell and Texaco, and BP and Amoco *never* both sold unbranded RFG gasoline at the same rack. Thus, it would be impossible to estimate merger effects at the unbranded rack unless GAO researchers defined competition to include posting at either the branded or unbranded rack.

[17]The GAO Report's focus on rack overlaps does not account for other methods of distributing of gasoline. As discussed earlier, rack overlaps will not capture where refiners participate in a region without posting prices at a rack. Distribution through means other than rack sales is particularly important in California. The method of gasoline distribution varies dramatically throughout the U.S. In California only 18% of gasoline is sold at either the branded or unbranded rack (See EIA 2003 California Gasoline Price Study, Figure 6-2, p. 43).

During the sample period of the GAO Report, Shell, for example, had a large number of gas stations in Los Angeles, San Diego, San Jose, and near the rack in Brisbane (north of San Francisco's airport) and did not post branded or unbranded gasoline prices at these racks. According to OPIS's station-specific retail pricing data, in the year prior to the Shell-Texaco merger there were 332 Shell stations in the Los Angeles metropolitan area (of 832 total stations in the OPIS data set) with 86 of these stations in the city of Los Angeles itself. In the OPIS sample corresponding to the San Diego metropolitan area there are 83 Shell stations (of 282 total stations) with 43 stations located in the city of San Diego. Finally, in the OPIS sample for the San Francisco metropolitan area, Shell has 340 stations (of 551 total stations). San Jose and South San Francisco (the city closest to the Brisbane Rack) are both included in OPIS's data for metropolitan San Francisco. There are 28 stations in OPIS data set for San Jose and 6 for South San Francisco. Shell was is a major participant in supplying gasoline to these regions. Similarly, Texaco was an important participant in Stockton. In the year prior to the merger 6 of the 25 gasoline stations reporting data in the OPIS sample were Texaco stations (10 were Shell stations).

In analyzing the effect of the Shell/Texaco joint venture in California, GAO researchers concluded that Shell and Texaco did not compete in Los Angeles and San Diego because only Texaco (and not Shell) posted at these racks. Similarly, GAO researchers did not classify Stockton as affected by the Shell/Texaco joint venture because only Shell posted prices at the Stockton rack. The information from OPIS shows, Shell and Texaco supplied gasoline in every region analyzed in the Report's branded CARB study. We conclude that the GAO Report incorrectly classified the Los Angeles, San Diego, and Stockton rack locations as being unaffected by the Shell-Texaco I joint venture.

calculate annual, PADD level concentration in refinery capacity. These annual data are available from the EIA website for 1994, 1995, 1997, and 1999-2004.[18] The data are a snapshot of distillation capacity as of January 1st of each year. No data are available for 1996 and 1998. The GAO Report researchers estimated concentration for 1996 and 1998 by averaging the concentration in those years adjacent to the missing year. Based on the HHIs report for the year 2000 reported in GAO Report Figures 13-17 and accompanying text, the GAO researchers used data for operable total crude oil distillation capacity per calendar day.[19] GAO researchers appeared to correct for some (but not all) refineries that are owned by the same company but are listed by EIA with different names or are part of joint ventures.[20]

However, it appears that several joint ventures remain unaccounted for: Chalmette Refining LLC was treated as its own company, even though it is a joint venture between ExxonMobil and PDVSA, which also owns Citgo. Similarly, Lyondell Citgo Refining is a joint venture between Lyondell and Citgo, and Deer Park Refining is a joint venture between Shell and PEMEX, yet each of these apparently were treated as an independent firm.[21] It also appears that the Shell Chemical refineries were assumed to be separate from Shell, and later Shell's joint venture with Texaco and Saudi Aramco. Finally, the GAO researchers apparently did not take into account that the Exxon Refinery in PADD V was being operated under a "hold-separate" agreement in 2000 pending the FTC's required divestiture of Exxon's California assets, which were purchased by Valero. Since the HHIs for all weeks in 2000 are based on the refinery ownership as of January 1st, the GAO researchers treated the

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[18] http://www.eia.doe.gov/oil_gas/petroleum/data_publications/refinery_capacity_data/refcapacity.html

[19] EIA provides data for total capacity, operating capacity, and idle capacity. EIA also provides capacity data by stream day (the capacity for a single day) and by calendar day (the annual capacity divided by 365, which takes into account factors such as downtime for maintenance).

[20] GAO staff gave additional information about the HHI calculations as shown in Appendix X, but were unable to share their HHI calculations.

[21] In the FTC merger report, joint ventures between firms with other refining assets are divided between the owners based on ownership share of the joint venture, while joint ventures with a parent without other domestic operations are attributed to the parent with domestic operations. Therefore, the Deer Park Refining joint venture is attributed to Shell, while Chalmette Refining is split between Mobil (later Exxon Mobil) and PDVSA. The GAO researchers appear to treat these joint ventures as individual companies.

former Exxon and the ExxonMobil refinery as being under common ownership for the entire year.

Table 7 shows the concentration measures based on our understanding of how the GAO researchers calculated HHI for their report. The table also shows concentration corrected for the joint venture ownerships discussed above. Correcting the ownership of the refineries mentioned above changes the concentration levels for PADD II in 1995 and 1997, and PADD III for all the years with data.

Concentration may also be based on operating capacity instead of operable capacity as defined by EIA, and this measure is also shown in Table 7. The difference between the concentration measures based on total operable and operating capacity is that refineries that have crude distillation units which are not being used, in this case asphalt refineries, are not counted in operating capacity. Asphalt plants do not make gasoline. In the next section we test whether price-concentration relationships are sensitive to these three HHI measures.

3. Control Variables

The GAO researchers used a number of variables to control for factors that affect gasoline prices over time but are not related to mergers or concentration.[22] Like the concentration measure, none of these variables are measured at the rack location level. The capacity utilization and the variables for specific supply disruptions are fairly straightforward. The third variable, Inventories Ratio, is an important control in the Report's estimations.[23] We begin this section with a detailed discussion of the creation of the Inventories Ratio variable and conclude with a brief description of the capacity utilization and supply disruption variables.

Inventories Ratio variable is designed to measure the ratio of realized gasoline

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[22] In its econometric model (see Section III), the GAO Report also includes rack-location fixed-effects to control for differences in the price levels across locations.

[23] See, for example, p. 147 of the GAO report, where GAO claims that this variable controls for seasonality. However, there are also seasonal impacts based on the extra cost of producing gasoline to meet more stringent summer specifications. These costs would not be captured by GAO inventory ratio.

inventories to expected demand. The Inventories Ratio is a key control variable in the GAO Report's analysis of gasoline markets. According to the GAO Report, this variable should control for factors that cause wholesale gasoline prices (net of crude costs) to change over time, including seasonality effects.[24]

The construction of this variable is involved. According to the GAO Report, the variable was created as follows:

> Gasoline inventories were normalized using the PADD mean over the sample period. The demand for wholesale gasoline was based on prime suppliers' sales of total regular gasoline in each state. We used an approach similar to the Borenstein and Shepard's (1996b) study to estimate the demand for gasoline. A simplified demand equation, in reduced form, for each state was obtained using the following regression equation:
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> $$\text{NVOLUME}_t = a_0 + a_1\text{NVOLUME}_{t-1} + \sum b_j\text{MONTH}_j + a_2\text{TREND}_t + a_3\text{TREND SQUARED} + e_t$$
>
> where t=time (monthly), j=2,…, 12. NVOLUME is the normalized monthly demand for gasoline in each state---prime suppliers' sales of gasoline in each state divided by the state mean over the sample period. The data for prime suppliers' sales was obtained from the EIA. Month_j is a monthly dummy variable, and Trend and TREND_SQUARED are time trend and square of time trend, respectively. The R^2 of these predicting equations varied between 0.50 and 0.96. The expected demand is the fitted values from estimating the regression equation above because it is assumed that suppliers' (sic) form their expectations of next-period demand based on current and past sales volumes observed in their markets. The expected demands for the states were aggregated to the PADD level to match the data for inventories.[25]

Appendix 1 offers additional information about the construction of the Inventories Ratio variable which was supplied to FTC staff. We now describe our recreation of the Inventories Ratio variable based on this understanding.

The Inventories Ratio is a function of two variables: gasoline inventories and expected gasoline consumption. Weekly inventory levels at the PADD level are reported by

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[24] See page 197 section b, GAO report.

[25] GAO report, page 121, footnote d to Table 13.

EIA and include all types of gasoline (e.g., conventional, RFG, premium, and regular octane). The consumption data are reported monthly by EIA at the state level.[26]

The inventories ratio is defined as the ratio of "one period lagged levels of normalized gasoline inventories" to expected demand as in the equation below:

$$\text{Inventories Ratio}_{pt} = \frac{\tilde{I}_{pt}}{\hat{V}_{pm}}$$

Where $\tilde{I}_{pt}$ is the gasoline inventory in PADD p in week t-1 divided by the average PADD level inventory over the entire sample period, and $\hat{V}_{pm}$ is the predicted normalized level of gasoline volume (consumption) in PADD p in month m. While the GAO Report does not state how the *weekly* inventory data and *monthly* consumption data are combined, GAO staff informed us that the monthly number was used for every week within the month. In other words, the level of $\hat{V}_{pm}$ used to construct the Inventories Ratio is constant within a month.

The predicted volume of gasoline in month m in PADD p, $\hat{V}_{pm}$, is derived from the following estimating equation (1) using *state* level gasoline consumption data:

$$(1)\ \tilde{V}_{sm} = a_0 + a_1\tilde{V}_{s,m-1} + \sum_j b_j \text{Month}_j + a_2 \text{Trend}_m + a_3 (\text{Trend})^2 + e_m$$

Where $\tilde{V}_{sm}$ is the volume of gasoline sold in state s in month m divided by the average volume of gasoline sold during the sample period in state s, $\tilde{V}_{s,m-1}$ is the one month lag of $\tilde{V}_{sm}$, Month_j are month indicators, Trend_m is a monthly time trend, and e_m is a disturbance. It appears, and we assume, that equation (1) is estimated separately by state since the GAO

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[26] EIA consumption data used is derived from EIA's "prime supplier data" and measures consumption for regular gasoline only, excluding mid and premium octane grades.

Report informs that "(t)he expected demands for the states were aggregated to the PADD Level to match the data for Inventories."[27]

While the GAO Report does not exactly spell out how the (normalized) expected demands from states aggregated to the PADD level to match the (normalized) Inventory data, GAO staff told us that the expected PADD volumes are defined to have a mean of 1 (similar to the mean reported in Table 19, page 140). For purposes of establishing our baseline model, we therefore construct the PADD level expected volumes as:

$$\hat{\tilde{V}}_{pm} = \frac{\sum_s V_{sm}}{\textbf{Number of States in PADD p}},$$

where $\hat{\tilde{V}}_{sm}$ is the predicted (scaled) volume in state s in month p.

Turning to the other two control variables, GAO researchers used a national measure of weekly refinery capacity utilization as a measure of gasoline supply. These weekly capacity utilization data are directly available from EIA. In describing the use of this variable, GAO researchers stated that, "(a)lthough the data for UTILIZATION RATES are available only at the national level and do not allow us to control for differences in utilization rates across the United States, the data are still useful because gasoline is mostly fungible, especially in the eastern part of the U.S."[28] We adopt this variable in our baseline model.

Finally, GAO researchers appropriately noted that short term supply disruptions can

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[27] See page 121 GAO Report, last sentence of footnote d in Table 13.

[28] GAO Report, p. 115. While there is certainly some validity to this statement, refiners in the Gulf region (PADD III) of the U.S. ship considerable amounts of gasoline to the PADDs I and II, it is at odds with the use of other variables in the report. For example, the key control variable relates *PADD* level inventories and consumption (Inventories Ratio) to rack location gasoline pricing, suggesting that the distinctions between PADD level capacity utilization and national capacity utilization are indeed important. The argument that gasoline is fungible across PADD's is in tension with using PADD level concentration measures.

Further, at least in the short run, it is not clear that gasoline is fungible across the United States. States have responded to EPA air quality requirements by creating literally dozens of fuel specifications, so called "boutique fuels." Because of the different boutique fuel specifications, it is often not possible to ship gasoline between contiguous geographic areas in response to supply disruptions. The GAO Report's separate estimations for different gasoline specifications itself reflects the important differences in gasoline specifications (and potential lack of fungibility of fuel types). The Report estimated price effects resulting from mergers and concentration differ substantially depending on fuel type (see tables 21-28).

dramatically affect gasoline prices. To control for these outages they constructed indicator variables for rack cities affected by supply disruptions during a defined time period. For the RFG estimations we examine below, the GAO researchers defined a variable, "MW Crisis", to "account for supply disruptions that occurred in the Midwest in June 2000."[29] This variable is defined to equal to one during June, 2000 for cities in PADD II. (Louisville is the only rack location in the Report posting RFG-MTBE gasoline in PADD II.) For the CARB estimations, the GAO researchers created a single indicator variable to account for three separate supply shocks 1999 and 2000.

We adopt these disruptions variable definitions in our baseline model. However, as discussed in more detail below, we consider some alternatives as part of our robustness checks. Specifically, the supply shock in the Midwest lasted longer than one month and affected the entire eastern half of the U.S. (PADDs I, II, and III). [30] We also consider how the CARB estimation results are affected by controlling for the three West Coast supply shocks with three separate indicator variables.

III. Baseline Econometric Model

In this section we present our baseline model, which represents our attempt to duplicate the GAO Report's statistical methodology. We have focused our attention on the GAO Report's RFG (branded and unbranded) merger event studies and price concentration studies and the CARB branded gasoline merger event studies because they do not require analysis of the GAO Report's instrumental variables estimator.[31] GAO researchers used a very similar econometric model for estimating both the effects of mergers and of

[29] GAO report, page 115.

[30] RFG phase II which went into effect in January 2000 affected the entire United States not just PADD II as stated in the GAO report.

[31] The GAO Report's instrumental variables estimator involved modification of the STATA procedure used to estimate the GAO Report's empirical results. The resources required to duplicate the instrumental variables technique developed by GAO researchers are beyond the scope of the current study.

concentration on branded and unbranded rack RFG gasoline prices.[32] We begin by describing the baseline model on merger effects.

A. Merger Effects Model

Wholesale gasoline prices net of crude prices are modeled as a function of merger indicators, Inventories Ratio, Utilization Rates, and indicator variables for supply shocks affecting either the Midwest or California. Equation (2a) and equation (2b) are used to estimate the merger effects for RFG and CARB gasoline, respectively.

$$\begin{aligned}(2a)\ (\text{Rack Price}_{it} - \text{WTI}_t) = {} & \alpha_0 + \alpha_{1,1}(\text{UDS-Total})_{it} + \alpha_{1,2}(\text{Marathon-Ashland})_{it} \\ & + \alpha_{1,3}(\text{Shell-Texaco II})_{it} + \alpha_{1,4}(\text{Bp-Amoco})_{it} \\ & + \alpha_{1,5}(\text{Exxon-Mobil})_{it} + \alpha_2 \text{Inventories Ratio}_{jt} \\ & + \alpha_3 \text{Utilization Rates}_t + \alpha_4 \text{MWCrisis}_{it} + u_{it}\end{aligned}$$

$$\begin{aligned}(2b)\ (\text{Rack Price}_{it} - \text{WTI}_t) = {} & \gamma_0 + \gamma_{1,1}(\text{Shell-Texaco I})_{it} + \gamma_{1,2}(\text{Tosco-Unocal})_{it} \\ & + \gamma_2 \text{Inventories Ratio}_{jt} + \gamma_3 \text{Utilization Rates}_t \\ & + \gamma_4 \text{WCCrisis}_{it} + u_{it}\end{aligned}$$

As noted in the previous section, some of the variables in equation (3) are observed at different levels of geographic aggregation. The rack price of gasoline (Rack Price) is a daily price observed weekly (t) for each rack (i) posting either RFG or CARB gasoline prices, the price of crude oil (WTI) and national refinery utilization rates are observed nationally each week (t), the Inventories Ratio is reported at the PADD level (j=1, 2, 3 for RFG, j=5 for CARB) each week (t), the Midwest Crisis and West Coast indicators correspond to discrete time periods, and the merger indicators (UDS-Total, Marathon-Ashland, Shell-Texaco II, BP-Amoco, and Exxon-Mobil for the RFG study, Tosco-Unocal and Shell-Texaco I for CARB) are equal to one in racks affected by a merger after the merger consummation dates designated in the GAO Report.

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[32] See GAO Report at 122-128.

It is important to note how merger effects are identified in this specification. Merger effects are defined as the difference in price post-merger in a city affected by a merger and the price in cities unaffected by a merger (pre- *and* post-merger) and in cities affected by a merger pre-merger, holding other factors constant (i.e., Inventories Ratio, Utilization Rates, and MW or WC shock variables). For example, other factors held constant, the effect of the UDS-Total merger in equation (3a) is defined as the difference in price in rack locations affected by UDS-Total post-merger relative to prices in rack locations affected by UDS-Total pre-merger *and* rack locations unaffected by the UDS-Total merger pre- and post-merger. Following GAO researchers, the model used rack location fixed effects, which are implemented by "demeaning the data by rack location (i.e. transforming the data into mean-deviations)".[33]

GAO staff estimated the branded and unbranded RFG and branded CARB merger event studies using the XTGLS procedure in STATA. The XTGLS procedure is used to estimate feasible GLS models using panel data. There are many different types of feasible GLS estimators that can be estimated by XTGLS. The model specified in the GAO Report uses a GLS estimator that accounts for a common (single) autocorrelation coefficient for all racks (Corr(ar1)), a separate error variance for each rack, and a covariance between each set of racks (these last two options are implemented by "Panels(Correlated)." All of these options appear to be consistent with gasoline pricing. The error term in equation (3) is highly autocorrelated. Table 22 of the GAO Report (which shows RFG merger effect results) reports an autocorrelation coefficient of 0.84. Second, it seems reasonable to expect that the error term in equation (3) may be heteroskedastic across cities. Finally, the error term in equation (3) is likely to be correlated across cities at a point in time. Following the GAO Report, this is the approach used in our baseline model.

While we agree that the disturbance in equation (2a) and (2b) is autocorrelated, has a different variance in different racks, and is likely correlated across racks at a point in time, it is unclear how best to use this information in estimating the price effects of mergers. If the basic model being estimated is misspecified, which almost surely is the case since it is a

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[33] GAO report, page 126, GAO staff and FTC staff meeting.

reduced form rather than structural estimating equation, re-weighting the data using a GLS estimator could exacerbate model misspecification.[34] As discussed in further detail below, we show that the baseline models estimations of RFG and CARB price effects are indeed very sensitive to the GLS modeling assumptions used.[35]

B. Price Concentration Study

Our baseline specification of the price concentration regressions is essentially the same as those for the merger effects. The only substantive difference is the substitution of an annual PADD-level measure of concentration (HHI_{jT}) for the merger indicators as shown in equation (4) below.

$$(3)\ (\text{Rack Price}_{it} - \text{WTI}_t) = \beta_0 + \beta_1 \text{HHI}_{jt} + \beta_2 \text{Inventories Ratio}_{jt} + \beta_3 \text{Utilization Rates}_t + \beta_4 \text{MW Crisis}_{it} + \varepsilon_{it}$$

Geographic, time, and aggregation units differ across variables in equation (4). Rack Price varies by rack location *i* and week *t*; WTI is a national crude oil price measured weekly; concentration (HHI) is measured *annually* (T = 1995, 1996, 1997, 1998, 1999, 2000) by PADD (j = 1, 2, 3); Inventories Ratio is measured weekly by PADD (j = 1, 2, 3); Utilization Rates is measured nationally by week; and the MW Crisis indicator is equal to 1 for four weeks in June 2000 for one RFG city, Louisville, Kentucky.

The statistical issues in estimating the price-concentration regression are similar to

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[34] See, e.g., Dickens (1990).

[35] The fourth issue that GAO researchers confronted is that a rack location's price, Inventories Ratio and Utilization Rate may be jointly determined: variables meant to control for changes to supply and demand (Inventories Ratio, Utilization Rate) may be determined (in part) by rack prices. We have been unable to determine how the GAO researchers implemented its instrumental variables (IV) estimator. Footnote 37 of the GAO report (at 128, n.37) provides the only reference to the Report's correction for the endogeneity of the Inventories Ratio and Utilization Rate variables while also controlling for autocorrelation, heteroskedasticity across rack cites, and contemporaneous correlations between rack cities. In including all four corrections, GAO researchers rewrote some of the STATA code. Because we do not adequately know what procedure GAO researchers used and because GAO researchers were unable to share with us their modified STATA programs used to estimate their IV models, we have refrained from attempting to construct and test corresponding baseline IV specifications. Because GAO researchers found that the Inventories Ratio and Utilization Rate variables are not endogenous in the branded and unbranded RFG and branded CARB equations, and as a result used models not requiring instruments, we concern ourselves only with constructing and testing baselines for those gasoline types.

the merger-effects regression equation from (3). Based on the GAO report and subsequent discussions with GAO staff, our baseline equation (4) for RFG gasoline uses the STATA XTGLS procedure controlling for (i) heteroskedasticity across groups, (ii) contemporaneous correlation between groups, and (iii) a common autocorrelation correction. Below, we explore the robustness of the baseline specifications (3) and (4) to inclusion of additional control variables and to different specifications of the XTGLS GLS estimator. As noted above, EIA did not report information necessary to calculate the HHI for 1996 and 1998. Following GAO researchers, we deal with this problem by linearly interpolating missing HHI data for 1996 and 1998. The sample period for RFG is 1995 to 2000 and 1996 to 2000 for CARB gasoline.

IV. Robustness of the Baseline Results - Alternative Estimation Assumptions and Additional Control Variables

A. Introduction

In this section of the study we examine the robustness of our baseline models' results for the RFG and CARB merger event studies and the RFG price concentration relationship. This section is structured as follows. We begin by discussing our baseline results and examining the robustness of the RFG merger event study. The next section describes our baseline results and robustness checks for the CARB merger event study. The last section discusses our baseline results and robustness checks on the price-concentration study for RFG gasoline

B. RFG Merger Effects

All of the tables estimating merger effects (and the relationship between price concentration) share the same format, see, e.g., Table 8. Column 1 produces the estimates from the GAO report relevant to the robustness test being considered (here the GAO merger event study for branded RFG),[36] column 2 presents our baseline results (which correspond to the GAO estimates), and the additional columns represent various robustness tests of the baseline model (here examining how the results change relative to the baseline when the model is estimated using different feasible GLS estimators). The bottom panel of the table describes the chosen options in STATA's XTGLS for the regression results reported in a given column. For the baseline model, these options include a common autocorrelation coefficient (Correction for autocorrelation=yes) the option "panels: correlated=yes," and the estimation technique does not use iterated GLS (iterated GLS=no).

We begin by estimating the baseline model for branded gasoline (results in Table 8). The results of our baseline (column 2) are quite similar to the GAO Report's estimates (column 1). All of the estimated coefficients from our baseline are of the same sign and order of magnitude as those reported in the GAO report. It is likely that the differences result from subtle differences in how we and the GAO researchers defined variables, dealt with missing data, and combined data measured with different frequency.

The other columns of the table show how the estimates change from the baseline when different forms of the GLS estimator are used. The columns to the right of the baseline column in Table 8 represent different GLS estimators that can be used in the STATA procedure XTGLS. Recall that a GLS estimator is used to generate more efficient estimates than OLS. The idea behind the GLS estimator is that if the form of model heteroskedasticity is known or can be estimated, this information can be used to reweigh the data used in the estimation procedure to obtain better (lower variance) estimates compared to OLS. While the parameter estimates coming from a GLS procedure will somewhat differ from OLS, the estimates should all be similar. That is, under the maintained hypothesis that the baseline model specification estimates are unbiased, all of the GLS estimators (and the OLS estimator) are unbiased. All of the estimates in Table 8 use some version of a GLS estimator (i.e., the correction for autocorrelation is a version of a GLS estimator).

Table 8 shows that the estimated merger effects change dramatically compared to the baseline depending on the GLS estimator used. In particular the regressions of columns 3, 4, and 5 yield much larger price effects (in absolute value) for the Exxon-Mobil,

[36] GAO report, page 142, table 22, column 2.

Marathon-Ashland, Shell-Texaco, and Total-UDS mergers than the regressions shown in remaining columns in the table. The difference between columns 3, 4, and 5 and the rest of the table is the use of the "panels=correlated" option. The fact that the parameter estimates change strongly suggests that the different weighting assumptions implicit in the two GLS estimators are empirically important. In essence, this can be viewed as a model specification test. The change in parameter estimates resulting from different weight matrices suggests that the data generating process is different for different observations.

Table 9 presents the corresponding results for unbranded RFG. Our baseline results are again quite similar to those reported in the GAO report. All estimated coefficients have the same sign, are of the same order of magnitude, and (with the exception of the coefficient corresponding to the Exxon-Mobil merger) are quantitatively very similar.

The results for the robustness analysis (examining different GLS estimators) are also qualitatively similar to those in Table 8. The use of the "panels=correlated" (columns 2, 6, 7, and 8) yields much smaller merger effects than models not using this option (columns 3, 4, and 5). The finding that the different types of GLS estimators result in very different parameter estimates again strongly suggests that our baseline econometric specification may be misspecified.

Table 10 (branded RFG) and Table 11 (unbranded RFG) present the results of additional robustness tests. First, we consider if the inclusion of controls for seasonality and supply shocks affect wholesale margins even after controlling for these factors through Inventory Ratio and Capacity Utilization variables.[37] Second, we examine if baseline results are sensitive to the choice of deflator. Following the GAO Report, our baseline regression used the Energy PPI to deflate wholesale margins (rack price less crude oil price). This is a questionable choice of deflator because the price of crude has already been subtracted in defining the dependent variable. The consumer price index (CPI) is a plausible alternative deflator. Deflating by the CPI, allows consumer prices to be comparable over time by controlling for inflation. This may be more relevant since we are ultimately concerned with measuring how refining mergers (or increases in refiner concentration) have affected

[37] In response to comments from FTC staff, GAO researchers concluded that additional controls for seasonality were unnecessary because of the inclusion of the inventory ratio, see GAO report at 196-197.

consumers.

Controls for seasonality are likely to be important predictors of the wholesale gasoline margins. Column 3 of both tables 10 and 11 includes month indicators as measures of seasonality (December is the omitted month). Wholesale margins vary throughout the year peaking in the summer. The differences in margins are both statistically and economically significant. Wholesale margins in May are estimated to be 6 cents more per gallon than December for branded gasoline and 6.5 cents more for unbranded gasoline. We also include an indicator variable (MW Crisis 2) which is defined to be one for all RFG racks from May, 2000 through July, 2000 to better control for the supply shock in the summer of 2000 that affected PADDS I, II, and III (not just PADD II in May of 2000 as the baseline assumes). This variable is also economically and statistically significant. All these variables are important predictors of wholesale gasoline margins and are not included in the baseline model. Their inclusion, however, does not significantly alter most of the estimated merger effects (compare merger effects estimates in columns 2 and 3 in Tables 10 and 11).[38]

Using the CPI rather than the baseline's energy PPI appears to have a material impact only on the Marathon-Ashland merger effect, essentially cutting it in half for both branded and unbranded RFG margins.[39] While arguably an important distinction conceptually in the RFG regressions, the use of the PPI or the CPI does not, as a practical matter, appear to affect the size of the estimated merger effects very much in the RFG regressions.

C. *CARB Merger Results.*

Table 12 presents our baseline results for the estimated price effects of the Tosco-Unocal and Shell-Texaco I mergers on branded CARB gasoline. Similar to the RFG study, our baseline estimates (column 2) are similar to results in the GAO Report (column 1). Our baseline estimate of the Tosco-Unocal merger effect is smaller (5.2 cents versus almost 7 cents) and is not statistically significant at conventional levels. Our estimate of the Shell-

[38]The primary exception is the coefficient on the Shell Texaco merger for branded gasoline, which nearly doubles (in absolute value) when the indicator and additional Midwest crisis indicators are added to the model.

[39]The estimated BP-Amoco coefficient in the branded RFG regression also increases when using the CPI rather than the PPI (compare column 2 to 4, Table 10), however, this does not occur in the unbranded RFG regression (compare column 2 to 4, Table 11).

Texaco joint venture is somewhat smaller but is statistically significant. The parameter estimates for the Inventory Ratio and Capacity Utilization variables, however, are quite different.

Paralleling the robustness analysis for RFG, we examined the robustness of the baseline findings to different implementations of the GLS estimator in the STATA XTGLS procedure. As with RFG (see Tables 8 and 9), the results change considerably depending on whether or not the "panels=correlated" option is used or not (specifications in columns 2, 6, 7, and 8 versus 3, 4, and 5). All of the GLS estimators should be unbiased estimates of the merger effects *if the model is correctly specified.* Alternative methods of re-weighting the data (via a GLS estimator) yield very different coefficient estimates, suggesting the data generating process is not the same for all observations and the model is misspecified.

Dramatic changes in the estimated coefficients depending on the GLS estimator used suggests that there is model misspecification, but it does not demonstrate the form of the model misspecification. The primary distinction between models using the "panels=correlated" option and those that do not is that STATA estimates an additional 15 parameters corresponding to the covariances between racks at a point in time.[40] STATA then re-weights the data matrix using these covariances in estimating the coefficient estimates.

One possibility is that the pooling assumption in the baseline model is incorrect; that is, the assumption that the coefficients for each of the explanatory variables in the estimating equation are the same for each rack in GAO's CARB regression is incorrect. Because there are only 6 racks in baseline CARB regression, the appropriateness of this assumption can easily be tested. To test this assumption we interact all of the explanatory variables in the baseline model with indicators for each of the six racks in GAO's CARB study: Colton, Imperial, Los Angeles, Sacramento, San Diego and Stockton. We then conduct a chi-squared test to see if the coefficients on the explanatory variables are the same for all cities. Before showing the results of this test, we deal with one additional detail.

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[40] The "panels=correlated" option causes STATA to estimate a weight matrix containing a separate covariance between each pair of racks. The number of covariances estimated increases exponentially with the number of racks included in the analysis (the formula is: $n*(n+1)/2 - n$, where n is the number of racks included in the regression). For GAO's CARB models with 6 racks this implies 15 additional covariances. For branded RFG (with 22 racks) this implies 231 covariance, and branded conventional (with 282 racks) 39,621 covariances.

Following the GAO Report's approach, the baseline model assumes that Los Angeles, San Diego, and Stockton were unaffected by the Shell-Texaco merger because Shell did not post branded or unbranded gasoline prices at the Los Angeles or San Diego racks (Texaco posted branded prices at both rack locations) and Texaco did not post at the Stockton rack (Shell posted branded prices at the Stockton rack). As described earlier, Shell was, in fact, one of the market leaders in these regions, but it directly supplied its stations rather than posting at the rack. That is, Texaco and Shell definitely competed in Los Angeles San Diego, and Stockton prior to their merger, although not directly in rack sales to independent distributors.[41] We thus adopt an alternative assumption that Shell and Texaco competed in these locations.

Table 13 presents the test of the misclassification of the Shell-Texaco merger overlaps and the pooling assumption with regard to the cities in California. Column 1 of the table presents the results from the GAO Report while Column 2 shows our baseline results. Column 3 shows the results of modifying the baseline to reflect the premerger competition between Shell and Texaco in Los Angeles, San Diego, or Stockton. Columns 4-9 correspond to a *single regression* that estimates the separate coefficients for each of the six cities in the baseline regressions (the columns are labeled for the city they correspond to). While none of the parameters are precisely estimated, the null hypothesis that the data generating process is the same for all cities (the p-value is .0001). can easily be rejected.[42] This strongly suggests that the model used in the GAO report is misspecified.

What is most notable about the Table 13 results is that the combination of the pooling assumption and the re-weighting of the data (using the STATA's panels="correlated" option) causes the coefficient estimate on the Shell-Texaco merger to change signs compared to the baseline (comparing column 3 to columns 4 through 9). When estimated separately by city, the Shell-Texaco merger coefficient is always negative and economically large (typically 1 to 2 cents), though never statistically significant. In contrast,

[41]For example, if Texaco attempted to raise rack prices to its distributors pre-merger, while Shell kept its delivered prices to its retail outlets constant, the resulting change in relative prices at the retail level would tend to result in Shell gaining volume at the expense of Texaco.

[42] Using GAO's model (which incorrectly identifies Shell and Texaco as not competing in Los Angeles, San Diego, and Stockton) we also reject the pooling assumption with a p-value of .0022.

coefficient estimate under pooling is *positive* and roughly 1.3 cents (but not statistically significant). We interpret this as evidence that the pooling assumption in the baseline model is problematic and could lead to incorrect inferences. While less dramatic, the results for Tosco-Unocal also appear to be affected by the pooling assumption. The estimated change in the wholesale margin associated with Tosco-Unocal estimated separately by rack-location (columns 4-9) is smaller than the estimate obtained by pooling (column 3). The typical difference is on the order of 1cent.

Table 14 presents results on whether seasonal controls (month indicators), alternative measures of shocks and inflation indices are important determinants of wholesale margins relative to the baseline model for CARB. In column 3, we include 11 month indicators (to control for seasonality) and we break up the baseline's single control (WC) into three separate supply shocks (WC1, WC2, and WC3).[43] As the table shows, inclusion of these seasonal controls and alternative measures of supply shocks are important predictors of wholesale margins. Holding the baseline's Inventories Ratio and Capacity Utilization variables constant, gasoline prices in California appear highly seasonal. The estimates in column 3 show that CARB gasoline prices in the spring and summer are estimated to be 4-10 cents higher than December. While not precisely estimated, the magnitude of the effects of the various supply shocks on CARB wholesale gasoline margins (WC1, WC2, and WC3) appear to be economically different (7.6 cents for WC1 versus 2.6 cents for WC2) although sometimes not statistically different from zero.

The choice of deflator also appears to affect the estimated merger effects. Comparing the baseline results in column 2 (which uses the energy PPI) with those in column 4 (which uses the CPI), we find that the estimated price effect of the Tosco-Unocal merger falls by a little more than 1.5 cpg. When accounting for all of these factors (seasonality, alternative controls for supply shocks, and inflation) the estimated price effect of Tosco-Unocal falls to roughly 50% of its baseline value.

As discussed on page 7, GAO researchers chose to analyze only those rack

[43]The GAO creates a single indicator variable to correspond to three different supply shocks that affected California gasoline prices (see GAO Report, page 120). Implicit in this variable definition is the assumption that all three shocks had the same affect on California gasoline pricing. It is possible, however, that the shocks differed in how severely they affected California's gasoline prices. For this reason we create three indicators corresponding to each of the three shocks, WC1 (equal to one between 3/5/99 and 9/10/99, zero otherwise), WC2 (equal to one between 2/12/00-5/6/00, zero otherwise), and WC3 (equal to one between 7/10/00-12/31/00, zero otherwise).

locations selling CARB gasoline that contained an oxygenate (MTBE) throughout the year. This decision rule resulted in the exclusion of seven California racks that sold CARB gasoline, including rack locations in the San Francisco Bay area.[44] This exclusion, which is maintained in our baseline analyses, could diminish the model's ability to detect merger effects where they might be most significant. In particular, the Tosco-Unocal transaction resulted in merger of competing refineries located in the Bay Area.[45] Exclusion of San Francisco area rack locations eliminated those rack locations closest to the Tosco and Unocal's merging refineries.

To examine this sample composition issue, we have estimated variations of the baseline specification using a data set comprised of those CARB cities excluded in the baseline and using a data set consisting of all racks selling branded CARB gasoline in California, including those using an oxygenate for only part of the year.[46] The results of these estimations are shown in Table 15. Column 1 of Table 15 reproduces the results from GAO Report, and Column 2 shows our baseline model results. Column 3 shows results of the baseline model rerun using only data from the excluded rack locations; Column 4 shows the results from the baseline model specification estimated using all CARB rack locations with complete branded CARB price series. The results for the previously excluded rack locations are very different from the baseline. Rather than estimating a 5.2 cent price increase from the Tosco-Unocal merger (Column 2), a regression run on just the excluded racks shows virtually no estimated change (-0.29 cents) in price resulting from the Tosco-Unocal merger (Column 3). When all of the rack locations are included in a single regression, the baseline model yields estimated price effects of the Tosco-Unocal merger of essentially zero (.03 cpg). Sample composition may also be an issue in estimating the price effects of the Shell-Texaco merger: the sign of the estimated price effect changes depending on the rack locations included in the sample.

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[44] The seven excluded racks locations are Bakersfield, Brisbane, Chico, Eureka, Fresno, San Francisco, and San Jose.

[45] Prior to their combination, Tosco and Unocal both operated refineries in the Bay Area. Tosco also operated a refinery in Southern California.

[46] The Barstow rack is not included in this regression because it does not have a complete data series for branded CARB gasoline.

In sum, the baseline model's estimated merger-related CARB gasoline price effects do not appear robust. Small changes in the form of GLS estimator, the inclusion of seasonal controls, and different price deflators each yield very different estimated price effects. Further, the findings seem to be very sensitive to the racks being studied.

C. *RFG Price-Concentration Relationship.*

In this section, we analyze the robustness of our baseline model of price concentration relationship in RFG for both branded and unbranded gasoline. Table 16 summarizes our findings for branded gasoline. As with the previous corresponding tables, column 1 shows the GAO Report findings and column 2 presents our baseline results. The GAO Report results and our baseline results are similar. Using the model used in the GAO report with our data set, we estimate a similar, although somewhat smaller effect of concentration on prices. Comparing the first and second columns, the main difference is that we estimate a larger coefficient for the Inventory Ratio.

The other columns of Table 16 present results from alternative implementations of the GLS estimator. Focusing on the HHI coefficient, the results can change dramatically relative to the baseline specification depending on the GLS estimation procedure used. For instance, the HHI coefficients in Columns 7 and 8 are one third the size of the baseline results and are not significantly different from zero. Consequently, the particular implementation of the GLS estimator affects the significance and magnitude of the HHI coefficient. The coefficients on the Inventories Ratio and Utilization Rate variables also show changes across alternative GLS specifications.

Table 17 summarizes the corresponding results for unbranded RFG. Our baseline model found a positive but not statistically significant relationship between HHI and wholesale price, while the GAO Report found a positive and significant (at the 10 percent level) effect.[47] Similar to the branded results in Table 16, the estimate of HHI coefficient changes in significance and magnitude relative to the baseline depending on how the GLS estimation is implemented. The coefficients on the control variables also fluctuate

[47] The GAO Report incorrectly indicates a 5 percent significance level.

significantly.

Table 18 shows results from incorporating month indicators, and the alternative measure of the Midwest Gasoline Crisis into the baseline specification for branded RFG. Columns 1 and 2 present the GAO Report and our baseline results, respectively. Column 3 presents the results from including additional control variables. As with the merger event studies, these variables are important predictors of the price of gasoline. Moreover, the estimated relationship between price and concentration significantly changes when these control variables are added. The more accurate accounting for the supply shock in 2000 (Midwest 2) and the month indicators are all economically and statistically significant, despite the accompanying inclusion of the Inventories Ratio variable. GAO researchers' conclusion that the Inventories Ratio (and to a lesser extent Utilization Rates variable) sufficiently control for factors (other than concentration or mergers) affecting wholesale margins over time is not supported by this analysis.

Table 18, columns 4 and 5 demonstrate how the results are affected when the CPI is used instead of the PPI energy deflator both without the additional control variables. Most notably, the significant relationship between price and HHI disappears when the CPI deflator is used. Comparing columns 4 and 5 again shows that additional control variables are important predictors of the price of gasoline and that the estimated relationship between price and concentration is smaller when they are included. The results in Table 18 show that either adding additional control variables or switching the deflator eliminates the significant estimated relationship between price and concentration.

Table 19 presents the results for the corresponding analyses for unbranded RFG. Columns 1and 2 show the GAO Report results and the our baseline results, respectively. Column 3 shows the results with the added controls. Adding these variables lead to changes similar to those observed in branded analyses. Monthly indicators to control for seasonality and a more accurate variable corresponding to the 2000 supply shock are important predictors of gasoline prices even when including the GAO's control variables. Columns 4 and 5 demonstrate the changes in results when CPI is used instead of the PPI energy deflator. Switching to the CPI deflator changes the estimated relationship between price and HHI. Additional control variables are also important predictors of the price of unbranded RFG as

Column Five also shows. None of the FTC estimated relationships between price and concentration shown on Table 19 are statistically different from zero.

Table 20 summarizes our robustness checks using alternate measures of HHI in branded RFG analysis The variable, HHI–GAO Report, is our measure of GAO Report's HHI variable. HHI–Corrected for Ownership adjusts this HHI measure to account for those joint ventures that were not correctly accounted for by GAO researchers.[48] HHI–Operating Capacity is, in our view, a better measure of HHI (conditional on the choice to measure HHI at the PADD level). It measures operating capacity not operable capacity and includes the correction for joint ventures. Operating capacity excludes crude distillation capacity which has not been used to make gasoline in recent years. The difference in operable and operation capacity is crude distillation capacity at asphalt plants.

Columns 1 and 2 of Table 20 respectively present the GAO Report results and our baseline results. Columns 3 and 4 correspond to the baseline model substituting the HHI–Corrected for Ownership and HHI-Operating Capacity measures. Using either of the two alternative measures of HHI, there is no statistically or economically significant relationship between price and concentration.

Table 21 shows the results for the corresponding analyses for unbranded RFG. The results are essentially the same. No regression yields an economically or statistically significant relationship between price and concentration, and alternative concentration measures lead to smaller estimated effects of concentration on price than the baseline estimation.

B. Robustness II – More Fundamental Identification Issues

While it is relatively straightforward to determine *if* prices changed after a merger or joint venture, it is much more difficult to determine *why* prices changed. Either a merger or unrelated changes in costs or demand can increase prices. The difficulty facing researchers is determining how prices changed relative to the "but-for" world of where there was no transaction or change in concentration. The researcher would like to compare the price of gasoline in a locale or locales where a transaction reduced the number of competitors

[48] The corrections to the HHI calculation are described in Section IV of this study.

with the price in the same location and the same time period with the same firms still competing. For example, the researcher ideally would want to compare prices in Houston after Exxon and Mobil merged in the year 2000 with prices in Houston where Exxon and Mobil operated independently in the year 2000. Since this is obviously not possible, the researcher is left with comparing the state of the world that can be observed, Houston after Exxon and Mobil merged in the year 2000, with a proxy for the locale city and time period absent the merger.

The critical question is what is the best proxy for the post-event world assuming that the event did not occur. One possible answer is to compare the prices pre- and post-merger in the same locale. In this type of analysis, the price of the merged firms' product (the market price) is regressed on demand and supply/cost shifters plus a merger indicator. The demand and supply shifters attempt to control for factors that affect price over time but are not related to the merger. This approach has been used in Schumann *et al*. (1992), Schumann *et al*. (1997), and Karikari *et al*. (2002).

The key to this identification strategy is controlling adequately for important supply and demand factors that affect the price of the product over time. Otherwise, the estimated merger effect will erroneously incorporate these factors. Continuing the example from above, this approach would use the 1999 price of gasoline in Houston as a proxy for the 2000 price without the merger, holding other factors constant (e.g., the Inventories Ration and Capacity Utilization).

A second approach to identifying the price effects of a change in market structure is to compare the price of the product pre- and post-merger in an area with a change in market structure to the price in another geographic area without the change in market structure pre- and post-merger. In the case of a merger event study, the difference between the price of the product of the merged firm and the price of the product in another market is regressed on controls for time or seasonality and a merger indicator variable. This is a version of a difference-in-difference estimator. Merger retrospectives studies that use some form of a difference-in-difference estimator include Barton and Sherman (1984), Kim and Singal (1993), and Vita and Sacher (2001).

For either of these options to yield valid results the researcher must control for factors that cause the price of gasoline to be different, either over time or across the cities. For the first option, comparing the price within one city before and after the transaction, it is crucial to have sufficient control variables with sufficient variation over time to explain the changing price of gasoline. In this case the average unexplained variation of the dependent variable, the wholesale margin, in pre and post merger time periods measures the merger effect. Any factor that causes higher or lower margins post merger will incorrectly be included in the estimated price effect of the event if it is not captured by the control variables. For example, more restrictive gasoline formulation requirements make gasoline more expensive relative to the price of crude. If changes in gasoline formulation are coincident with a merger and not controlled for, this increase of cost and price would be inappropriately included in the estimated merger effect.

The identification of merger effects in the GAO researchers combined elements of both of the two approaches described above. Merger effects are defined as the difference in prices post-merger in a rack locations affected by a merger *and* prices in rack locations affected by a merger pre-merger plus the prices in rack locations unaffected by a merger (both pre <u>and</u> post-merger), holding other control factors constant. For example, other factors held constant, the effect of the UDS-Total merger in equation (2a) is defined as the difference in price at racks affected by UDS-Total post-merger relative to prices at racks affected by UDS-Total pre-merger *and* racks unaffected by the UDS-Total merger pre- and post-merger.

Identification of merger price effects of mergers is difficult in virtually any setting. For this reason, economists typically check the robustness of their findings to reasonable alternative model specifications to ensure they have, in fact, successfully estimated the price effect of a merger. In the remainder of this section we will focus on three identification areas that are particularly relevant to the methodology used in the GAO Report. We describe the key conceptual issue in each case and provide empirical support demonstrating its relevance. In each case, we find reason to doubt the validity of the methodology used in the GAO Report.

We begin with a description of the "event windows" used in the GAO's Report merger analysis. Event windows refer to the time period surrounding the merger. Second, we examine the decision to explicitly control for factors that change prices rather than using a difference-in-difference estimator to identify merger effects.[49] Finally, we examine more generally, the power of the GAO Report's key control variable, the Inventories Ratio, in explaining changes in wholesale margins that are coincident with mergers.

Understanding how merger effects are identified by the GAO Report's merger event analyses requires careful thought. Because GAO researchers estimated a single regression equation for all rack locations affected by five mergers (in the RFG analyses) and two mergers (in the CARB gasoline analyses), the event windows for the same merger necessarily differ for different rack locations. For example, in the CARB study GAO researchers classified all racks as affected by the Tosco-Unocal merger, which occurred in April 1997, but only four racks as affected by the Shell-Texaco merger, which occurred in February 1998 .[50] Thus, for the CARB study all racks have the same "pre-merger" window, May 16, 1996 through April 4, 1997. For those racks also affected by the Shell-Texaco merger, the post-merger window for the Tosco-Unocal merger ends on January 31, 1998. For those markets unaffected by the Shell-Texaco merger (under GAO's classification scheme), the post-merger period for the Tosco-Unocal merger ends when the sample period ends: December 31, 2000. Thus, the post-merger period used to identify the price effect of the Tosco-Unocal merger is roughly ten months long for two-thirds of the sample and three years and nine months for the other third.

The "event-window" issue is more complicated in the RFG regressions because more mergers are involved. According to the GAO researchers' classification, six rack locations are unaffected by mergers, while six, six, two, and two racks are affected by one, two, three, and four mergers, respectively (see Table 1). This means that size of many of the pre- and post-merger windows vary across the RFG rack locations. That is, in some rack locations (affected by few mergers) changes in wholesale margins over relatively long periods of time are used to identify the price effects of a merger. In contrast, rack locations affected by many mergers (e.g., Fairfax and Richmond) the time period over which price effects are

[49] While GAO researchers include cities affected and unaffected by mergers in their merger studies, they are not estimating merger effects using a difference-in-difference model. See GAO Report, Comment 36, page 207.

[50] GAO researchers misclassified the Shell-Texaco merger as not affecting three of the CARB racks studied, Los Angeles, San Diego, and Stockton.

identified is much shorter.

One specification test typically performed in merger event studies examines the sensitivity of results to alternative choices for pre- and post-merger event windows. For example, it is *a priori* unclear how long it takes a firm either to raise its price (or limit output) in response to an increase in market power or to lower its price (or increase output) in response to efficiencies.[51] The GAO Report's study design makes such a robustness analysis very difficult to undertake. By estimating all merger price effects in a single regression, a modification of one window will affect other windows. If separate regressions each focusing on a merger were estimated separately, it would have been possible to explore the sensitivity of merger effects to the choice of event window.[52] Pooling five mergers into a single estimating equation causes identification of merger specific price changes in the GAO Report's RFG regressions to be very difficult to understand. Similar difficulties arise in the Report's analysis of seven mergers affecting the prices of conventional gasoline.

However, it is easier to explore robustness of results to choice of event windows in the merger regressions for CARB gasoline. In the GAO Report's estimation of merger effects for CARB gasoline, the post-merger window for Tosco-Unocal is 44 weeks long (for those cities also categorized as being affected by the Shell-Texaco merger)[53] and the post-merger window for Shell-Texaco is 152 weeks long. As a result, the Shell-Texaco post-merger window is more than three times longer than that of the Tosco-Unocal merger.[54] To explore the sensitivity of the results from our CARB gasoline baseline model to the length of the merger window, we have estimated three additional regressions. Results are shown in Table 22. The first two columns of Table 22 contain the estimated effects on wholesale margins from the GAO Report and our baseline estimates. Column 3 uses the same variable

51 A recent paper examining the price effects and efficiencies associated with banking mergers in Italy found that three years were required for the efficiencies of the mergers to be realized (Focarelli and Panetta, 2003).

52 GAO researchers also could have partially controlled for multiple mergers affecting a single rack by examining racks only affected by a single merger, or racks that are affected by mergers separated by some minimum time period, e.g., at least one year.

53 Because GAO researchers classified Shell and Texaco as not competing in Los Angeles, San Diego, and Stockton, the post-merger time period for the Tosco-Unocal merger for these racks is the entire sample period following the Tosco-Unocal merger (196 weeks).

54 A similar issue arises because the size of the pre-merger window varies across rack locations.

definitions as the baseline, but forces the post-merger windows for both the Shell-Texaco and Tosco-Unocal mergers to be 44 weeks; thus shortening the merger window for Shell-Texaco. All data after December 3, 1998 is dropped. The estimated effect of Shell-Texaco goes from approximately -1 cent per gallon to statistically zero. More striking is the change in the estimates on the Inventories Ratio control variable. It declines to roughly 20% of its original size (from -40 to -9) and is no longer statistically significant (although the standard errors of both estimates are roughly the same.)

This analysis suggests that the baseline model is misspecified, since the coefficient on the Inventories Ratio changed dramatically and the estimated merger effects change. Because of the misclassification of Los Angeles, San Diego, and Stockton as being unaffected by the Shell-Texaco merger, the estimated merger indicators for Shell-Texaco could be biased for regressions shown in Columns 1, 2 and 3. Column 4 regression estimates when Los Angeles, San Diego, and Stockton are classified as being affected by the Shell-Texaco merger. Column 5 shows regression estimates the model used for the results in Column 4, but forces the post-merger windows for Shell-Texaco and Tosco-Unocal to be of the same length (the analogue of column 3). The estimated price effect of the Shell-Texaco merger changes and the estimated relationship between the inventory ratio and prices changes dramatically. The results suggest that the estimated price effects are sensitive to the size of the merger windows.

As discussed above, the GAO researchers chose to control for the but-for world by explicitly including control variables (indicators corresponding to supply shocks, national capacity utilization, and the PADD level ratio of gasoline inventories to expected demand) rather than through a difference-in-difference estimator. If the GAO's control variable approach is successful in controlling for changes in wholesale gasoline margins unrelated to mergers, then its findings should be similar to those generated by a difference-in-difference estimator. Thus, we estimate two variations on the baseline specification for RFG with difference-in-difference estimators.[55] The first estimator is described in, equation (4a) below:

[55] We do not estimate the equation for CARB gasoline because both the Unocal-Tosco and Shell-Texaco mergers affected all CARB racks studied by GAO(i.e., the equations (5a) and (5b) would not be identified for the CARB study).

$$
\begin{aligned}
(4a)\ (\text{Rack Price}_{it} - \text{WTI}_t) = {} & \alpha_0 + \alpha_{1,1}(\text{UDS}-\text{Total})_{it} + \alpha_{1,2}(\text{Marathon}-\text{Ashland})_{it} \\
& + \alpha_{1,3}(\text{Shell}-\text{Texaco II})_{it} + \alpha_{1,4}(\text{Bp}-\text{Amoco})_{it} \\
& + \alpha_{1,5}(\text{Exxon}-\text{Mobil})_{it} \\
& + \pi_{1,1}(\text{Post UDS}-\text{Total})_{it} + \pi_{1,2}(\text{Post Marathon}-\text{Ashland})_{it} \\
& + \pi_{1,3}(\text{Post Shell}-\text{Texaco II})_{it} + \pi_{1,4}(\text{Post Bp}-\text{Amoco})_{it} \\
& + \pi_{1,5}(\text{Post Exxon}-\text{Mobil})_{it} + \\
& + \alpha_2 \text{Inventories Ratio}_{jt} \\
& + \alpha_3 \text{Utilization Rates}_t + \alpha_4 \text{MWCrisis}_{it} + u_{it}
\end{aligned}
$$

In equation (4a) there are five new indicator variables (e.g., Post UDS-Total), corresponding to each of the five mergers where the indicator variable equals 1 for *all racks* after the merger. The interpretation of the coefficients on the merger effects changes relative to that of the GAO Report's specification (equation (2a)). For example, $_{1,1}$ is the change in wholesale (rack) margin of all racks following the UDS-Total merger; i.e., the change in rack margins that is coincident (but not caused by) the UDS-Total merger. $_{1,1}$ is the change in the wholesale (rack) margin in racks affected by the UDS-Total margin *relative* to racks unaffected by the UDS-Total merger; that is, $_{1,1}$ has the interpretation of being the change in wholesale margins caused by the UDS-Total merger.

The second difference-in-difference estimator is described by the following equation:

$$
\begin{aligned}
(4b)\ (\text{Rack Price}_{it} - \text{WTI}_t) = {} & \alpha_0 + \alpha_{1,1}(\text{UDS}-\text{Total})_{it} + \alpha_{1,2}(\text{Marathon}-\text{Ashland})_{it} \\
& + \alpha_{1,3}(\text{Shell}-\text{Texaco II})_{it} + \alpha_{1,4}(\text{Bp}-\text{Amoco})_{it} \\
& + \alpha_{1,5}(\text{Exxon}-\text{Mobil})_{it} + \sum_{t=1}^{t=305} \psi_t \\
& + \alpha_2 \text{Inventories Ratio}_{jt} \\
& + \alpha_3 \text{Utilization Rates}_t + \alpha_4 \text{MWCrisis}_{it} + u_{it}
\end{aligned}
$$

The difference between specifications (4a) and (4b) is how changes in wholesale margins are controlled for that are unrelated to the mergers. In specification (4a), five indicator variables are added to the regression to measure the change in average wholesale margins in all racks during the merger windows assumed in the GAO baseline model. In specification (4b), separate indicator variables are added for each week in the sample to control for the average weekly change in wholesale margins across all rack locations. This is a more general method of controlling for changes to wholesale gasoline margins that are potentially coincident with the merger windows defined by the GAO researchers, but not caused by the mergers being studied. The model using weekly indicators is likely to control better for all common weekly shocks common to rack locations (in PADDS I, II, and III), including seasonality. The weakness of this approach, is that it accounts for much of the variation in wholesale margins with which we can estimate merger effects. The interpretation of the merger effects ($_{1,1}$, …, $_{1,5}$) is the same in equations 4a and 4b, but is different than that in (equation 2a and 2b). Results are shown in Tables 23 and 24 for branded and unbranded RFG respectively. Column 1 shows the GAO Report findings and Column 2 shows our baseline results. Column 3 reports the estimates of specification (4a) and Column Four shows the results for specification (4b).

Our baseline model's results for Exxon-Mobil are not robust to either difference-in-difference estimator. By controlling for general changes in wholesale margins (in racks not affected by the merger), we estimate much smaller price effects than in the baseline model. For branded gasoline, the estimated price effect of Exxon-Mobil is about 0.11 cents (*one tenth* of the baseline estimate, 1.34 cents) and for unbranded gasoline (Table 24) the price effect is estimated to be -0.34 and -0.26 cents per gallon (compared to the baseline estimate of baseline estimate of 0.77 cents).

Interestingly, the coefficient on the Post Exxon-Mobil variable (controlling for changes in the wholesale margin for all racks following the Exxon-Mobil merger) is large (roughly 6.8 and 8.9 cents per gallon for branded and unbranded gasoline, respectively) and statistically significant. This suggests that the baseline model specification is measuring a general increase in wholesale margins coincident with the Exxon-Mobil merger rather than a price effect associated with racks where Exxon and Mobil competed prior to their merger.

The difference-in-difference results also strongly suggest that the baseline control variables do not control for the large increase in wholesale margins coincident with the Exxon-Mobil merger because they differ substantively from the baseline results.

The BP-Amoco estimated merger effects for branded RFG decreases when estimated with both difference-in-difference estimators, and is no longer statistically significant when compared to the baseline. The change from using the difference-in-difference estimates for Shell-Texaco II differs for branded and unbranded RFG: the estimated change in margin is essentially zero and insignificant for branded RFG and becomes positive (and statistically significant) for unbranded RFG. With one exception, the other coefficients estimated using our baseline specification and the difference-in-difference estimators appear to be similar.[56]

We conclude this section with additional analysis of the GAO Report's Inventory Ratio variable. GAO researchers correctly conclude that refiners make their production and distribution plans in response to expected gasoline demand. Every year refiners build up large inventories of gasoline in the spring to satisfy demand in the summer when consumption is greater than production. Similarly, in the fall, refiners in the eastern United States switch some production capacity away from gasoline to make heating oil. In addition, refiners in the Gulf region change the proportion of gasoline supplied to PADD I and PADD II in response to changes in expected relative prices. For example, the supply shock that affected refineries in the Midwest in 2000 was felt throughout the eastern half of the U.S. as refiners shipped gasoline to the Midwest from elsewhere in the United States.

Modeling production and product allocation process for gasoline is not straightforward. Almost certainly, any feasible technique will not control for all potentially important factors and will be subject to criticism. For this reason, it is essential that the technique be clearly described and tested for validity. The GAO Report does not explain how its inventory variable controls for changes in wholesale margins and does not test the robustness of its findings to alternative measures of this control variable. It is impossible for any study to conduct all possible robustness checks. However, because the Inventory Ratio variable is the key variable in the identification of the GAO Report's merger effects, it is critical to have confidence in its ability to control for factors affecting wholesale margins that

[56] The coefficient on the Inventories Ratio and utilization rates variables is much smaller when using equation (4b) instead of (4a) for branded RFG.

are coincident with mergers. We briefly provide some theoretical concerns below and then describe two empirical robustness tests of the GAO Report's Inventories Ratio variable.

The purpose of the Inventory Ratio variable is to control for changes in supply and demand that may affect wholesale margins. GAO researchers argue that if expected demand is high relative to realized inventories then prices will rise.[57] The variable is defined as the ratio of PADD level lagged gasoline inventories to expected PADD demand. There are many obvious critiques of this measure.

First, as noted above, every year refiners build inventories in the spring to cover demand in the summer to optimize production in response to seasonal demand changes. This implies a pattern between *expected* inventories and expected demand and suggests the need to control separately for predictable changes in supply and demand and surprises resulting from supply or demand shocks. For example, wholesale prices might be a function of expected inventories, expected consumption, shocks to consumption, and shocks to supply.

Second, it is important to remember that gasoline is not the only product produced by refineries. A significant fraction of refining capacity is devoted to home heating oil production during the fall and winter, particularly in PADD I, and to diesel fuel throughout the year. Changes in refinery product slates (and the anticipation of this switch in product slates) will have an effect on expected gasoline inventories, and, by implication the expected inventory ratio. For these reasons, it is not clear that changes in the expected ratio of inventories to demand (the Inventory Ratio) would have much impact on wholesale margins. In contrast, large deviations in the ratio of actual inventories to demand relative to expected inventories to demand would be expected to have large impacts on wholesale margins.

Third, it is unclear why the PADD level is the correct unit of observation for a control variable measuring the amount of gasoline available for sale (the ratio of inventories to sale). If one is interested in controlling for very short-run shocks to demand or supply, e.g., less than a month, data at the PADD level are almost certainly too broad a measure. It takes some time to move gasoline between refinery centers and racks within a PADD or from one rack to another within a PADD. In trying to control for relatively short term shocks to wholesale margins, some measure of gasoline inventories relative to demand at or near a

[57] See, e.g., GAO report Table 13, page 117.

terminal (or possibly a state) would be a more appropriate measure.

Similarly, for shocks of medium duration in the Eastern section of the U.S., PADD III provides a significant fraction of the gasoline consumed in PADDS I and II, and is the marginal source of supply. PADD III contains much of the refining capacity in the United States, and refiners in the Gulf change the fraction of product shipped to consumers in PADDS I and II in response to changes in expected relative prices. It is difficult to conceive of a situation where a PADD level measure of the quantity of gasoline available for sale (i.e., the Inventories Ratio) would be a sensible control for a rack in PADD I or II without also controlling for gasoline available in PADD III for shipment. Finally, it is unclear why the GAO Report examines the expected level of demand and the realized value of (lagged) inventory. If demand shocks are autocorrelated, refiners likely change their inventory holding decisions in response to information about the current period's demand shock to updated their forecasts of demand tomorrow. There appears to be an inconsistency in using a forecasted level of demand and a realized level of (lagged) inventory in the creation of the GAO Report's Inventories Ratio variable.

We conduct two empirical analyses to test the validity of the GAO Report's Inventory Ratio variable as a primary control to identify merger effects. First, we explore the effects of the Inventory Ratio for different PADDS on wholesale margins. Second, we explore the impact *of any of* the GAO Report's control variables on the estimated merger effects.

Tables 25 and 26 show the regression results of two robustness checks of the Inventory Ratio variable for branded and unbranded RFG, respectively. First, we test to see if the effect of gasoline inventories to expected demand on wholesale prices varies by PADD. PADD's that receive sizeable imports from outside, such as PADDS I and II receiving shipments from PADD IIII, the impact of a change in Inventory Ratio may be different than a self-sufficient region such as PADD III. This difference can be seen when comparing Column 2 to Column 3 of the Tables 25 and 26 which interacts the Inventories Ratio with an indicator of the racks PADD location. The relationship between the Inventory Ratio in a PADD and wholesale margin differs across PADDs. The estimated coefficient on the inventory ratio in PADD II is very different than that for PADDs I and III. Further, PADD III, which is self-sufficient, has the lowest estimated coefficient on the Inventory Ratio.

This second set of regressions (column 4) includes two variables to account for the fact that PADD III exports gasoline to PADDS I and II. Specifically, we enter an interaction between the Inventories Ratio at time t in PADD III and an indicator for whether the rack is located in either PADD I or PADD II. These results appear in Column 4 of Tables 25 and 26. When the interactions are included in the model, the coefficients on the own PADD Inventory Ratio for PADD I and III appear to be different (i.e. -3 for PADD I and -12 for PADD III). The magnitude of the coefficients on the PADD III Inventory Ratio on wholesale margins in PADDS I and II are large and statistically significant at at least the 10% level. Taken together, these findings suggest that the baseline model is misspecified in that the effect of inventories relative to consumption on wholesale margins differs across PADDs, and that the inventories ratio in PADD III affect pricing in PADDS I and II. Analogous to Tables 25 and 26, Tables 27 (branded RFG) and 28 (unbranded RFG) examine the importance of the Inventories Ratio in the estimated price concentration relationship. These Tables show similar results for the price concentration regressions.

Despite observing very different empirical relationships between the Inventory Ratio and wholesale margins across PADDs, the estimated merger effects do not vary much across Columns 2 (the baseline), 3, and 4 of Tables 27 and 28. In fact, other than the difference-in-difference models *none* of the specific control variables (or their alternatives) appear to have much impact when compared to our baseline results for RFG. It appears that all of the measured controls, while correlated with wholesale margins, do not appear to affect the estimated merger effects. That is, the control variables do not appear to be correlated with the pre-and post-merger windows specified by GAO researchers.

To test this conjecture, we have modified the branded and unbranded RFG merger and the branded CARB baselines specifications by dropping *all* of the control variables other than the merger indicators.[58] These findings appear in Table 29. Table 29 is broken into three parts: RFG branded, RFG unbranded, and CARB gasoline The first two sub-columns corresponding to each column repeat the GAO Reports's findings, our baseline, and the

[58]The models are still estimated using fixed-effect; i.e., all variables are measured as deviations from rack-location means.

models estimated without control variables. For both the branded and unbranded RFG merger studies, the controls have no meaningful impact on the estimated merger effects. This is particularly puzzling because we know there are factors which cause gasoline margins both to rise and fall dramatically and persistently over time (e.g., the autocorrelation in virtually every regression presented by us or in GAO Report is greater than .8). This is evidence that the control variables (Inventories Ratio, National Capacity Utilization, and the Midwest supply indicator) do not control for many factors that cause gasoline prices to change over time.

The findings for the CARB study are different. The inclusion of the control variables does have an impact on the estimated price effects of the merger. This can be seen by examining the final panel of Table 29. By dropping all of the control variables the estimated price effect of the Tosco-Unocal merger increases by roughly one-third and the estimated price effect of the Shell-Texaco merger is no longer economically (or statistically) significant (comparing columns 8 and 9). Further, the results presented previously, e.g., the results in Table 14, show that controls for seasonality, supply shocks, and deflating gasoline prices using the CPI (instead of the PPI) lead to sizable changes in the estimated price effects of mergers in California.

The findings in the RFG price concentration regressions are also not that affected by the inclusion of control variables. Table 30 show the GAO Report results, our baseline results and the estimated price concentration relationship without control variables for branded and unbranded gasoline. In both cases, the estimated relationship between price and concentration for branded and unbranded is smaller without the control variables but the changes are relatively small.

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Appendix 2

I. RFG Study

A. Marathon/Ashland

USX-Marathon and Ashland announced in May of 1997 the planned combination of their downstream operations into a refining and marketing joint venture, owned 62 percent by USX-Marathon and 38 percent by Ashland. Marathon contributed refineries in Garyville, Louisiana; Robinson, Illinois; Texas City, Texas; and Detroit, Michigan. Ashland contributed refineries in Catlettsburg, Kentucky; St. Paul, Minnesota; and Canton, Ohio. Marathon also contributed 51 terminals, and Ashland contributed 33 terminals. Marathon also contributed 3,980 retail outlets in 17 states, while Ashland contributed 1,420 retail outlets in 11 states. The combined firm has a retail presence in 20 states. Marathon also contributed 5,000 miles of pipelines to the joint venture (Platt's Oilgram News, May 16, 1997). Marathon and Ashland signed the definitive joint venture agreement in December 1997, and consummated the joint venture on January 1, 1998.

B. Shell/Texaco (Motiva)

In 1997, Shell, Texaco and Saudi Aramco agreed to combine most of their downstream assets in two new joint ventures, Equilon and Motiva. Only the Motiva joint venture is relevant for the RFG study, which covered the Gulf Coast and East Coast.[1] Shell contributed refineries in Norco, Louisiana, while Texaco contributed refineries in Convent, Louisiana; Port Arthur, Texas; and Delaware City, Delaware, which were part of its joint venture with Saudi Refining (Star Enterprises). Shell also owned or supplied approximately 8600 branded stations in 40 states, along with terminals and other distribution assets. Texaco (including the joint venture) owned or supplied approximately 13,800 branded stations in 46 states, along with terminals and other distribution assets. In the Motiva area, Shell and Texaco agreed to divest one of the firms interest in a pipeline in the Southeast.

[1] The only RFG city that was used in the study that is in the area that became part of the Equilon joint venture is Louisville. Shell supplied RFG in Louisville, but Texaco was not in that market.

C. BP/Amoco

In 1998, BP and Amoco agreed to merge their entire operations. Most of the value of these firms is from their upstream operations, but both firms had significant downstream assets in the United States as well. BP owned 2 refineries in Belle Chasse, Louisiana, and Toledo, Ohio, while Amoco owned 5 refineries in Texas City, Texas; Whiting, Indiana; Yorktown, Virginia; Mandan, North Dakota; and Salt Lake City, Utah. BP also operated or supplied approximately 7000 BP-branded retail stations in 20 states, while Amoco operated or supplied approximately 9000 Amoco-branded retail stations in 32 states.[2] States where both BP and Amoco had significant branded retail operations included Georgia, North Carolina, South Carolina, Alabama, Mississippi, Tennessee, Florida, Pennsylvania, and Michigan.

As part of a Federal Trade Commission consent decree, BP and Amoco agreed to divest retail assets in Tennessee, Pennsylvania, Georgia, Florida, North Carolina, South Carolina, Alabama, Mississippi and Ohio, as well as nine terminals in Alabama, Mississippi, South Carolina, Ohio, Florida, and Tennessee. None of these divestitures affected RFG areas in this study.

D. Exxon/Mobil

In 1998, Exxon and Mobil agreed to merge their entire operations. Most of the value of these firms is from their upstream operations, but both firms had significant downstream assets in the United States as well. Exxon owned 4 refineries in Baytown, Texas; Baton Rouge, Louisiana; Benicia, California; and Billings, Montana. Mobil owned three refineries in Beaumont, Texas, Joliet, Illinois, and Torrance, California (as well as 50 percent of Chalmette Refining, a joint venture with PdVSA, in Chalmette, Louisiana). Exxon also owned or supplied 8500 branded stations in 39 states, while Mobil owned or supplied 7400 branded stations in 29 states. Both firms also owned numerous terminals and other distribution assets. States where Exxon and Mobil both had significant branded retail

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[2] From EIA website, listing source as *National Petroleum News, Market Facts 1998*, Volume 90, Number 8 (Mid-July 1988), pp. 41-46, and 123.

operations included Connecticut, Delaware, Maine, Massachusetts, Maryland, New Hampshire, New York, New Jersey, Pennsylvania, Louisiana, Texas, Nevada, and California.

As part of a Federal Trade Commission consent decree, Exxon and Mobil agreed to divest certain competing downstream assets. These assets included Exxon's downstream assets in California including all marketing assets and its refinery in Benicia, Mobil's retail assets in Virginia, Maryland, the District of Columbia, Pennsylvania, Delaware, and New Jersey, Exxon's retail assets in New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont and Maine, and Mobil retail assets in several Texas metropolitan areas including Dallas and Houston. The divestitures on the East Coast also included the wholesale business that supplied the Exxon or Mobil branded dealers and jobbers with gasoline. Therefore, after the merger, wholesale Mobil gasoline sales in Virginia, including branded rack sales, were no longer controlled by Exxon Mobil. These divestitures sold all of one firm or the others marketing assets in all the retail and wholesale RFG overlap markets in this study. Similarly, the California divestiture included all of Exxon's marketing assets in each of the CARB overlap markets.

E. UDS/Total

In 1997, UDS purchased the North American subsidiary of Total. Prior to the merger, UDS operated three refineries, in McKee, Texas, Three Rivers, Texas, and Wilmington, California. Total operated three small refineries in Ardmore, Oklahoma, Alma, Michigan, and Denver, Colorado. UDS owned or supplied approximately 2900 retail stations under the Ultramar, Diamond Shamrock, and Beacon brand names, while Total owned or supplied approximately 2100 branded stations. The only overlap in an RFG city covered by this study was in Dallas, Texas.

II. CARB Study

A. Tosco/Unocal

In 1997, Tosco purchased Unocal's downstream assets on the West Coast, which included refineries in San Francisco, California, Santa Maria, California, and Los Angeles, California. Unocal also owned various terminal and bulk supply assets, and owned 1100 branded stations 250 unbranded sites in 6 Western states including California. Tosco already owned refineries on the West Coast in Avon, California and Ferndale, Washington. Tosco also owned terminal assets and supplied or owned branded stations in Western states including California. This merger closed without any antitrust enforcement actions.

B. Shell/Texaco (Equilon)

As mentioned above, Shell, Texaco, and Saudi Refining agreed to combine most of their downstream assets in two new joint ventures, Equilon and Motiva. Only the Equilon joint venture between Shell and Texaco is relevant for the CARB study. Shell contributed refineries in Wood River, Illinois and Martinez, California, while Texaco contributed refineries in Anacortes, Washington, Wilmington, California, El Dorado, Kansas, and Bakersfield. Both Shell and Texaco also had large retail operations on the West Coast. As part of a Federal Trade Commission consent decree, Shell divested its refinery in Anacortes, as well as a terminal and retail assets in Hawaii, and retail assets in San Diego. The refinery divestiture and the San Diego retail divestiture were due to concerns in the sale of CARB gasoline in California.

Table 1
GAO Report's Classification of Where Merging Firms Competed:
RFG Study's Rack Locations

City	Exxon-Mobil	BP-Amoco	Marathon-Ashland	Shell-Texaco II	Total-UDS	Total Mergers
Albany	Yes	No	No	Yes	No	2
Baltimore	Yes	No	No	Yes	No	2
Boston	Yes	No	No	No	No	1
Dallas Metro	Yes	No	No	Yes	Yes	3
Dallas/Arlington	No	No	No	No	No	0
Dallas/Fort Worth	Yes	No	No	Yes	No	2
Dallas/Grapevine	No	No	No	No	No	0
Dallas/Southgate	Yes	No	No	Yes	No	2
Fairfax	Yes	Yes	Yes	Yes	No	4
Hartford/Rocky Hill	No	No	No	No	No	0
Houston	Yes	No	No	Yes	No	2
Louisville	No	Yes	Yes	No	No	2
New Haven	Yes	No	No	No	No	1
Newburgh	Yes	No	No	No	No	1
Norfolk	No	Yes	Yes	Yes	No	3
Paulsboro	Yes	No	No	No	No	1
Philadelphia	Yes	No	No	No	No	1
Providence	No	No	No	No	No	0
Richmond	Yes	Yes	Yes	Yes	No	4
Springfield	No	No	No	No	No	0
Trenton	No	No	No	No	No	0
Wilmington	Yes	No	No	No	No	1
Total Overlaps	14	4	4	9	1	

See Appendix 2 for GAO Information.

Table 2: Frequency Distribution of Number of Firms Posting any Unleaded Gasoline at the Branded Rack in a Week For Rack Locations in the GAO Report's RFG Merger Study (Percentage of Weeks in Table)

City/# Firms	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Albany									46.5%	53.5%				
Baltimore								5.0%	23.4%	29.7%	41.6%	0.3%		
Boston								15.8%	83.8%	0.3%				
Dallas Metro											14.5%	31.0%	38.6%	15.8%
Dallas/Arlington	100.0%													
Dallas/Fort Worth					20.5%	54.8%	24.8%							
Dallas/Grapevine		68.7%	31.4%											
Dallas/Southgate					24.1%	6.3%	66.3%	3.3%						
Fairfax							11.2%	4.6%	8.6%	22.4%	53.1%			
Hartford/Rocky Hill			15.5%	84.2%	0.3%									
Houston										10.2%	40.9%	48.8%		
Louisville						6.3%	80.5%	13.2%						
New Haven									49.2%	18.2%	32.7%			
Newburgh								14.2%	85.5%	0.3%				
Norfolk								4.3%	70.6%	17.5%	7.6%			
Paulsboro							30.0%	30.0%	39.9%					
Philadelphia								38.9%	49.5%	11.6%				
Providence								99.7%	0.3%					
Richmond										57.1%	42.9%			
Springfield					99.7%	0.3%								
Trenton	99.7%	0.3%												
Wilmington								14.9%	38.9%	46.2%				

Table 3: Frequency Distribution of Number of Firms Posting any Unleaded Gasoline at the Unbranded Rack in a Week For Rack Locations in the GAO Report's RFG Merger Study (Percentage of Weeks in Table)

City/# Firms	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Albany							14.5%	29.7%	51.8%	4.0%									
Baltimore							0.7%	5.6%	4.6%	40.6%	26.1%	10.2%	6.6%	5.3%	0.3%				
Boston					17.5%	18.5%	30.7%	33.0%	0.3%										
Dallas Metro							41.6%	15.5%	16.5%	5.9%	20.5%								
Dallas/Arlington	91.1%	8.9%																	
Dallas/Fort Worth		8.9%	77.9%	13.2%															
Dallas/Southgate	30.0%	25.4%	3.0%	0.3%	30.0%	11.2%													
Fairfax									0.7%	9.2%	8.6%	47.5%	32.0%	2.0%					
Hartford/Rocky Hill	6.9%	19.8%	14.5%	58.1%	0.7%														
Houston								29.0%	31.4%	25.1%	4.3%	4.3%	5.9%						
Louisville		3.0%	0.7%	5.3%	38.3%	15.2%	8.9%	16.8%	1.7%	10.2%									
New Haven				11.6%	5.6%	67.7%	15.2%												
Newburgh		13.9%	33.3%	40.9%	11.6%	0.3%													
Norfolk									2.3%	6.6%	10.6%	31.0%	16.5%	18.5%	11.9%	2.6%			
Paulsboro			34.3%	57.8%	7.9%														
Philadelphia		15.5%	12.9%	1.0%	38.6%	32.0%													
Providence				4.0%	8.3%	20.5%	44.9%	21.5%	1.0%										
Richmond													0.7%	8.9%	20.1%	35.0%	29.7%	5.3%	0.3%
Wilmington				21.8%	38.6%	30.0%	7.3%	2.3%											

Table 4a
GAO Report's Classification of Where Merging Firms Competed: Branded CARB Rack Locations

City	Tosco-Unocal	Shell-Texaco
Colton	Yes	Yes
Imperial	Yes	Yes
Los Angeles	Yes	No
Sacramento	Yes	Yes
San Diego	Yes	No
Stockton	Yes	No

Table 4b
Where Merging Firms Posted at Rack Locations not included in the GAO Report's Branded CARB Event Study

City	Tosco-Unocal	Shell-Texaco
Bakersfield	Yes	Yes
Brisbane	No	No
Chico	Yes	Yes
Eureka	No	Yes
Fresno	Yes	Yes
San Francisco	Yes	Yes
San Jose	No	No

Table 5
GAO Report's RFG Study's Rack Locations:
Where Merging Firms Posted any Specification of Gasoline at the Branded Rack Pre-Merger

City	Exxon	Mobil	BP	Amoco	Marathon	Ashland	Texaco	Shell	Total	UDS
Albany	Yes	Yes	No	No	No	No	Yes	Yes	No	No
Baltimore	Yes	Yes	No	Yes	No	No	Yes	Yes	No	No
Boston	Yes	Yes	No	No	No	No	Yes	No	No	No
Dallas Metro	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
Dallas/Arlington	No	No	No	No	No	No	No	No	No	No
Dallas/Fort Worth	Yes	Yes	No	No	No	No	Yes	No	No	No
Dallas/Grapevine	No	No	No	No	No	No	No	No	No	No
Dallas/Southgate	Yes	No	No	No	No	No	No	Yes	No	Yes
Fairfax	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No
Hartford/Rocky Hill	No	No	No	No	No	No	Yes	No	No	No
Houston	Yes	Yes	No	No	No	No	Yes	Yes	No	Yes
Louisville	No	No	Yes	Yes	Yes	No	No	Yes	No	No
New Haven	Yes	Yes	No	Yes	No	No	Yes	Yes	No	No
Newburgh	Yes	Yes	No	No	No	No	Yes	No	No	No
Norfolk	Yes	No	Yes	Yes	No	No	Yes	Yes	No	No
Paulsboro	Yes	Yes	No	No	No	No	Yes	No	No	No
Philadelphia	Yes	Yes	No	Yes	No	No	Yes	No	No	No
Providence	No	Yes	No	No	No	No	Yes	No	No	No
Richmond	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No
Springfield	No	Yes	No	No	No	No	Yes	No	No	No
Trenton	No	Yes	No	No	No	No	No	No	No	No
Wilmington	Yes	Yes	No	Yes	No	No	Yes	No	No	No
Totals	15	16	4	8	1	0	17	10	1	3

Table 6
GAO Report's RFG Study's Rack Locations:
Where Merging Firms Posted any Specification of Gasoline at the Unbranded Rack Pre-Merger

City	Exxon	Mobil	BP	Amoco	Marathon	Ashland	Texaco	Shell	Total	UDS
Albany	No	No	No	No	No	No	No	No	No	No
Baltimore	Yes	No	No	No	No	Yes	No	No	No	No
Boston	No	No	No	No	No	No	No	No	No	No
Dallas Metro	Yes	No	No	No	No	No	No	No	Yes	Yes
Dallas/Arlington	No	No	No	No	No	No	No	No	No	No
Dallas/Fort Worth	No	No	No	No	No	No	No	No	No	No
Dallas/Southgate	No	No	No	No	No	No	No	No	No	Yes
Fairfax	Yes	No	Yes	No	Yes	Yes	No	No	No	No
Hartford/Rocky Hill	No	No	No	No	No	No	No	No	No	No
Houston	Yes	No	No	No	No	No	No	No	No	Yes
Louisville	No	No	Yes	No	Yes	Yes	No	No	No	No
New Haven	No	No	No	No	No	No	No	No	No	No
Newburgh	No	No	No	No	No	No	No	No	No	No
Norfolk	Yes	No	No	No	Yes	Yes	No	No	No	No
Paulsboro	Yes	No	No	No	No	No	No	No	No	No
Philadelphia	Yes	No	No	No	No	No	No	No	No	No
Providence	No	No	No	No	No	No	No	No	No	No
Richmond	Yes	No	Yes	No	Yes	Yes	No	No	No	No
Wilmington	No	No	No	No	No	No	No	No	No	No
Totals	8	0	3	0	4	5	0	0	1	3

Table 7: HHI Calculations Under Alternate Methodologies by Year

Year	Geographic Area	HHI-GAO Report	HHI-Corrected For Ownership	HHI-Operating Capacity
1995	PADD I	1558	1558	1591
	PADD II	**692**	**683**	689
	PADD III	**519**	**554**	566
	PADD IV	1128	1128	1128
	PADD V	942	942	957
	PADD I, III	474	499	502
	PADD II, III	417	457	463
	PADD I, II, III	408	442	445
	United States	362	401	403
1997	PADD I	1760	1760	2001
	PADD II	**721**	**711**	711
	PADD III	**509**	**574**	580
	PADD IV	1129	1129	1129
	PADD V	988	988	1034
	PADD I, III	466	511	514
	PADD II, III	426	486	491
	PADD I, II, III	410	459	464
	United States	359	411	415
1999	PADD I	1827	1827	2148
	PADD II	1004	1004	1004
	PADD III	**582**	**734**	739
	PADD IV	1116	1116	1116
	PADD V	1239	1239	1257
	PADD I, III	516	635	640
	PADD II, III	528	675	678
	PADD I, II, III	483	611	616
	United States	422	544	547
2000	PADD I	1819	1819	2007
	PADD II	980	980	980
	PADD III	**704**	**887**	889
	PADD IV	1124	1124	1164
	PADD V	1267	1227	1240
	PADD I, III	596	736	742
	PADD II, III	621	764	765
	PADD I, II, III	553	675	680
	United States	484	591	594

Table 8
Reformulated Gasoline Price Effects in Merger Event Study For Branded Gasoline: Alternative Methods of Implementing STATA's XTGLS Command

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)	(6)	(7)	(8)
Exxon-Mobil	1.6080	1.3352	5.5851	5.6042	5.6044	0.1029	1.8108	0.4880
	(0.3010)	(0.2658)	(0.5020)	(0.4934)	(0.4934)	(0.0767)	(0.2449)	(0.0953)
BP-Amoco	0.5500	0.5374	0.3921	0.2670	0.2664	0.2783	0.6877	0.3067
	(0.2309)	(0.2227)	(0.8845)	(0.9021)	(0.9021)	(0.1890)	(0.2260)	(0.1932)
Marathon Ashland	0.7131	0.6842	2.1872	2.2299	2.2300	0.5155	0.6913	0.4850
	(0.2221)	(0.2146)	(0.8518)	(0.8691)	(0.8690)	(0.1822)	(0.2177)	(0.1862)
Shell-Texaco II	-0.3896	-0.4450	-2.9788	-2.9535	-2.9535	0.1879	-0.5775	0.2174
	(0.1825)	(0.1999)	(0.5305)	(0.5254)	(0.5253)	(0.1247)	(0.1797)	(0.1162)
Total UDS	-0.3875	-0.4346	-1.2335	-1.2485	-1.2485	-0.2653	-0.4863	-0.2785
	(0.0745)	(0.0848)	(1.4302)	(1.3953)	(1.3952)	(0.0682)	(0.0888)	(0.0720)
Inventories Ratio	-3.4529	-3.5979	-11.0737	-10.9220	-10.9211	-2.1708	-4.4407	-2.6333
	(0.8275)	(0.8911)	(1.0131)	(1.0119)	(1.0119)	(0.7299)	(0.8523)	(0.6976)
Utilization Rates	0.1905	0.1731	0.1561	0.1563	0.1563	0.1711	0.2406	0.2423
	(0.0971)	(0.0987)	(0.0241)	(0.0241)	(0.0241)	(0.1018)	(0.0759)	(0.0699)
MW Crisis	2.8199	2.6817	3.3438	3.3611	3.3612	2.7412	3.0070	3.4280
	(1.0261)	(1.0172)	(2.0448)	(2.3160)	(2.3168)	(1.0413)	(1.0574)	(1.0665)
Constant	0.0565	0.0410	0.0080	0.0071	0.0071	0.0594	0.0829	0.0224
	(0.6561)	(0.6845)	(0.1659)	(0.1655)	(0.1655)	(0.7064)	(0.3164)	(0.2729)
AR (1) Coefficient	0.8375	0.8011	0.8011	0.8011	0.8011	0.8011	n/a	n/a
Rack Cities	22	22	22	22	22	22	22	22
Weeks	305	305	305	305	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC	FTC	FTC	FTC	FTC
STATA XTGLS Options:								
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Estimate Separate Auto Correlation by Rack	No	No	No	No	No	No	Yes	Yes
Panels: Heteroskedastic	No	No	No	Yes	Yes	No	No	No
Panels: Correlated	Yes	Yes	No	No	No	Yes	Yes	Yes
Iterated GLS	No	No	No	No	Yes	Yes	No	Yes

* The figures in this column come directly from the GAO report, page 145.

Table 9
Reformulated Gasoline Price Effects in Merger Event Study For Unbranded Gasoline: Alternative Methods of Implementing STATA's XTGLS Command

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)	(6)	(7)	(8)
Exxon-Mobil	1.0118	0.7687	7.1859	7.2364	7.2369	-0.2513	1.1843	0.0403
	(0.4503)	(0.4114)	(0.5402)	(0.5307)	(0.5307)	(0.1550)	(0.3947)	(0.1639)
BP-Amoco	0.3976	0.4034	1.2832	1.0611	1.0596	0.2224	0.6383	0.4109
	(0.3185)	(0.3307)	(0.9471)	(0.9496)	(0.9495)	(0.2785)	(0.3477)	(0.2971)
Marathon Ashland	0.8558	0.8125	1.6479	1.6933	1.6935	0.6753	0.9012	0.7098
	(0.3060)	(0.3181)	(0.9113)	(0.9141)	(0.9141)	(0.2685)	(0.3349)	(0.2867)
Shell-Texaco II	0.0862	0.1205	-2.9384	-2.9199	-2.9200	0.4340	0.2885	0.3754
	(0.3531)	(0.3667)	(0.5663)	(0.5543)	(0.5543)	(0.3176)	(0.3678)	(0.3128)
Total UDS	-0.2237	-0.2785	-0.5550	-0.5720	-0.5720	-0.2386	-0.2414	-0.2269
	(0.1679)	(0.1762)	(1.5219)	(1.4577)	(1.4574)	(0.1696)	(0.1837)	(0.1760)
Inventories Ratio	-3.8524	-3.9998	-11.7352	-11.5526	-11.5504	-2.7357	-4.5561	-3.2085
	(0.9432)	(1.0150)	(1.1853)	(1.1795)	(1.1794)	(0.8607)	(1.0169)	(0.8702)
Utilization Rates	0.0835	0.1590	0.1506	0.1508	0.1508	0.1600	0.1968	0.1573
	(0.1048)	(0.1057)	(0.0282)	(0.0280)	(0.0280)	(0.1110)	(0.0963)	(0.0974)
MW Crisis	5.2124	4.8924	4.8433	4.8706	4.8709	5.0536	6.1679	6.0963
	(1.4006)	(1.3930)	(2.2229)	(2.5549)	(2.5567)	(1.4223)	(1.4383)	(1.4572)
Constant	0.0042	-0.0055	-0.0192	-0.0205	-0.0205	-0.0008	0.0311	0.0075
	(0.6908)	(0.7144)	(0.1886)	(0.1876)	(0.1876)	(0.7499)	(0.5106)	(0.4925)
AR (1) Coefficient	0.8347	0.7953	0.7953	0.7953	0.7953	0.7953	n/a	n/a
Rack Cities	19	19	19	19	19	19	19	19
Weeks	305	305	305	305	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC	FTC	FTC	FTC	FTC
STATA XTGLS Options:								
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Estimate Separate Auto Correlation by Rack	No	No	No	No	No	No	Yes	Yes
Panels: Heteroskedastic	No	No	No	Yes	Yes	No	No	No
Panels: Correlated	Yes	Yes	No	No	No	Yes	Yes	Yes
Iterated GLS	No	No	No	No	Yes	Yes	No	Yes

* The figures in this column come directly from the GAO report, page 145.

Table 10
Reformulated Gasoline Price Effects - Merger Event Study - Branded: Additional Control Variables and Alternative Price Deflator

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)
Exxon-Mobil	1.6080	1.3352	1.6090	1.4396	1.8535
	(0.3010)	(0.2658)	(0.2081)	(0.3085)	(0.2532)
BP-Amoco	0.5500	0.5374	0.4542	0.7506	0.9523
	(0.2309)	(0.2227)	(0.1771)	(0.2009)	(0.1591)
Marathon Ashland	0.7131	0.6842	0.8240	0.3273	0.1646
	(0.2221)	(0.2146)	(0.1691)	(0.1939)	(0.1520)
Shell-Texaco II	-0.3896	-0.4450	-0.7708	-0.3358	-0.8087
	(0.1825)	(0.1999)	(0.1492)	(0.2000)	(0.1566)
Total UDS	-0.3875	-0.4346	-0.3844	-0.4539	-0.5267
	(0.0745)	(0.0848)	(0.0526)	(0.1087)	(0.0634)
Inventories Ratio	-3.4529	-3.5979	-4.5148	-3.0428	-4.4431
	(0.8275)	(0.8911)	(0.8929)	(0.8204)	(0.8767)
Utilization Rates	0.1905	0.1731	0.1247	0.1372	0.0939
	(0.0971)	(0.0987)	(0.0983)	(0.0915)	(0.0906)
MW Crisis	2.8199	2.6817	3.8098	2.3601	3.4414
	(1.0261)	(1.0172)	(1.0469)	(0.9488)	(0.9775)
MW Crisis 2	n/a	n/a	3.6709	n/a	3.9565
	n/a	n/a	(1.6012)	n/a	(1.4876)
Constant	0.0565	0.0410	0.0536	0.0564	0.0581
	(0.6561)	(0.6845)	(0.4493)	(0.6945)	(0.4262)
Month 1	n/a	n/a	0.0816	n/a	0.4183
	n/a	n/a	(0.9964)	n/a	(0.9180)
Month 2	n/a	n/a	1.9278	n/a	1.9097
	n/a	n/a	(1.2062)	n/a	(1.1148)
Month 3	n/a	n/a	3.0669	n/a	2.9678
	n/a	n/a	(1.2322)	n/a	(1.1436)
Month 4	n/a	n/a	3.6921	n/a	3.4039
	n/a	n/a	(1.2585)	n/a	(1.1702)
Month 5	n/a	n/a	6.0593	n/a	5.5686
	n/a	n/a	(1.3037)	n/a	(1.2126)
Month 6	n/a	n/a	6.0025	n/a	5.5050
	n/a	n/a	(1.3174)	n/a	(1.2249)
Month 7	n/a	n/a	4.4303	n/a	4.0935
	n/a	n/a	(1.3043)	n/a	(1.2125)
Month 8	n/a	n/a	4.5878	n/a	4.2594
	n/a	n/a	(1.2650)	n/a	(1.1747)
Month 9	n/a	n/a	3.0144	n/a	2.7917
	n/a	n/a	(1.2348)	n/a	(1.1442)
Month 10	n/a	n/a	2.2938	n/a	1.9595
	n/a	n/a	(1.1190)	n/a	(1.0344)
Month 11	n/a	n/a	2.0111	n/a	1.8185
	n/a	n/a	(0.9188)	n/a	(0.8455)
AR (1) Coefficient	0.8375	0.8011	0.7064	0.8199	0.7159
Rack Cities	22	22	22	22	22
Weeks	305	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC	FTC
Deflator	PPI	PPI	PPI	CPI	CPI
STATA XTGLS Options:					
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No	No
Panels: Heteroskedastic	No	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No	No

* The figures in this column come directly from the GAO report, page 145.

Table 11
Reformulated Gasoline Price Effects- Merger Event Study - Unbranded: Additional Control Variables and Alternative Price Deflator

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)
Exxon-Mobil	1.0118	0.7687	0.9450	0.9770	1.3651
	(0.4503)	(0.4114)	(0.2983)	(0.4524)	(0.3394)
BP-Amoco	0.3976	0.4034	0.5030	0.5089	0.6712
	(0.3185)	(0.3307)	(0.2512)	(0.3233)	(0.2542)
Marathon Ashland	0.8558	0.8125	0.8154	0.4796	0.4164
	(0.3060)	(0.3181)	(0.2404)	(0.3115)	(0.2432)
Shell-Texaco II	0.0862	0.1205	-0.0234	0.1509	-0.0569
	(0.3531)	(0.3667)	(0.2574)	(0.3724)	(0.2617)
Total UDS	-0.2237	-0.2785	-0.1778	-0.3088	-0.3088
	(0.1679)	(0.1762)	(0.1198)	(0.1846)	(0.1171)
Inventories Ratio	-3.8524	-3.9998	-5.0290	-3.6898	-5.2023
	(0.9432)	(1.0150)	(0.9931)	(0.9483)	(0.9738)
Utilization Rates	0.0835	0.1590	0.0841	0.1250	0.0557
	(0.1048)	(0.1057)	(0.1045)	(0.0981)	(0.0962)
MW Crisis	5.2124	4.8924	7.1233	4.6199	6.8645
	(1.4006)	(1.3930)	(1.4206)	(1.3162)	(1.3413)
MW Crisis 2	n/a	n/a	5.6103	n/a	5.8780
	n/a	n/a	(1.6851)	n/a	(1.5685)
Constant	0.0042	-0.0055	0.0179	0.0076	0.0233
	(0.6908)	(0.7144)	(0.4533)	(0.7184)	(0.4318)
Month 1	n/a	n/a	0.0050	n/a	0.4439
	n/a	n/a	(1.0609)	n/a	(0.9766)
Month 2	n/a	n/a	1.8576	n/a	2.0923
	n/a	n/a	(1.2778)	n/a	(1.1807)
Month 3	n/a	n/a	3.4103	n/a	3.4587
	n/a	n/a	(1.2940)	n/a	(1.2017)
Month 4	n/a	n/a	4.2496	n/a	4.0127
	n/a	n/a	(1.3174)	n/a	(1.2261)
Month 5	n/a	n/a	6.4793	n/a	6.0241
	n/a	n/a	(1.3636)	n/a	(1.2696)
Month 6	n/a	n/a	4.5792	n/a	4.2853
	n/a	n/a	(1.3784)	n/a	(1.2828)
Month 7	n/a	n/a	3.2794	n/a	3.1357
	n/a	n/a	(1.3639)	n/a	(1.2689)
Month 8	n/a	n/a	5.2538	n/a	5.0256
	n/a	n/a	(1.3252)	n/a	(1.2315)
Month 9	n/a	n/a	4.2883	n/a	4.0900
	n/a	n/a	(1.2981)	n/a	(1.2034)
Month 10	n/a	n/a	2.5854	n/a	2.3632
	n/a	n/a	(1.1814)	n/a	(1.0922)
Month 11	n/a	n/a	1.7294	n/a	1.5729
	n/a	n/a	(0.9780)	n/a	(0.8990)
AR (1) Coefficient	0.8347	0.7953	0.6887	0.8129	0.7006
Rack Cities	19	19	19	19	19
Weeks	305	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC	FTC
Deflator	PPI	PPI	PPI	CPI	CPI
STATA XTGLS Options:					
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No	No
Panels: Heteroskedastic	No	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No	No

* The figures in this column come directly from the GAO report, page 145.

Table 12
Gasoline Price Effects in Merger Event Study For Branded CARB Gasoline: Alternative Methods of Implementing STATA's XTGLS Command

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)	(6)	(7)	(8)
Tosco-Unocal	6.8685	5.1733	1.8416	1.8416	1.8770	5.4419	5.5602	5.6573
	(3.3136)	(3.2909)	(1.5144)	(1.5144)	(1.5141)	(3.2743)	(2.7640)	(2.7388)
Shell-Texaco I	-0.6933	-0.9910	-1.5720	-1.5720	-1.5646	-0.9326	-0.9739	-0.9272
	(0.3167)	(0.2948)	(1.8861)	(1.8861)	(1.8593)	(0.2922)	(0.2968)	(0.2953)
Inventories Ratio	-20.9206	-41.8458	-40.2218	-40.2218	-40.2349	-41.8569	-34.6150	-34.4319
	(5.9529)	(9.2852)	(4.1499)	(4.1499)	(4.1451)	(9.2369)	(8.6909)	(8.6477)
Utilization Rates	0.3625	0.1632	0.2907	0.2907	0.2889	0.1516	0.2095	0.2067
	(0.2186)	(0.2178)	(0.0969)	(0.0969)	(0.0967)	(0.2167)	(0.2072)	(0.2064)
WC Crisis	4.8834	3.9464	4.8916	4.8916	4.8836	3.8090	5.5766	5.5587
	(2.0148)	(2.0033)	(0.8935)	(0.8935)	(0.8924)	(1.9928)	(1.8533)	(1.8431)
Constant	0.3891	0.3470	0.3372	0.3372	0.3374	0.3440	0.3204	0.3159
	(1.6817)	(1.6157)	(0.7167)	(0.7167)	(0.7157)	(1.6072)	(1.1885)	(1.1718)
AR (1) Coefficient	0.8647	0.8146	0.8146	0.8146	0.8146	0.8146	n/a	n/a
Rack Cities	6	6	6	6	6	6	6	6
Weeks	242	242	242	242	242	242	242	242
Estimated By:	GAO	FTC	FTC	FTC	FTC	FTC	FTC	FTC
STATA XTGLS Options:								
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Estimate Separate Auto Correlation by Rack	No	No	No	No	No	No	Yes	Yes
Panels: Heteroskedastic	No	No	No	Yes	Yes	No	No	No
Panels: Correlated	Yes	Yes	No	No	No	Yes	Yes	Yes
Iterated GLS	No	No	No	No	Yes	Yes	No	Yes

* The figures in this column come directly from the GAO report, page 146.

Table 13
California Air Resources Board Gasoline Price Effects - Branded:
Individual Cities

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	Colton	Imperial	Los Angeles	Sacramento	San Diego	Stockton
City	n/a	n/a	n/a	0.1006	-0.0895	0.0878	0.0078	0.0051	Omitted value
	n/a	n/a	n/a	(0.4796)	(0.4852)	(0.5010)	(0.2042)	(0.5133)	Omitted value
Tosco-Unocal	6.8685	5.1733	3.7802	1.7887	3.1726	2.8760	1.5247	1.4443	2.8170
	(3.3136)	(3.2909)	(3.5523)	(3.7365)	(3.7890)	(3.8983)	(3.8521)	(4.0507)	(3.7879)
Shell-Texaco I	-0.6933	-0.9910	1.3312	-0.7445	-1.4909	-2.0375	-2.8773	-2.6113	-1.4631
	(0.3167)	(0.2948)	(3.2184)	(3.3834)	(3.4310)	(3.5300)	(3.4881)	(3.6680)	(3.4300)
Inventories Ratio	-20.9206	-41.8458	-40.1516	-41.6789	-39.4069	-42.0951	-40.0249	-41.5957	-41.2506
	(5.9529)	(9.2852)	(9.4224)	(9.9327)	(10.0724)	(10.3628)	(10.2401)	(10.7680)	(10.0693)
Utilization Rates	0.3625	0.1632	0.1807	0.3133	0.2408	0.2899	0.2529	0.3684	0.2550
	(0.2186)	(0.2178)	(0.2186)	(0.2306)	(0.2338)	(0.2406)	(0.2377)	(0.2500)	(0.2337)
WC Crisis	4.8834	3.9464	3.5870	4.6808	4.1279	4.9001	5.5756	5.5797	5.7033
	(2.0148)	(2.0033)	(2.0226)	(2.1317)	(2.1617)	(2.2240)	(2.1977)	(2.3110)	(2.1610)
Constant	0.3891	0.3470	0.3410	0.3095					
	(1.6817)	(1.6157)	(1.5919)	(1.6896)					
Test Statistic	n/a	n/a	n/a	Chi2 (30) = 67.77					
	n/a	n/a	n/a	P-value = 0.0001					
AR (1) Coefficient	0.8647	0.8146	0.8120	0.8105					
Rack Cities	6	6	6	6					
Weeks	242	242	242	242					
Estimated By:	GAO	FTC	FTC	FTC					
Reclassify San Diego, LA and Stockton as affected by Shell-Texaco I	No	No	Yes	Yes					
STATA XTGLS Options:									
Correction for Auto Correlation	Yes	Yes	Yes	Yes					
Estimate Separate Auto Correlation by Rack	No	No	No	No					
Panels: Heteroskedastic	No	No	No	No					
Panels: Correlated	Yes	Yes	Yes	Yes					
Iterated GLS	No	No	No	No					

* The figures in this column come directly from the GAO report, page 146.

Table 14
California Air Resources Board Price Effects - Merger Event Study - Branded: Additional Control Variables and Alternative Price Deflator

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)
Tosco-Unocal	6.8685	5.1733	4.1191	3.7938	2.5207
	(3.3136)	(3.2909)	(2.8989)	(2.9303)	(2.6471)
Shell-Texaco I	-0.6933	-0.9910	-1.3047	-1.1416	-1.4337
	(0.3167)	(0.2948)	(0.2464)	(0.2739)	(0.2443)
Inventories Ratio	-20.9206	-41.8458	-46.6269	-39.1099	-45.7514
	(5.9529)	(9.2852)	(11.0115)	(8.5148)	(10.1474)
Utilization Rates	0.3625	0.1632	0.1089	0.1291	0.0629
	(0.2186)	(0.2178)	(0.2234)	(0.2005)	(0.2061)
WC Crisis	4.8834	3.9464	n/a	4.2447	n/a
	(2.0148)	(2.0033)	n/a	(1.8311)	n/a
WC Crisis 1	n/a	n/a	7.6006	n/a	5.6286
	n/a	n/a	(2.7887)	n/a	(2.5607)
WC Crisis 2	n/a	n/a	2.5956	n/a	3.5658
	n/a	n/a	(3.1783)	n/a	(2.9272)
WC Crisis 3	n/a	n/a	3.7000	n/a	5.6156
	n/a	n/a	(3.2471)	n/a	(2.9727)
Constant	0.3891	0.3470	0.2215	0.3371	0.2166
	(1.6817)	(1.6157)	(1.2100)	(1.3907)	(1.0987)
Month 1	n/a	n/a	3.8129	n/a	4.3504
	n/a	n/a	(2.4675)	n/a	(2.2781)
Month 2	n/a	n/a	4.4104	n/a	4.4991
	n/a	n/a	(2.8777)	n/a	(2.6519)
Month 3	n/a	n/a	5.7323	n/a	5.6760
	n/a	n/a	(3.0738)	n/a	(2.8280)
Month 4	n/a	n/a	8.4798	n/a	8.0826
	n/a	n/a	(3.1721)	n/a	(2.9158)
Month 5	n/a	n/a	10.5028	n/a	10.0501
	n/a	n/a	(3.1118)	n/a	(2.8583)
Month 6	n/a	n/a	6.7937	n/a	6.5009
	n/a	n/a	(3.1571)	n/a	(2.8999)
Month 7	n/a	n/a	4.2260	n/a	3.9988
	n/a	n/a	(3.2041)	n/a	(2.9442)
Month 8	n/a	n/a	5.8692	n/a	5.2662
	n/a	n/a	(3.1896)	n/a	(2.9331)
Month 9	n/a	n/a	3.5350	n/a	3.3388
	n/a	n/a	(2.9610)	n/a	(2.7249)
Month 10	n/a	n/a	1.5877	n/a	1.1392
	n/a	n/a	(2.6195)	n/a	(2.4125)
Month 11	n/a	n/a	0.6110	n/a	0.4793
	n/a	n/a	(2.0658)	n/a	(1.9064)
AR (1) Coefficient	0.8647	0.8146	0.7552	0.8002	0.7509
Rack Cities	6	6	6	6	6
Weeks	242	242	242	242	242
Estimated By:	GAO	FTC	FTC	FTC	FTC
Deflator	PPI	PPI	PPI	CPI	CPI
STATA XTGLS Options:					
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No	No
Panels: Heteroskedastic	No	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No	No

* The figures in this column come directly from the GAO report, page 146.

Table 15
California Air Resources Board Price Effects - Merger Event Study -Branded: Including Additional Cities

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)
Tosco-Unocal	6.8685	5.1733	-0.2935	0.0274
	(3.3136)	(3.2909)	(0.3857)	(0.3311)
Shell-Texaco I	-0.6933	-0.9910	0.8128	-0.0826
	(0.3167)	(0.2948)	(0.3878)	(0.2356)
Inventories Ratio	-20.9206	-41.8458	-34.9800	-37.7153
	(5.9529)	(9.2852)	(9.0933)	(8.5766)
Utilization Rates	0.3625	0.1632	0.3116	0.1765
	(0.2186)	(0.2178)	(0.2148)	(0.2032)
WC Crisis	4.8834	3.9464	4.7076	4.2788
	(2.0148)	(2.0033)	(1.9836)	(1.8698)
Constant	0.3891	0.3470	0.3438	0.2948
	(1.6817)	(1.6157)	(1.7379)	(1.5854)
AR (1) Coefficient	0.8647	0.8146	0.8315	0.8246
Rack Cities	6	6	7	13
Weeks	242	242	242	242
Estimated By:	GAO	FTC	FTC	FTC
GAO CARB Cities	Yes	Yes	No	No
Additional CARB Cities	No	No	Yes	No
All CARB Cities	No	No	No	Yes
STATA XTGLS Options:				
Correction for Auto Correlation	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No
Panels: Heteroskedastic	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No

* The figures in this column come directly from the GAO report, page 146.

Table 16
Reformulated Gasoline Price HHI - Branded Gasoline:
Different Methods of Implementing STATA's XTGLS Command

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)	(6)	(7)	(8)
HHI-GAO Report	0.0041	0.0034	0.0022	0.0020	0.0020	0.0041	0.0014	0.0018
	(0.0016)	(0.0017)	(0.0018)	(0.0018)	(0.0018)	(0.0014)	(0.0017)	(0.0014)
Inventories Ratio	-3.4990	-4.1328	-13.0113	-12.9686	-12.9686	-2.3745	-4.5566	-2.4516
	(0.8147)	(0.9085)	(0.9995)	(0.9975)	(0.9975)	(0.7248)	(0.8913)	(0.7015)
Utilization Rates	0.1830	0.1727	0.1504	0.1507	0.1507	0.1658	0.1319	0.1437
	(0.1005)	(0.1013)	(0.0244)	(0.0244)	(0.0244)	(0.1023)	(0.0811)	(0.0817)
MW Crisis	2.6429	2.6986	3.0833	3.0886	3.0886	2.6645	3.2588	3.2382
	(1.0268)	(1.0314)	(2.0628)	(2.3139)	(2.3142)	(1.0355)	(1.0759)	(1.0882)
Constant	0.0790	0.0442	0.0349	0.0355	0.0355	0.0480	0.0861	0.0937
	(0.7432)	(0.7376)	(0.1768)	(0.1764)	(0.1764)	(0.7451)	(0.3580)	(0.3608)
AR (1) Coefficient	0.8447	0.8116	0.8116	0.8116	0.8116	0.8116	n/a	n/a
Rack Cities	22	22	22	22	22	22	22	22
Weeks	305	305	305	305	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC	FTC	FTC	FTC	FTC
STATA XTGLS Options:								
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Estimate Separate Auto Correlation by Rack	No	No	No	No	No	No	Yes	Yes
Panels: Heteroskedastic	No	No	No	Yes	Yes	No	No	No
Panels: Correlated	Yes	Yes	No	No	No	Yes	Yes	Yes
Iterated GLS	No	No	No	No	Yes	Yes	No	Yes

* The figures in this column come directly from the GAO report, page 150.

Table 17
Reformulated Gasoline Price HHI - Unbranded Gasoline:
Different Methods of Implementing STATA's XTGLS Command

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)	(6)	(7)	(8)
HHI-GAO Report	0.0037	0.0034	0.0035	0.0031	0.0031	0.0030	0.0048	0.0042
	(0.0019)	(0.0020)	(0.0021)	(0.0021)	(0.0021)	(0.0016)	(0.0021)	(0.0017)
Inventories Ratio	-3.7742	-4.7114	-15.1555	-15.1106	-15.1110	-3.0427	-5.2069	-3.3133
	(0.9543)	(1.0857)	(1.1695)	(1.1633)	(1.1633)	(0.8726)	(1.0973)	(0.8863)
Utilization Rates	0.0797	0.1465	0.1389	0.1398	0.1399	0.1457	0.2150	0.2233
	(0.1096)	(0.1093)	(0.0287)	(0.0285)	(0.0285)	(0.1110)	(0.1003)	(0.1017)
MW Crisis	4.8318	4.6688	4.3547	4.3624	4.3625	4.8434	6.0692	6.2162
	(1.3905)	(1.3925)	(2.2550)	(2.5473)	(2.5480)	(1.4120)	(1.4508)	(1.4753)
Constant	0.0088	-0.0184	0.0182	0.0193	0.0193	-0.0143	0.0176	0.0183
	(0.7980)	(0.7809)	(0.2037)	(0.2029)	(0.2029)	(0.7935)	(0.5761)	(0.5873)
AR (1) Coefficient	0.8401	0.8077	0.8077	0.8077	0.8077	0.8077	n/a	n/a
Rack Cities	19	19	19	19	19	19	19	19
Weeks	305	305	305	305	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC	FTC	FTC	FTC	FTC
STATA XTGLS Options:								
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Estimate Separate Auto Correlation by Rack	No	No	No	No	No	No	Yes	Yes
Panels: Heteroskedastic	No	No	No	Yes	Yes	No	No	No
Panels: Correlated	Yes	Yes	No	No	No	Yes	Yes	Yes
Iterated GLS	No	No	No	No	Yes	Yes	No	Yes

* The figures in this column come directly from the GAO report, page 150.

Table 18
Reformulated Gasoline Price HHI - Branded:
Additional Controls and Alternative Price Deflator

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)
HHI-GAO Report	0.0041	0.0034	0.0025	0.0022	0.0007
	(0.0016)	(0.0017)	(0.0014)	(0.0017)	(0.0015)
Inventories Ratio	-3.4990	-4.1328	-6.3133	-3.4715	-6.9013
	(0.8147)	(0.9085)	(1.0023)	(0.8449)	(1.0741)
Utilization Rates	0.1830	0.1727	0.1273	0.1304	0.0862
	(0.1005)	(0.1013)	(0.1000)	(0.0948)	(0.0931)
MW Crisis	2.6429	2.6986	3.9694	2.4851	3.9535
	(1.0268)	(1.0314)	(1.0792)	(0.9635)	(1.0319)
MW Crisis 2	n/a	n/a	3.3087	n/a	3.8477
	n/a	n/a	(1.6219)	n/a	(1.5117)
Constant	0.0790	0.0442	0.0505	0.0765	0.0639
	(0.7432)	(0.7376)	(0.4504)	(0.7827)	(0.4204)
Month 1	n/a	n/a	0.1047	n/a	0.5763
	n/a	n/a	(1.0159)	n/a	(0.9485)
Month 2	n/a	n/a	1.7759	n/a	1.9483
	n/a	n/a	(1.2263)	n/a	(1.1433)
Month 3	n/a	n/a	3.0466	n/a	3.2171
	n/a	n/a	(1.2496)	n/a	(1.1649)
Month 4	n/a	n/a	3.6915	n/a	3.6834
	n/a	n/a	(1.2748)	n/a	(1.1882)
Month 5	n/a	n/a	6.0715	n/a	5.7552
	n/a	n/a	(1.3199)	n/a	(1.2301)
Month 6	n/a	n/a	6.1163	n/a	5.7422
	n/a	n/a	(1.3338)	n/a	(1.2428)
Month 7	n/a	n/a	4.3503	n/a	4.1221
	n/a	n/a	(1.3209)	n/a	(1.2307)
Month 8	n/a	n/a	4.1921	n/a	3.9248
	n/a	n/a	(1.2818)	n/a	(1.1943)
Month 9	n/a	n/a	2.8054	n/a	2.6076
	n/a	n/a	(1.2524)	n/a	(1.1665)
Month 10	n/a	n/a	2.0425	n/a	1.7322
	n/a	n/a	(1.1364)	n/a	(1.0583)
Month 11	n/a	n/a	1.8937	n/a	1.7064
	n/a	n/a	(0.9352)	n/a	(0.8705)
AR (1) Coefficient	0.8447	0.8116	0.7014	0.8356	0.7024
Rack Cities	22	22	22	22	22
Weeks	305	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC	FTC
Deflator	PPI	PPI	PPI	CPI	CPI
STATA XTGLS Options:					
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No	No
Panels: Heteroskedastic	No	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No	No

* The figures in this column come directly from the GAO report, page 150.

Table 19
Reformulated Gasoline Price HHI - Unbranded:
Additional Controls and Alternative Price Deflator

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)
HHI-GAO Report	0.0037	0.0034	0.0034	0.0018	0.0019
	(0.0019)	(0.0020)	(0.0016)	(0.0020)	(0.0016)
Inventories Ratio	-3.7742	-4.7114	-7.1783	-4.1112	-7.8070
	(0.9543)	(1.0857)	(1.1779)	(1.0251)	(1.2392)
Utilization Rates	0.0797	0.1465	0.0700	0.1059	0.0328
	(0.1096)	(0.1093)	(0.1064)	(0.1022)	(0.0991)
MW Crisis	4.8318	4.6688	6.9008	4.3174	6.7614
	(1.3905)	(1.3925)	(1.4625)	(1.3139)	(1.3977)
MW Crisis 2	n/a	n/a	5.7832	n/a	6.4945
	n/a	n/a	(1.6963)	n/a	(1.5855)
Constant	0.0088	-0.0184	0.0031	0.0020	0.0135
	(0.7980)	(0.7809)	(0.4485)	(0.8194)	(0.4221)
Month 1	n/a	n/a	0.1806	n/a	0.7016
	n/a	n/a	(1.0865)	n/a	(1.0147)
Month 2	n/a	n/a	2.0475	n/a	2.4131
	n/a	n/a	(1.3002)	n/a	(1.2138)
Month 3	n/a	n/a	3.7578	n/a	4.0221
	n/a	n/a	(1.3099)	n/a	(1.2241)
Month 4	n/a	n/a	4.6366	n/a	4.6710
	n/a	n/a	(1.3307)	n/a	(1.2442)
Month 5	n/a	n/a	6.8666	n/a	6.5543
	n/a	n/a	(1.3761)	n/a	(1.2866)
Month 6	n/a	n/a	4.9714	n/a	4.8232
	n/a	n/a	(1.3916)	n/a	(1.3007)
Month 7	n/a	n/a	3.4529	n/a	3.3610
	n/a	n/a	(1.3776)	n/a	(1.2873)
Month 8	n/a	n/a	5.3364	n/a	5.1543
	n/a	n/a	(1.3400)	n/a	(1.2517)
Month 9	n/a	n/a	4.3069	n/a	4.1187
	n/a	n/a	(1.3151)	n/a	(1.2275)
Month 10	n/a	n/a	2.4948	n/a	2.2589
	n/a	n/a	(1.2004)	n/a	(1.1194)
Month 11	n/a	n/a	1.6568	n/a	1.5073
	n/a	n/a	(0.9988)	n/a	(0.9296)
AR (1) Coefficient	0.8401	0.8077	0.6777	0.8304	0.6816
Rack Cities	19	19	19	19	19
Weeks	305	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC	FTC
Deflator	PPI	PPI	PPI	CPI	CPI
STATA XTGLS Options:					
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No	No
Panels: Heteroskedastic	No	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No	No

* The figures in this column come directly from the GAO report, page 150.

Table 20
Reformulated Gasoline Price HHI - Branded:
Alternative Measures of Concentration

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)
HHI-GAO Report	0.0041	0.0034	n/a	n/a
	(0.0016)	(0.0017)	n/a	n/a
HHI-Corrected For Ownership	n/a	n/a	0.0030	n/a
	n/a	n/a	(0.0016)	n/a
HHI-Operating Capacity	n/a	n/a	n/a	0.0011
	n/a	n/a	n/a	(0.0009)
Inventories Ratio	-3.4990	-4.1328	-4.1799	-4.2504
	(0.8147)	(0.9085)	(0.9091)	(0.9216)
Utilization Rates	0.1830	0.1727	0.1730	0.1725
	(0.1005)	(0.1013)	(0.1013)	(0.1011)
MW Crisis	2.6429	2.6986	2.7080	2.7562
	(1.0268)	(1.0314)	(1.0317)	(1.0353)
Constant	0.0790	0.0442	0.0431	0.0490
	(0.7432)	(0.7376)	(0.7386)	(0.7254)
AR (1) Coefficient	0.8447	0.8116	0.8119	0.8084
Rack Cities	22	22	22	22
Weeks	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC
STATA XTGLS Options:				
Correction for Auto Correlation	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No
Panels: Heteroskedastic	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No

* The figures in this column come directly from the GAO report, page 150.

Table 21
Reformulated Gasoline Price HHI - Unbranded:
Alternative Measures of Concentration

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)
HHI-GAO Report	0.0037	0.0034	n/a	n/a
	(0.0019)	(0.0020)	n/a	n/a
HHI-Corrected For Ownership	n/a	n/a	0.0022	n/a
	n/a	n/a	(0.0019)	n/a
HHI-Operating Capacity	n/a	n/a	n/a	0.0012
	n/a	n/a	n/a	(0.0010)
Inventories Ratio	-3.7742	-4.7114	-4.7173	-4.7968
	(0.9543)	(1.0857)	(1.0888)	(1.0955)
Utilization Rates	0.0797	0.1465	0.1461	0.1493
	(0.1096)	(0.1093)	(0.1092)	(0.1092)
MW Crisis	4.8318	4.6688	4.6573	4.7375
	(1.3905)	(1.3925)	(1.3929)	(1.3976)
Constant	0.0088	-0.0184	-0.0149	-0.0140
	(0.7980)	(0.7809)	(0.7827)	(0.7675)
AR (1) Coefficient	0.8401	0.8077	0.8082	0.8041
Rack Cities	19	19	19	19
Weeks	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC
STATA XTGLS Options:				
Correction for Auto Correlation	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No
Panels: Heteroskedastic	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No

* The figures in this column come directly from the GAO report, page 150.

Table 22
California Air Resource Board Gasoline Event Study:
Robustness of Event Window

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)	(5)
Tosco-Unocal	6.8685	5.1733	3.9148	3.7802	3.8327
	(3.3136)	(3.2909)	(2.7202)	(3.5523)	(2.7450)
Shell-Texaco I	-0.6933	-0.9910	-0.1175	1.3312	0.2803
	(0.3167)	(0.2948)	(0.3836)	(3.2184)	(2.7773)
Inventories Ratio	-20.9206	-41.8458	-9.6191	-40.1516	-9.4379
	(5.9529)	(9.2852)	(8.2893)	(9.4224)	(8.3982)
Utilization Rates	0.3625	0.1632	-0.3068	0.1807	-0.3073
	(0.2186)	(0.2178)	(0.1797)	(0.2186)	(0.1799)
WC Crisis	4.8834	3.9464	n/a	3.5870	n/a
	(2.0148)	(2.0033)	n/a	(2.0226)	n/a
Constant	0.3891	0.3470	-0.7416	0.3410	-0.6644
	(1.6817)	(1.6157)	(2.4781)	(1.5919)	(2.5362)
AR (1) Coefficient	0.8647	0.8146	0.8970	0.8120	0.8957
Rack Cities	6	6	6	6	6
Weeks	242	242	134	242	134
Reclassify San Diego, LA and Stockton as affected by Shell-Texaco	No	No	No	Yes	Yes
Equivalent post-merger window (Final Date: Dec. 3, 1998)	No	No	Yes	No	Yes
Estimated By:	GAO	FTC	FTC	FTC	FTC
STATA XTGLS Options:					
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No	No
Panels: Heteroskedastic	No	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No	No

* The figures in this column come directly from the GAO report, page 146.

Table 23
Reformulated Gasoline Merger Event Study Price Effects - Branded: Difference in Difference Estimates

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)
Exxon-Mobil	1.6080	1.3352	0.1092	0.1860
	(0.3010)	(0.2658)	(0.0699)	(0.0998)
BP-Amoco	0.5500	0.5374	0.3052	0.2068
	(0.2309)	(0.2227)	(0.1903)	(0.2319)
Marathon Ashland	0.7131	0.6842	0.6637	0.5217
	(0.2221)	(0.2146)	(0.1829)	(0.2259)
Shell-Texaco II	-0.3896	-0.4450	0.0552	0.0530
	(0.1825)	(0.1999)	(0.1150)	(0.1679)
Total UDS	-0.3875	-0.4346	-0.2332	-0.2044
	(0.0745)	(0.0848)	(0.0629)	(0.0912)
C-Exxon-Mobil	n/a	n/a	6.7857	n/a
	n/a	n/a	(1.5946)	n/a
C-BP-Amoco	n/a	n/a	-0.3339	n/a
	n/a	n/a	(1.6848)	n/a
C-Marathon Ashland	n/a	n/a	3.1005	n/a
	n/a	n/a	(1.9081)	n/a
C-Shell-Texaco	n/a	n/a	-2.5439	n/a
	n/a	n/a	(1.8091)	n/a
C-Total UDS	n/a	n/a	-3.7557	n/a
	n/a	n/a	(1.7712)	n/a
Inventories Ratio	-3.4529	-3.5979	-4.0679	-1.8116
	(0.8275)	(0.8911)	(0.8854)	(0.7440)
Utilization Rates	0.1905	0.1731	0.1852	0.0569
	(0.0971)	(0.0987)	(0.0979)	(0.0032)
MW Crisis	2.8199	2.6817	3.0926	2.1488
	(1.0261)	(1.0172)	(1.0369)	(1.0050)
Constant	0.0565	0.0410	-0.0093	n/a
	(0.6561)	(0.6845)	(0.5892)	n/a
AR (1) Coefficient	0.8375	0.8011	0.7700	0.8767
Rack Cities	22	22	22	22
Weeks	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC
Week Dummies	No	No	No	Yes
STATA XTGLS Options:				
Correction for Auto Correlation	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No
Panels: Heteroskedastic	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No

* The figures in this column come directly from the GAO report, page 145.

Table 24
Reformulated Gasoline Merger Event Study Price Effects - Unbranded: Difference in Difference Estimates

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)
Exxon-Mobil	1.0118	0.7687	-0.3391	-0.2553
	(0.4503)	(0.4114)	(0.1387)	(0.1497)
BP-Amoco	0.3976	0.4034	0.3380	0.3643
	(0.3185)	(0.3307)	(0.2827)	(0.2754)
Marathon Ashland	0.8558	0.8125	0.6948	0.7438
	(0.3060)	(0.3181)	(0.2719)	(0.2647)
Shell-Texaco II	0.0862	0.1205	0.5440	0.4651
	(0.3531)	(0.3667)	(0.2839)	(0.2830)
Total UDS	-0.2237	-0.2785	-0.1694	-0.1615
	(0.1679)	(0.1762)	(0.1494)	(0.1453)
C-Exxon-Mobil	n/a	n/a	8.9276	n/a
	n/a	n/a	(1.6601)	n/a
C-BP-Amoco	n/a	n/a	0.8776	n/a
	n/a	n/a	(1.7594)	n/a
C-Marathon Ashland	n/a	n/a	3.4498	n/a
	n/a	n/a	(2.0209)	n/a
C-Shell-Texaco	n/a	n/a	-3.8924	n/a
	n/a	n/a	(1.9331)	n/a
C-Total UDS	n/a	n/a	-2.4009	n/a
	n/a	n/a	(1.8659)	n/a
Inventories Ratio	-3.8524	-3.9998	-4.1230	-3.2906
	(0.9432)	(1.0150)	(0.9916)	(0.9843)
Utilization Rates	0.0835	0.1590	0.1786	-0.0590
	(0.1048)	(0.1057)	(0.1045)	(0.0044)
MW Crisis	5.2124	4.8924	5.5964	5.5643
	(1.4006)	(1.3930)	(1.4213)	(1.4340)
Constant	0.0042	-0.0055	-0.0577	n/a
	(0.6908)	(0.7144)	(0.5906)	n/a
AR (1) Coefficient	0.8347	0.7953	0.7529	0.7449
Rack Cities	19	19	19	19
Weeks	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC
Week Dummies	No	No	No	Yes
STATA XTGLS Options:				
Correction for Auto Correlation	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No
Panels: Heteroskedastic	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No

* The figures in this column come directly from the GAO report, page 145.

Table 25
Reformulated Gasoline Merger Event Study Price Effects - Branded: Robustness of Inventory Ratio

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)
Exxon-Mobil	1.6080	1.3352	1.3939	1.4021
	(0.3010)	(0.2658)	(0.2632)	(0.2578)
BP-Amoco	0.5500	0.5374	0.4819	0.4555
	(0.2309)	(0.2227)	(0.2195)	(0.2150)
Marathon Ashland	0.7131	0.6842	0.6906	0.7223
	(0.2221)	(0.2146)	(0.2112)	(0.2066)
Shell-Texaco II	-0.3896	-0.4450	-0.4082	-0.4709
	(0.1825)	(0.1999)	(0.1981)	(0.1962)
Total UDS	-0.3875	-0.4346	-0.4288	-0.4300
	(0.0745)	(0.0848)	(0.0835)	(0.0794)
Inventories Ratio	-3.4529	-3.5979	n/a	n/a
	(0.8275)	(0.8911)	n/a	n/a
(If Padd I)*(Inventory Ratio Padd I)	n/a	n/a	-3.3929	-2.9747
	n/a	n/a	(0.9859)	(0.9604)
(If Padd II)*(Inventory Ratio Padd II)	n/a	n/a	-9.6695	-9.3784
	n/a	n/a	(2.3518)	(2.6414)
(If Padd III)*(Inventory Ratio Padd III)	n/a	n/a	-2.5211	-12.2147
	n/a	n/a	(1.1264)	(4.3845)
(If Padd I)*(Inventory Ratio Padd III)	n/a	n/a	n/a	-10.3705
	n/a	n/a	n/a	(4.4101)
(If Padd II)*(Inventory Ratio Padd III)	n/a	n/a	n/a	-10.9556
	n/a	n/a	n/a	(5.3023)
Utilization Rates	0.1905	0.1731	0.1754	0.1688
	(0.0971)	(0.0987)	(0.0988)	(0.0985)
MW Crisis	2.8199	2.6817	2.2307	2.3183
	(1.0261)	(1.0172)	(1.0280)	(1.0308)
Constant	0.0565	0.0410	0.0396	0.0450
	(0.6561)	(0.6845)	(0.6830)	(0.6586)
AR (1) Coefficient	0.8375	0.8011	0.8004	0.7931
Rack Cities	22	22	22	22
Weeks	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC
STATA XTGLS Options:				
Correction for Auto Correlation	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No
Panels: Heteroskedastic	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No

* The figures in this column come directly from the GAO report, page 145.

Table 26
Reformulated Gasoline Merger Event Study Price Effects - Unbranded: Robustness of Inventory Ratio

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)
Exxon-Mobil	1.0118	0.7687	0.8328	0.8152
	(0.4503)	(0.4114)	(0.4080)	(0.4046)
BP-Amoco	0.3976	0.4034	0.3381	0.3427
	(0.3185)	(0.3307)	(0.3222)	(0.3178)
Marathon Ashland	0.8558	0.8125	0.8462	0.8529
	(0.3060)	(0.3181)	(0.3082)	(0.3035)
Shell-Texaco II	0.0862	0.1205	0.1804	0.1274
	(0.3531)	(0.3667)	(0.3633)	(0.3561)
Total UDS	-0.2237	-0.2785	-0.2684	-0.2726
	(0.1679)	(0.1762)	(0.1742)	(0.1691)
Inventories Ratio	-3.8524	-3.9998	n/a	n/a
	(0.9432)	(1.0150)	n/a	n/a
(If Padd I)*(Inventory Ratio Padd I)	n/a	n/a	-4.4401	-4.1805
	n/a	n/a	(1.0858)	(1.1101)
(If Padd II)*(Inventory Ratio Padd II)	n/a	n/a	-13.3191	-13.4842
	n/a	n/a	(3.1821)	(3.6058)
(If Padd III)*(Inventory Ratio Padd III)	n/a	n/a	-1.7318	-12.1305
	n/a	n/a	(1.2769)	(4.7875)
(If Padd I)*(Inventory Ratio Padd III)	n/a	n/a	n/a	-10.4875
	n/a	n/a	n/a	(4.7032)
(If Padd II)*(Inventory Ratio Padd III)	n/a	n/a	n/a	-10.5799
	n/a	n/a	n/a	(6.1779)
Utilization Rates	0.0835	0.1590	0.1613	0.1538
	(0.1048)	(0.1057)	(0.1057)	(0.1055)
MW Crisis	5.2124	4.8924	4.2273	4.3444
	(1.4006)	(1.3930)	(1.4110)	(1.4158)
Constant	0.0042	-0.0055	-0.0068	-0.0005
	(0.6908)	(0.7144)	(0.7093)	(0.6846)
AR (1) Coefficient	0.8347	0.7953	0.7937	0.7860
Rack Cities	19	19	19	19
Weeks	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC
STATA XTGLS Options:				
Correction for Auto Correlation	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No
Panels: Heteroskedastic	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No

* The figures in this column come directly from the GAO report, page 145.

Table 27
Reformulated Gasoline Price HHI - Branded:
Robustness of Inventory Ratio

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)
HHI-GAO Report	0.0041	0.0034	0.0040	0.0042
	(0.0016)	(0.0017)	(0.0017)	(0.0016)
Inventories Ratio	-3.4990	-4.1328	n/a	n/a
	(0.8147)	(0.9085)	n/a	n/a
(If Padd I)*(Inventory Ratio Padd I)	n/a	n/a	-4.2929	-3.9492
	n/a	n/a	(1.0240)	(0.9998)
(If Padd II)*(Inventory Ratio Padd II)	n/a	n/a	-9.8817	-9.7724
	n/a	n/a	(2.4086)	(2.6955)
(If Padd III)*(Inventory Ratio Padd III)	n/a	n/a	-2.7316	-11.9582
	n/a	n/a	(1.1536)	(4.5282)
(If Padd I)*(Inventory Ratio Padd III)	n/a	n/a	n/a	-9.7729
	n/a	n/a	n/a	(4.5174)
(If Padd II)*(Inventory Ratio Padd III)	n/a	n/a	n/a	-9.9042
	n/a	n/a	n/a	(5.3457)
Utilization Rates	0.1830	0.1727	0.1735	0.1683
	(0.1005)	(0.1013)	(0.1013)	(0.1010)
MW Crisis	2.6429	2.6986	2.2796	2.3634
	(1.0268)	(1.0314)	(1.0427)	(1.0464)
Constant	0.0790	0.0442	0.0418	0.0449
	(0.7432)	(0.7376)	(0.7377)	(0.7094)
AR (1) Coefficient	0.8447	0.8116	0.8115	0.8041
Rack Cities	22	22	22	22
Weeks	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC
STATA XTGLS Options:				
Correction for Auto Correlation	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No
Panels: Heteroskedastic	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No

* The figures in this column come directly from the GAO report, page 150.

Table 28
Reformulated Gasoline Price HHI - Unbranded:
Robustness of Inventory Ratio

Independent Variable	*GAO Report (1)	Baseline (2)	(3)	(4)
HHI-GAO Report	0.0037	0.0034	0.0038	0.0037
	(0.0019)	(0.0020)	(0.0020)	(0.0019)
Inventories Ratio	-3.7742	-4.7114	n/a	n/a
	(0.9543)	(1.0857)	n/a	n/a
(If Padd I)*(Inventory Ratio Padd I)	n/a	n/a	-5.5524	-5.2754
	n/a	n/a	(1.1981)	(1.2186)
(If Padd II)*(Inventory Ratio Padd II)	n/a	n/a	-12.9205	-13.4461
	n/a	n/a	(3.2254)	(3.6282)
(If Padd III)*(Inventory Ratio Padd III)	n/a	n/a	-2.2516	-11.8342
	n/a	n/a	(1.3812)	(4.9424)
(If Padd I)*(Inventory Ratio Padd III)	n/a	n/a	n/a	-9.8171
	n/a	n/a	n/a	(4.8720)
(If Padd II)*(Inventory Ratio Padd III)	n/a	n/a	n/a	-8.9820
	n/a	n/a	n/a	(6.2946)
Utilization Rates	0.0797	0.1465	0.1472	0.1416
	(0.1096)	(0.1093)	(0.1093)	(0.1091)
MW Crisis	4.8318	4.6688	4.1530	4.2473
	(1.3905)	(1.3925)	(1.4091)	(1.4136)
Constant	0.0088	-0.0184	-0.0216	-0.0154
	(0.7980)	(0.7809)	(0.7783)	(0.7484)
AR (1) Coefficient	0.8401	0.8077	0.8070	0.7990
Rack Cities	19	19	19	19
Weeks	305	305	305	305
Estimated By:	GAO	FTC	FTC	FTC
STATA XTGLS Options:				
Correction for Auto Correlation	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No
Panels: Heteroskedastic	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No

* The figures in this column come directly from the GAO report, page 150.

Table 29
Merger Event Studies - Importance of Control Variables

Independent Variable	RFG - Branded: *GAO Report (1)	RFG - Branded: Baseline (2)	RFG - Branded: No Controls (3)	RFG - Unbranded: *GAO Report (4)	RFG - Unbranded: Baseline (5)	RFG - Unbranded: No Controls (6)	CARB - Branded: *GAO Report (7)	CARB - Branded: Baseline (8)	CARB - Branded: No Controls (9)
Exxon-Mobil	1.6080	1.3352	1.4681	1.0118	0.7687	0.8367	n/a	n/a	n/a
	(0.3010)	(0.2658)	(0.3311)	(0.4503)	(0.4114)	(0.4991)	n/a	n/a	n/a
BP-Amoco	0.5500	0.5374	0.3474	0.3976	0.4034	0.2705	n/a	n/a	n/a
	(0.2309)	(0.2227)	(0.2318)	(0.3185)	(0.3307)	(0.3198)	n/a	n/a	n/a
Marathon Ashland	0.7131	0.6842	0.6674	0.8558	0.8125	0.8432	n/a	n/a	n/a
	(0.2221)	(0.2146)	(0.2241)	(0.3060)	(0.3181)	(0.3086)	n/a	n/a	n/a
Shell-Texaco II	-0.3896	-0.4450	-0.1952	0.0862	0.1205	0.1964	n/a	n/a	n/a
	(0.1825)	(0.1999)	(0.2047)	(0.3531)	(0.3667)	(0.4032)	n/a	n/a	n/a
Total UDS	-0.3875	-0.4346	-0.4135	-0.2237	-0.2785	-0.2787	n/a	n/a	n/a
	(0.0745)	(0.0848)	(0.1060)	(0.1679)	(0.1762)	(0.2011)	n/a	n/a	n/a
Inventories Ratio	-3.4529	-3.5979	n/a	-3.8524	-3.9998	n/a	-20.9206	-41.8458	n/a
	(0.8275)	(0.8911)	n/a	(0.9432)	(1.0150)	n/a	(5.9529)	(9.2852)	n/a
Utilization Rates	0.1905	0.1731	n/a	0.0835	0.1590	n/a	0.3625	0.1632	n/a
	(0.0971)	(0.0987)	n/a	(0.1048)	(0.1057)	n/a	(0.2186)	(0.2178)	n/a
MW Crisis	2.8199	2.6817	n/a	5.2124	4.8924	n/a	n/a	n/a	n/a
	(1.0261)	(1.0172)	n/a	(1.4006)	(1.3930)	n/a	n/a	n/a	n/a
Constant	0.0565	0.0410	0.0488	0.0042	-0.0055	-0.0104	0.3891	0.3470	0.6687
	(0.6561)	(0.6845)	(0.8286)	(0.6908)	(0.7144)	(0.8441)	(1.6817)	(1.6157)	(3.0358)
Tosco-Unocal	n/a	n/a	n/a	n/a	n/a	n/a	6.8685	5.1733	7.3030
	n/a	n/a	n/a	n/a	n/a	n/a	(3.3136)	(3.2909)	(4.2168)
Shell-Texaco I	n/a	n/a	n/a	n/a	n/a	n/a	-0.6933	-0.9910	-0.0303
	n/a	n/a	n/a	n/a	n/a	n/a	(0.3167)	(0.2948)	(0.4208)
WC Crisis	n/a	n/a	n/a	n/a	n/a	n/a	4.8834	3.9464	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	(2.0148)	(2.0033)	n/a
AR (1) Coefficient	0.8375	0.8011	0.8342	0.8347	0.7953	0.8245	0.8647	0.8146	0.9008
Rack Cities	22	22	22	19	19	19	6	6	6
Weeks	305	305	305	305	305	305	242	242	242
Estimated By:	GAO	FTC	FTC	GAO	FTC	FTC	GAO	FTC	FTC
Drop Controls:	No	No	Yes	No	No	Yes	No	No	Yes
STATA XTGLS Options:									
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No	No	No	No	No	No
Panels: Heteroskedastic	No	No	No	No	No	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No	No	No	No	No	No

* The figures in this column come directly from the GAO report, pages 145 and 146.

Table 30
Reformulated Gasoline Price HHI:
Importance of Control Variables

Independent Variable	Branded *GAO Report (1)	Branded Baseline (2)	Branded No Controls (3)	Unbranded *GAO Report (1)	Unbranded Baseline (2)	Unbranded No Controls (3)
HHI-GAO Report	0.0041 (0.0016)	0.0034 (0.0017)	0.0030 (0.0016)	0.0037 (0.0019)	0.0034 (0.0020)	0.0025 (0.0019)
Inventories Ratio	-3.4990 (0.8147)	-4.1328 (0.9085)	n/a n/a	-3.7742 (0.9543)	-4.7114 (1.0857)	n/a n/a
Utilization Rates	0.1830 (0.1005)	0.1727 (0.1013)	n/a n/a	0.0797 (0.1096)	0.1465 (0.1093)	n/a n/a
MW Crisis	2.6429 (1.0268)	2.6986 (1.0314)	n/a n/a	4.8318 (1.3905)	4.6688 (1.3925)	n/a n/a
Constant	0.0790 (0.7432)	0.0442 (0.7376)	0.0705 (0.9834)	0.0088 (0.7980)	-0.0184 (0.7809)	-0.0189 (1.0174)
AR (1) Coefficient	0.8447	0.8116	0.8568	0.8401	0.8077	0.8501
Rack Cities	22	22	22	19	19	19
Weeks	305	305	305	305	305	305
Estimated By:	GAO	FTC	FTC	GAO	FTC	FTC
Drop Controls	No	No	Yes	No	No	Yes
STATA XTGLS Options:						
Correction for Auto Correlation	Yes	Yes	Yes	Yes	Yes	Yes
Estimate Separate Auto Correlation by Rack	No	No	No	No	No	No
Panels: Heteroskedastic	No	No	No	No	No	No
Panels: Correlated	Yes	Yes	Yes	Yes	Yes	Yes
Iterated GLS	No	No	No	No	No	No

* The figures in this column come directly from the GAO report, page 150.

Appendix I

Document I
FTC Staff Questions to GAO Staff with FTC Summary of Answers

1. Which rack cities are included in each analysis: the branded and unbranded rack, for each of Conventional/RFG/CARB gasoline?

   GAO gave FTC staff a printout listing all racks included in GAO's Conventional, RFG, and CARB regressions. The document was labeled Appendix I.

2. For each merger analyzed in the GAO report (e.g., see tables 21, 22, and 23), which rack cities are in the control group and which are in the affected group? In other words, which rack cities were affected by which mergers?

   GAO gave FTC staff a list of all racks affected by each merger. There is a separate list for each formulation of gasoline examined by GAO: Conventional, RFG, and CARB. The document is called Appendix II.

3. A comment on page 125 of the GAO report states, "the specific merger dummies ($MERGER_{ki}$) were applicable only in the rack cities where the merging companies operated." We assume that this statement defines GAO's decision rule of how it identified refiners competing in a rack city. The statement, however, does not define what GAO means by "operating." How is operating defined? Does GAO define operations separately by fuel type (RFG/Conventional/CARB) or for the branded and unbranded rack? Is a firm defined as "operating" at a rack if it posts a price during at least one week of the GAO study's time period (1994-2000), or is there a requirement placed on the minimum number of weeks the firm participated at the rack? Please explicitly state the definition of "operating" and provide parameters for how GAO used the concept.

   GAO's decision rule was as follows: two firms are defined as operating at a rack if both firms posted a price for a formulation(Conventional/RFG/ CARB) of gasoline (either branded or unbranded) in at least one week in the 52 weeks prior to the merger. GAO stated that the program that generated overlaps was estimated separately for the different specifications of gasoline (Conventional, RFG, CARB). Overlaps were the same for both branded and unbranded. GAO explained that

requiring a firm to post at least once in the 52 weeks proceeding the merger (as opposed to posting at any time pre-merger) did not affect the definition of overlaps for CARB or RFG. However, this requirement did change the definition of overlaps for a number of conventional racks: Hammond, Kankee, Chicago, Madison were no longer overlaps for Marathon/Ashland.

4. Different parts of the GAO report suggest different definitions of the merger dummies (see below). How, exactly, are the merger dummies defined?

   a. In Table 14 (page119) the merger dummies are defined as being equal to zero in all time periods prior to the effective merger date, and one in all subsequent periods.

   b. Table 15 (pages 132-133) reports discrete time periods in which merger effects are estimated, e.g., Marathon/Ashland's merger "estimates are obtained using data for" the pre-merger period of 3/2/95-1/4/98 and the post-merger period 1/5/98-6/30/98. This appears to be inconsistent with the description in table 14.

   GAO explained that a (above) explains how variables are defined while b explains the identification of the merger effects.

5. A comment on page 125 suggests that the panel used in the estimation of each model is balanced; that is, the number of time periods for each rack is identical. Did this require you to drop some racks? If so, which racks were dropped from your analysis because of incomplete panels? Please state separately by fuel specification (CARB, RFG-MTBE, and Conventional) and for the branded and unbranded rack.

   GAO restricted its analysis to balanced panels. Their rule for CARB and RFG was to only include cities that had a complete panel on CARB/RFG with MTBE. If one week is missing from a series, GAO interpolated the missing value. If more than one consecutive week is missing, GAO dropped the city.

6. There appears to be an inconsistency about whether data was used from PADD II for the

RFG analysis. Are data from PADD II used in the GAO analysis of RFG gasoline?

a. Comment 7d on page198 states that GAO did not "focus on" RFG in PADD II.

b. Table 16 on page 133 states that data from one PADD II rack city was used in estimating merger effects for RFG. Which rack city?

The only city in PADD II in GAO's analysis of RFG gasoline is Louisville.

7. Which deflator from the Economic Report of the President was used to deflate the price series? Would GAO give FTC staff this deflator series?

a. If a monthly deflator was used, how was this monthly variable matched with the weekly price data?

i. Were weekly deflators interpolated from monthly deflators?

ii. Was the same monthly level used for each week in a given month?

GAO used the annual finished goods PPI for energy. (Economic Report of the President, Table B-66, 3rd column) GAO used the same value of the index for each price level in a year.

8. The description of the construction of the "Inventories Ratio" variable is incomplete; i.e., FTC staff are unclear as to how this variable was constructed. GAO staff could greatly facilitate FTC staff's understanding of this variable if GAO provided FTC with the data and STATA program(s) used to construct this variable (the data used in the creation of this variable comes from the U.S. government.) If the programs are unavailable, FTC staff request a detailed step-by-step description of the method used to construct the variable.

a. **The inventory data is PADD level for all gasoline ('http://tonto.eia.doe.gov/oog/ftparea/wogirs/xls/psw10vwgt.xls') and consumption data is state level prime supplier sales data for all gasoline (Table 48 of the Petroleum Marketing Annual).**

i. Inventories and Consumption are scaled by the mean level over the entire time period. Inventory is scaled by the mean PADD level,

consumption by the mean state level.

ii. **Predicted consumption is generated by the equation in the footnote to table on page 121.**

iii. **The PADD level consumption averages are the average of the states.**

iv. **DC, Alaska, and Hawaii were not used in the analysis.**

v. **GAO matched the weekly and monthly data. They did not interpolate. They used the same monthly data for each week.**

9. There are a number of options in the XTGLS estimation procedure in correcting for autocorrelation and heteroskedacticity. Exactly which options in XTGLS were used? **The options are panels=c=correlated, they estimate a common autocorrelation, and did not use the iteration function.**

10. It is unclear to FTC staff how GAO implemented its instrumental variables (IV) estimation procedure. The footnote describing the modification of STATA's procedures is not sufficiently detailed. Below is a partial list of questions to clarify FTC staff's understanding of GAO staff's methodology.

a. When using STATA's IVREG2 procedure, what specific options did GAO staff use?

i. To understand GAO staff's estimation procedure, it is important either to see GAO's STATA programs or receive a detailed explanation of exactly what econometric estimation was done.

b. The GAO report states that the residuals from IVREG2 are used as inputs for XTGLS. XTGLS is not an IV estimator; that is, XTGLS is not designed to correct for endogeneity. Did GAO staff modify XTGLS to perform an IV estimation? If so, what modifications were made? (See also part c below)

c. In footnote 37, the report states that a "two-stage XTGLS" procedure was used.

i. What is meant by "two-stage"? What are the two stages? Please be very explicit.

ii. Does footnote 37 imply that XTGLS is the second stage of a two step method (the two steps being (1) IVREG2 and (2) modified XTGLS)?

iii. Or does footnote 37 imply that GAO staff modified the XTGLS procedure to do some form of a 3SLS calculation?

1. GAO gave FTC staff a handout.

2. Run IVREG2 (2SLS) to get residuals.

3. Get fitted values for use in XTGLS:

1. Regress (straight OLS) each explanatory variable on the instruments (including exogenous explanatory variables),

2. Obtain predicted values from each regression (the predicted values of the exogenous explanatory variables are themselves).

4. Run XTGLS using as explanatory variables the fitted values from OLS (step 3b) and the residuals from IVREG2 (step 2).

11. It is unclear how some of the concentration measures (HHIs) were calculated. The data for the yearly PADD level HHIs used in the various price concentration analyses are necessary to replicate the GAO's price concentration analysis. We need the underlying calculations of the HHI from the EIA capacity data to understand how GAO treated joint ventures. In addition, we need a description of how the multiple PADD level HHIs (for example the HHI for PADDS I-III in Table 18) were calculated.

A. EIA sent GAO the refinery capacity data. The data they received contained company codes. GAO calculated HHI's using the company codes as the firm identifiers.

B. In generating the estimated price effects in table 19 on page 137 of the GAO report, the change in HHI for RFG is a weighted average of PADD level HHI where the weight is the number of racks in each PADD.

C. Related Point: In calculating PADD HHI for PADD V, Alaska and Hawaii are included.

12. The GAO report uses rack city fixed-effects in all of its econometric analyses of the effect of mergers and concentration on gasoline prices. How does GAO implement its fixed-effect estimator? For example, did GAO transform its data into deviations from rack-city means, or did GAO add rack-city dummies to its estimating equations?

GAO demeaned the data.

Document II
GAO response to FTC Summary of Answers

Date: November 9, 2004

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1. Note that there is a separate list for each formulation of gasoline—conventional, RFG, and CARB.

2. OK.

3. A merger was assumed to affect a rack city if at the time of the merger both merging companies had posted gasoline prices for any formulation (conventional, RFG, or CARB) at the rack for at least 52 weeks immediately prior to the merger. The merger-affected rack city for each gasoline formulation was then identified, based on data availability. Then, for each gasoline formulation, the gasoline type (branded or unbranded) was also identified, based on data availability.

   A few modifications were made that affected only conventional gasoline.

   (i) For two of the mergers affecting conventional gasoline we included a few rack cities where, while both merging companies had substantial presence since 1994, one of the companies was not present in the immediate 52 weeks prior to the merger. This is because, initially, we planned to run the results for each merger using all the available data before the merger and after the merger; however, the premerger and postmerger periods for some mergers were shortened due to the overlapping nature of the mergers. This affected the following mergers and rack cities: Marathon/Ashland (Chicago, IL; Kankakee, IL; Hammond, IN; and Madison, WI), and UDS-Total (Wynnewood, OK).
   (ii) Harrisburg was mistakenly included in the Shell-Texaco I (Equilon) merger instead of the Shell-Texaco II (Motiva).
   (iii) For the market concentration model, the Four Corners Ref. rack city, which was assigned to New Mexico based on the nearest rack city was mistakenly classified PADD IV instead of PADD III.

4. OK.

5. OK.

6. OK.

7. Yes.

   The deflator series used was Producer Price Indexes (PPI) by Stage of Processing, Finished Goods, Energy, annual, published in the 2002 Economic Report of the President (see pp. 119-120 of the GAO Report), Table B-66, 3rd column.

8. The Inventories Ratio is a ratio of Inventories to Demand, by PADD, and weekly. The Inventories data are one-period lagged levels of gasoline stocks obtained from

EIA (see Table 14, 120 of the GAO Report). The inventory data are in the EIA database, Excel file PSW04VWALL.xls, available by PADD, and weekly. The data were normalized by the mean of each PADD over the sample period (1994-2000). The data for Demand are based on prime suppliers' sales of regular gasoline in each state, available monthly. The data were normalized by each state mean over the sample period and estimated (see p. 121 of the GAO Report). The data were then averaged by PADD, using all the states in each PADD, because the Inventories are at the PADD level. The prime suppliers' data were obtained from EIA (Tammy Heppner, 202-586-4748). As stated in the GAO Report, the expected demand was obtained from the regression equation specified on p. 121. The states that were used in the analysis are listed in dataset Appendix I.

9. The commands used in the XTGLS estimation procedure are the common autocorrelation correction (corr =ar1), and the correction for heteroscedasticity (panels=c). The default for the iterations is 100, and there was no problem with convergence—the default was used since we did not use the iteration option to indicate a specific number of iterations.

10. Yes.

    In general, here are the steps we used for the two-stage estimation process. In the first stage, we run an OLS to generate fitted values for the potential endogenous regressors. In the second stage, we used XTGLS to estimate our IV models, where the residuals of XTGLS were replaced with ("clean") residuals from the IVREG2 estimation. The handout outlines how the IVREG2 and XTGLS procedures were integrated.

11. Yes.

    The HHI data, based on refinery capacity was obtained from EIA. See table 14, p. 119. The data, titled "Atmospheric Distillation Capacity in Barrels Per Calender Day, were sorted by PADD and corporate code, and the refinery capacities summed across the corporate codes by PADD. The HHI was then calculated. The data provided by EIA reflected changes in the market conditions, including joint ventures. The HHIs for the multiple PADDs are based on the average of the HHIs for the associated PADDs. (See also 8 above for EIA contact).

    We used all available data for the HHI analysis, which included the states of Alaska and Hawaii.

12. Yes.

    The fixed effects were estimated by demeaning the data (transforming the data into mean-deviations).

Document III
Email information from GAO Staff

Email sent from FTC staff to GAO Staff on 11/15/2004

Thanks for the document. Two follow up questions

1) On answer 8 - you mentioned that the states to be included in the inventory ratio calculation are given in Appendix I. Just to make sure I understand, the states that would be dropped for those included in the EIA data are - Alaska, Hawaii, New Hampshire and the District of Columbia.

2) On answer 9 - you mention that the default iteration is 100 and there was no problem with convergence. Did you use iterated GLS (igls)?

Email from GAO staff to FTC staff on 12/1/2004

Here is an update.

Q8. For the inventory-demand variable, the data used for the gasoline consumption included all the available data, which includes Alaska, DC, and Hawaii.
Q9. We did not use the iteration option for XTGLS (or the modified XTGLS), which has a default of 100. The same results were obtained when the iteration option of 100 or 1000 was used.

Email from FTC staff to GAO staff on November 5th 2004

There is an outstanding issue with respect to the overlaps in the merger cases. We have the list of overlaps that you gave us and the overlap rule that you described. When we apply the rule to the data we do not get the same overlaps. Some examples, we can find no overlap for Total -UDS in reformulated gasoline or for Exxon-Mobil in Albany or Shell-Texaco in Albany in RFG. If you want a complete list I can send that along. If you want to talk about this please give me a call.

Email from GAO staff to FTC staff on November 10th , 2004

This is how the overlaps work out for the mergers and rack cites that you identified, consistent with the rule defined in our response to Q3.

Both companies post prices for the same formulation (in this case conventional), but only one of the companies posts prices for the other formulation that you referred to (RFG). Specifically, this is the outcome for the overlaps.

Exxon-Mobil @ Albany, NY
Conventional: Exxon, Mobil
RFG: Mobil

Shell-Texaco @ Albany, NY
Conventional: Shell, Texaco
RFG: Texaco

UDS-Total @ Dallas Metro, TX
Conventional: UDS, Total
RFG: UDS

Email from GAO staff to FTC staff on October 13, 2004

Regarding the treatment of the demand variable used in constructing the "Inventory to Demand" variable (Q8), we did the following. The estimated normalized demand values, which are at the state level, were averaged using all the states in each PADD.

Document IV
Description of GAO Instrumental Variables Estimation

Steps to Combine IV and XTGLS :

1) Adjust the XTGLS ado file as suggested below and save it under a new name: XTGLS@@)
2) Run the IV routine for a given model.
3) Generate double precision IV residuals via predict double.... command and name them IVRES.
4) Generate the first-stage predicted values for the endogenous regressors in the given model.
5) Perform XTGLS@@ on the dependent variable, exogenous variables, and these predicted variables.
6) Drop IVRES.
7) Go to step 2 and repeat (2) through (6) for another model.

Added Codes to Adjust XTGLS.ado File (see XTGLSDK.ado in Attachment I):

replace *$X_ee*=IVRES //*IVRES* (IV residuals) must be computed in double precision. *(place it after the first "predict double..." line in mc0)* Auto

replace *$X_ee*=IVRES //*IVRES* (IV residuals) must be computed in double precision. *(place it after the first "predict double..." line in mc1)*

replace *$X_ee*=IVRES //*IVRES* (IV residuals) must be computed in double precision. *(place it after the first "predict double..." line in mc2)*

Document V
Appendix I - Description of Cities used in GAO Analysis

APPENDIX I

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STATA™
Statistics/Data Analysis

User: john a karikari
Project: Rack Cities: mktcon

```
      log:  D:\My Documents\STATA\GRC\grc_rcity_mktcon.smcl
 log type:  smcl
opened on:  24 Jun 2004, 16:28:27

1 .
2 . set more off
3
4 *conventional gasoline
5 .
6 . use "D:\My Documents\STATA\GRC\G_DATA1_fe.dta", clear
7 .
8 . bysort padd state r_city: sum rp_brn rp_unb
```

B = Branded
U = Unbranded

-> padd = 1, state = FL, r_city = JACKSONVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.09482	11.78923	42.36559	104
rp_unb	361	69.89292	12.69027	38.24373	105.03

B, U

-> padd = 1, state = FL, r_city = MIAMI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.2558	12.05125	41.79211	103.415
rp_unb	361	69.70525	12.64036	38.74552	104.865

B, U

-> padd = 1, state = FL, r_city = NICEVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.5185	12.22654	40.81242	103.25
rp_unb	361	68.78026	12.44598	38.23178	102.95

B, U

-> padd = 1, state = FL, r_city = ORLANDO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.60421	11.873	42.65233	104.64
rp_unb	361	71.17735	12.59601	39.55795	105.15

B, U

-> padd = 1, state = FL, r_city = PANAMA CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.4437	11.98998	41.14695	103.14
rp_unb	361	68.82952	12.4922	37.71804	102.86

B, U

-> padd = 1, state = FL, r_city = PENSACOLA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.34976	12.29978	40.48985	103.17
rp_unb	361	69.06821	12.7813	38.72163	104.55

B, U

-> padd = 1, state = FL, r_city = ST. MARKS

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Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.32775	12.08121	41.95938	104.25
rp_unb	361	69.99082	13.12352	39.34289	107.26

B, U

-> padd = 1, state = FL, r_city = TAMPA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.41576	12.0092	40.14337	102.065
rp_unb	361	69.1942	12.60504	37.64635	103.5

B, U

-> padd = 1, state = GA, r_city = ALBANY_GA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.58567	12.06214	39.9761	103.06
rp_unb	361	68.57509	12.53208	37.32378	103.3

B, U

-> padd = 1, state = GA, r_city = ATHENS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.36293	12.3587	39.76105	105.195
rp_unb	361	68.63322	12.87639	37.28793	108.79

B, U

-> padd = 1, state = GA, r_city = ATLANTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.35902	12.30367	39.53405	105.965
rp_unb	361	69.20237	13.30392	37.29988	114.22

B, U

-> padd = 1, state = GA, r_city = BAINBRIDGE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.73727	12.00167	40.28674	103.25
rp_unb	361	68.69339	12.44477	37.71804	103.58

B, U

-> padd = 1, state = GA, r_city = COLUMBUS_GA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.66818	11.99942	40.07169	103.04
rp_unb	361	68.61484	12.42833	37.51493	103.16

B, U

-> padd = 1, state = GA, r_city = GRIFFIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.73105	12.63409	40.0239	108.43
rp_unb	361	68.85334	12.86426	37.57467	107.39

B, U

-> padd = 1, state = GA, r_city = MACON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.37931	12.00763	39.7491	102.82
rp_unb	361	68.42514	12.41632	37.27599	103

B, U

- 32 ...
1 - 29

-> padd = 1, state = GA, r_city = ROME

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.26813	12.1578	40.0239	103.51
rp_unb	361	68.51279	12.55526	37.69415	103.4

B, U

-> padd = 1, state = GA, r_city = SAVANNAH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.02511	11.95245	42.06691	104.38
rp_unb	361	70.69299	12.70314	39.56989	106.24

B, U

-> padd = 1, state = MD, r_city = BALTIMORE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.93723	12.17893	40.38232	103.26
rp_unb	361	70.28919	12.64906	38.45878	103.97

B, U

-> padd = 1, state = MD, r_city = SALISBURY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.47457	12.2725	40.23895	100.88
rp_unb	0				

B

-> padd = 1, state = ME, r_city = BANGOR

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.07266	12.91062	43.73955	107.55
rp_unb	0				

B

-> padd = 1, state = ME, r_city = PORTLAND_ME

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.71972	12.94379	41.93548	105.635
rp_unb	361	73.00485	13.1849	40.17921	110.11

B, U

-> padd = 1, state = NC, r_city = CHARLOTTE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.37685	12.09948	40.13142	103.29
rp_unb	361	68.63935	12.46363	37.33572	103.415

B, U

-> padd = 1, state = NC, r_city = GREENSBORO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.42659	12.15993	39.80884	103.295
rp_unb	361	68.76332	12.51421	37.39546	103.66

B, U

-> padd = 1, state = NC, r_city = SELMA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.76116	12.17016	40.29869	103.8
rp_unb	361	69.08201	12.64717	37.74194	104.905

B, U

-> padd = 1, state = NC, r_city = WILMINGTON_NC

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.50661	11.98253	41.8638	104.55
rp_unb	361	70.13934	12.48298	39.21147	104.95

B, U

-> padd = 1, state = NY, r_city = ALBANY_NY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.78182	12.94653	40.63321	104.52
rp_unb	361	71.75308	12.86085	39.67742	108.15

B, U

-> padd = 1, state = NY, r_city = BINGHAMTON/VESTAL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.99585	12.73226	43.53644	105.62
rp_unb	361	73.16176	12.93288	41.3859	111.56

B, U

-> padd = 1, state = NY, r_city = BUFFALO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.13013	12.51863	43.65591	105.18
rp_unb	0				

B

-> padd = 1, state = NY, r_city = NEWBURGH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.55678	13.33462	44.06213	107.82
rp_unb	361	71.82399	13.20417	39.66547	107.38

B, U

-> padd = 1, state = NY, r_city = ROCHESTER_NY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.94303	12.71161	42.44922	104.85
rp_unb	361	73.45169	12.75287	41.27837	109.73

B, U

-> padd = 1, state = NY, r_city = SYRACUSE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.73256	12.74832	42.99881	105.18
rp_unb	361	73.64847	12.79363	41.78017	110.18

B, U

-> padd = 1, state = NY, r_city = UTICA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.59824	12.75015	42.16248	105.08
rp_unb	361	73.52498	12.88137	41.72043	111.07

B, U

B-49
U-44

-> padd = 1, state = PA, r_city = ALTOONA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.85674	12.72174	41.26643	104.56
rp_unb	361	71.83069	12.91763	39.773	108.22

B, U

-> padd = 1, state = PA, r_city = HARRISBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.75536	12.82235	39.02031	103.49
rp_unb	361	71.27363	12.97055	39.36679	106.29

B, U

-> padd = 1, state = PA, r_city = LANCASTER

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.11375	12.74398	39.24731	102.98
rp_unb	0				

B

-> padd = 1, state = PA, r_city = MACUNGIE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.2999	12.84228	39.546	104.1
rp_unb	0				

B

-> padd = 1, state = PA, r_city = NORTHUMBERLAND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.59587	12.74721	40.65711	104.29
rp_unb	361	71.65215	12.98483	39.72521	106.33

B, U

-> padd = 1, state = PA, r_city = PITTSBURGH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.4738	12.98363	38.94863	107.22
rp_unb	361	71.65158	13.38595	38.47073	109.83

B, U

-> padd = 1, state = PA, r_city = SCRANTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.53371	12.71558	40.82437	103.87
rp_unb	361	72.63728	12.98717	41.03942	107.16

B, U

-> padd = 1, state = PA, r_city = WARREN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.58402	13.11376	41.08722	106.96
rp_unb	361	75.287	13.52651	42.1147	111.13

B, U

-> padd = 1, state = PA, r_city = WILLIAMSPORT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.79163	12.80512	40.63321	104.68
rp_unb	361	73.49114	13.00479	40.91995	109.05

B, U

-> padd = 1, state = SC, r_city = BELTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.62048	12.00067	40.13142	102.93
rp_unb	361	68.33914	12.45564	37.06093	102.78

B, U

-> padd = 1, state = SC, r_city = CHARLESTON_SC

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.69434	11.99278	41.4098	104.33
rp_unb	361	69.69428	12.54132	38.85305	104.65

B, U

-> padd = 1, state = SC, r_city = NORTH AUGUSTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.56964	12.05609	39.92831	102.6
rp_unb	361	68.66424	12.4559	37.76583	103.12

B, U

-> padd = 1, state = SC, r_city = SPARTANBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.3668	12.06949	39.73716	102.89
rp_unb	361	68.53473	12.50605	37.26404	103.07

B, U

-> padd = 1, state = VA, r_city = FAIRFAX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.75279	12.0505	41.17085	102.33
rp_unb	361	69.74862	12.41212	38.18399	103.6

B, U

-> padd = 1, state = VA, r_city = NORFOLK_VA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.07999	12.19071	39.53405	101.54
rp_unb	361	69.16794	12.37736	37.61052	103.1

B, U

-> padd = 1, state = VA, r_city = RICHMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.03955	12.10756	39.47431	101.92
rp_unb	361	69.10936	12.51542	37.81362	103.77

B, U

-> padd = 1, state = VA, r_city = ROANOKE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.44141	11.96346	39.71326	101.78
rp_unb	361	69.01244	12.4522	37.87336	103.74

B, U

-> padd = 1, state = VT, r_city = BURLINGTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.19327	12.608	45.61529	108.24
rp_unb	0				

B

-> padd = 1, state = WV, r_city = CHARLESTON_WV

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.23267	12.01029	43.75149	112.39
rp_unb	361	73.47021	12.44567	40.7049	112.22

B, u

-> padd = 2, state = IA, r_city = BETTENDORF

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.60097	12.91302	42.61649	132.34
rp_unb	361	73.89585	13.57775	40.05974	144.02

B, u

-> padd = 2, state = IA, r_city = COUNCIL BLUFFS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.05164	12.95608	43.52131	131.88
rp_unb	361	73.15294	12.8395	42.43108	133.63

B, u

-> padd = 2, state = IA, r_city = DES MOINES

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.39152	12.80505	44.56141	132.35
rp_unb	361	73.68668	13.20647	43.03465	138.27

B, u

-> padd = 2, state = IA, r_city = DUBUQUE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.77544	12.84712	44.6595	133.01
rp_unb	361	74.05914	12.97108	43.46476	136.05

B, u

-> padd = 2, state = IA, r_city = FT. DODGE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.96946	12.64961	45.33834	132.8
rp_unb	361	73.88843	12.97366	42.75986	134.35

B, u

-> padd = 2, state = IA, r_city = FT. MADISON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.15657	12.69135	44.98208	132.11
rp_unb	361	74.41305	12.82993	43.48371	132.9

B, u

-> padd = 2, state = IA, r_city = IOWA CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.99557	12.84651	44.73118	132.45
rp_unb	361	74.0065	13.01189	42.97491	136.35

B, u

-> padd = 2, state = IA, r_city = LEMARS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.98417	12.99757	44.44862	133.08
rp_unb	361	73.77502	12.97788	43.15789	133.64

B, u

-> padd = 2, state = IA, r_city = MASON CTY/CLR.LK.

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.0747	12.86518	44.8865	132.7
rp_unb	361	74.29644	12.95643	43.87218	136.34

B, u

-> padd = 2, state = IA, r_city = MILFORD

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.43792	13.04115	44.07268	133.09
rp_unb	361	73.22862	13.15474	42.43727	136.85

B, u

-> padd = 2, state = IA, r_city = OTTUMWA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.52962	12.83436	45.61529	132.52
rp_unb	361	74.90112	13.42527	41.47869	139.7

B, u

-> padd = 2, state = IA, r_city = ROCK RAPIDS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.10462	12.86252	44.51128	133.19
rp_unb	361	73.64404	12.85159	42.88221	135.34

B, u

-> padd = 2, state = IA, r_city = SIOUX CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.59831	12.94551	44.81203	132.83
rp_unb	361	73.76493	13.1982	43.28555	138.51

B, u

-> padd = 2, state = IA, r_city = WATERLOO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.25899	12.83025	45.13739	132.48
rp_unb	361	74.10305	13.04099	43.17802	136.29

B, u

-> padd = 2, state = IL, r_city = AMBOY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.37816	13.77631	37.03704	141.25
rp_unb	361	72.62394	14.14782	36.32019	140.5

B, u

B - 66
u - 60

U-76

-> padd = 2, state = IL, r_city = CHAMPAIGN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.83171	13.51791	36.76225	133.29
rp_unb	361	70.6973	14.01744	34.80287	136.68

B, U

-> padd = 2, state = IL, r_city = CHICAGO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	0				
rp_unb	361	71.0552	14.72545	35.42413	145.56

U

-> padd = 2, state = IL, r_city = DECATUR/FORSYTHE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.56763	13.45041	38.1123	133.12
rp_unb	361	72.21295	14.3299	34.8865	145.25

B, U

-> padd = 2, state = IL, r_city = HEYWORTH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.02154	12.9619	42.5687	134.23
rp_unb	0				

B

-> padd = 2, state = IL, r_city = KANKAKEE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.82522	13.34215	37.84946	134.8
rp_unb	361	70.95843	14.22408	34.76702	145.37

B, U

-> padd = 2, state = IL, r_city = PEORIA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.75985	13.69918	37.07288	138.88
rp_unb	361	72.14483	14.56978	35.37634	152.14

B, U

-> padd = 2, state = IL, r_city = ROBINSON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.04959	13.18193	37.76583	131.79
rp_unb	361	70.56897	13.84686	34.94624	134.75

B, U

-> padd = 2, state = IL, r_city = ROCKFORD

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.43101	13.53901	37.59857	134.27
rp_unb	361	71.2053	13.91698	35.8184	138.81

B, U

-> padd = 2, state = IL, r_city = WOOD RIVER

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.52206	13.86073	38.1601	132.63
rp_unb	361	70.65692	14.01218	35.74672	130.7

B, U

-> padd = 2, state = IN, r_city = EVANSVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.82962	12.54502	39.48626	114.53
rp_unb	361	70.34095	12.71558	38.08841	113.26

B, U

-> padd = 2, state = IN, r_city = HAMMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.69159	13.47054	37.15651	132.97
rp_unb	361	70.61638	14.52656	34.54002	149.05

B, U

-> padd = 2, state = IN, r_city = HUNTINGTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.56877	13.32124	38.41099	131.61
rp_unb	361	72.28019	14.01358	37.49104	141.37

B, U

-> padd = 2, state = IN, r_city = INDIANAPOLIS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.46488	13.2172	36.55914	127.57
rp_unb	361	70.38855	13.75848	35.97372	135.06

B, U

-> padd = 2, state = IN, r_city = MUNCIE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.92789	13.3125	36.9534	128.1
rp_unb	361	70.25551	13.65219	34.46834	130.2

B, U

-> padd = 2, state = IN, r_city = PRINCETON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.22999	12.54759	38.68578	113.38
rp_unb	361	70.85965	13.30476	38.54241	115.07

B, U

-> padd = 2, state = KS, r_city = COFFEYVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.84144	13.12226	40.93985	130.62
rp_unb	361	71.13449	13.29255	39.97494	135.48

B, U

-> padd = 2, state = KS, r_city = CONCORDIA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.12457	12.78983	42.10526	131.03
rp_unb	361	71.76847	12.99948	40.43859	132.17

B, U

B-97
U-92

-> padd = 2, state = KS, r_city = EL DORADO_KS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.7611	12.84863	43.32138	130.33
rp_unb	361	72.99365	13.32128	41.60401	135.83

B, U

-> padd = 2, state = KS, r_city = GREAT BEND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.18966	13.0458	43.05764	132.61
rp_unb	361	73.26484	13.16895	41.90476	134.34

B, U

-> padd = 2, state = KS, r_city = HUTCHINSON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.38324	12.96287	40.61404	131.61
rp_unb	361	71.34288	13.15045	39.97494	134.2

B, U

-> padd = 2, state = KS, r_city = KANSAS CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.54629	12.94204	42.56892	131.505
rp_unb	361	72.62964	13.13531	41.35338	134.555

B, U

-> padd = 2, state = KS, r_city = KC/SINCLAIR

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.43994	12.95161	42.36842	131.805
rp_unb	361	72.48138	13.10755	41.00251	133.26

B, U

-> padd = 2, state = KS, r_city = KC/SUGAR CREEK

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.32698	12.81779	43.10777	129.35
rp_unb	0				

B

-> padd = 2, state = KS, r_city = KC/WPL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.57566	12.93553	42.5188	131.9
rp_unb	361	72.77531	13.14549	41.37395	135.095

B, U

-> padd = 2, state = KS, r_city = MCPHERSON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.96533	13.00389	42.72401	132.32
rp_unb	361	71.83515	13.31356	40.59737	134.3

B, U

-> padd = 2, state = KS, r_city = OLATHE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.03933	12.96819	43.04511	132.965
rp_unb	361	72.74997	13.03049	41.30227	133.075

B, U

-> padd = 2, state = KS, r_city = PHILLIPSBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.02346	12.80954	44.51128	132.99
rp_unb	361	74.18456	12.82065	43.10777	135.15

B, U

-> padd = 2, state = KS, r_city = SALINA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.66273	12.83234	42.59399	130.99
rp_unb	361	72.65414	13.155	41.39098	135

B, U

-> padd = 2, state = KS, r_city = SCOTT CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.8889	12.98325	44.98747	132.51
rp_unb	361	74.83816	13.23677	43.08271	135.08

B, U

-> padd = 2, state = KS, r_city = TOPEKA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.59911	12.82991	42.99499	131.5
rp_unb	361	72.80289	13.15426	41.6129	136.29

B, U

-> padd = 2, state = KS, r_city = WATHENA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.51694	12.85076	43.03258	131.86
rp_unb	361	72.42053	12.99863	41.58901	134.19

B, U

-> padd = 2, state = KS, r_city = WICHITA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.94927	12.98055	41.57895	130.09
rp_unb	361	72.21627	13.34798	40.73935	136.01

B, U

-> padd = 2, state = KS, r_city = WICHITA/CONOCO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.90916	12.97682	41.64161	130.71
rp_unb	361	72.7304	13.58377	41.16541	137.75

B, U

-> padd = 2, state = KS, r_city = WICHITA/WILLIAMS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.88716	13.00005	41.6792	131.75
rp_unb	361	72.00011	13.45045	40.77658	136.94

B, U

B-1/8
U-109

-> padd = 2, state = KY, r_city = ASHLAND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.00226	12.00384	42.43727	112.68
rp_unb	361	73.02665	12.54447	39.78495	112.58

B, U

-> padd = 2, state = KY, r_city = COVINGTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.6399	12.94944	39.21147	115.5
rp_unb	361	71.84485	12.96411	39.22342	113.68

B, U

-> padd = 2, state = KY, r_city = LEXINGTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.87516	12.84896	40.13142	117.57
rp_unb	361	72.91488	12.8476	39.94026	115.47

B, U

-> padd = 2, state = KY, r_city = LOUISVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.9564	12.97796	39.02031	115.16
rp_unb	361	71.78457	13.20611	38.55436	117.24

B, U

-> padd = 2, state = KY, r_city = OWENSBORO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.28487	12.57472	40.20311	111.32
rp_unb	361	70.74161	12.83596	38.20789	110.53

B, U

-> padd = 2, state = KY, r_city = PADUCAH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.67495	12.42085	39.85663	107.93
rp_unb	361	70.17416	12.84827	37.80167	108.75

B, U

-> padd = 2, state = MI, r_city = BAY CITY_MI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.73056	14.33488	39.49821	144.01
rp_unb	361	74.2808	14.72347	38.19594	150.68

B, U

-> padd = 2, state = MI, r_city = CHEBOYGAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.57306	14.58339	41.69654	150.84
rp_unb	361	76.34662	14.63881	39.91637	150.15

B, U

-> padd = 2, state = MI, r_city = DETROIT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.80241	14.06496	37.15651	140.545
rp_unb	361	72.2191	14.73559	35.93787	144.095

B, U

-> padd = 2, state = MI, r_city = FERRYSBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.26065	14.12813	37.81362	144.17
rp_unb	361	72.37082	14.45744	36.58303	145.23

B, U

-> padd = 2, state = MI, r_city = FLINT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.24209	14.09737	38.23178	141.99
rp_unb	361	73.29891	14.6938	36.73835	152.07

B, U

-> padd = 2, state = MI, r_city = JACKSON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.19395	14.05362	38.3871	142.055
rp_unb	361	71.64791	14.53512	36.12903	148.99

B, U

-> padd = 2, state = MI, r_city = LANSING

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.31514	14.07594	38.66189	142.4
rp_unb	361	72.19327	14.69999	36.64277	149.7

B, U

-> padd = 2, state = MI, r_city = MUSKEGON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.50571	14.07963	38.33931	144.3
rp_unb	361	71.93469	14.30962	36.33214	145.75

B, U

-> padd = 2, state = MI, r_city = NILES

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.27804	13.85346	37.16846	139.19
rp_unb	361	71.11786	14.3833	35.05376	148.54

B, U

-> padd = 2, state = MI, r_city = TRAVERSE CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.57094	14.54793	41.13501	147.28
rp_unb	361	75.97374	14.52642	39.78495	148.8

B, U

-> padd = 2, state = MN, r_city = ALEXANDRIA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.2284	12.93642	44.56141	132.37
rp_unb	361	75.08856	12.8791	43.18296	133.06

B, U

-> padd = 2, state = MN, r_city = DULUTH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.31813	12.91989	45.31328	133.14
rp_unb	361	75.41539	12.7411	44.13534	132.45

B, U

-> padd = 2, state = MN, r_city = MANKATO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.44436	12.8881	44.22306	133.31
rp_unb	361	74.50717	12.91411	42.81955	133.84

B, U

-> padd = 2, state = MN, r_city = MARSHALL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.91451	12.86337	44.71178	132.31
rp_unb	361	75.07256	12.95683	43.30827	135.03

B, U

-> padd = 2, state = MN, r_city = MINNEAPOLIS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.24444	12.59281	44.56141	130.31
rp_unb	361	74.57446	12.90645	43.90977	135.54

B, U

-> padd = 2, state = MN, r_city = MOORHEAD

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.42451	12.83695	47.15539	133.21
rp_unb	0				

B

-> padd = 2, state = MN, r_city = PINE BEND/KOCH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.10237	12.57501	44.46115	130.95
rp_unb	361	74.37305	12.84962	43.19549	135.78

B, U

-> padd = 2, state = MN, r_city = ROCHESTER_MN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.53963	12.943	44.3609	131.68
rp_unb	361	74.42129	13.09854	42.98246	135.49

B, U

-> padd = 2, state = MN, r_city = ROSEVILLE/WPL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.24748	12.66488	44.49874	130.86
rp_unb	361	74.60494	12.82845	43.54637	134.48

B, U

-> padd = 2, state = MN, r_city = SAUK CENTRE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.48222	12.94979	45.07519	132.65
rp_unb	0				

B

-> padd = 2, state = MN, r_city = ST. PAUL/MAPLLC

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.08028	12.61231	44.3609	130.53
rp_unb	361	74.09334	12.72124	43.35839	130.98

B, U

-> padd = 2, state = MO, r_city = BELLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.30723	13.14526	43.48371	134.13
rp_unb	361	73.40134	13.43479	42.5188	135.48

B, U

-> padd = 2, state = MO, r_city = CAPE GIRARDEAU

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.67726	12.31728	40.227	107.11
rp_unb	361	70.16745	12.84547	38.53046	110.79

B, U

-> padd = 2, state = MO, r_city = CARROLLTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.01346	12.77855	41.81704	131.62
rp_unb	361	73.36785	12.81269	41.66667	132.65

B, U

-> padd = 2, state = MO, r_city = CARTHAGE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.65939	12.88309	43.35839	131.91
rp_unb	361	72.35429	13.36759	41.12306	137.49

B, U

-> padd = 2, state = MO, r_city = COLUMBIA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.35249	12.9827	44.17293	132.32
rp_unb	361	73.65296	13.35349	42.55675	138.86

B, U

-> padd = 2, state = MO, r_city = MEXICO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.09523	13.08721	41.73238	131.8
rp_unb	0				

B

-> padd = 2, state = MO, r_city = MT. VERNON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.98563	12.90386	44.04762	131.33
rp_unb	361	72.69768	12.98224	42.5188	136.28

B, U

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U-138

-> padd = 2, state = MO, r_city = PALMYRA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.69587	12.94665	43.89486	130.93
rp_unb	361	73.55827	13.20479	42.50896	137.34

B, U

-> padd = 2, state = MO, r_city = RIVERSIDE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.65281	12.96444	42.2807	132.04
rp_unb	361	72.82189	13.2031	41.1828	136.31

B, U

-> padd = 2, state = MO, r_city = SPRINGFIELD_MO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.65269	12.92729	43.58396	131.27
rp_unb	361	72.29282	13.2214	41.51732	135.65

B, U

-> padd = 2, state = MO, r_city = ST. LOUIS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.51978	13.76126	38.1601	129.83
rp_unb	361	71.19231	14.13546	36.76225	140.41

B, U

-> padd = 2, state = ND, r_city = BISMARCK/MANDAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	78.28012	12.30938	48.52131	130.32
rp_unb	0				

B, [illegible]

-> padd = 2, state = ND, r_city = FARGO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.91358	12.66926	46.55389	132.69
rp_unb	361	76.01962	12.93657	44.87469	136.22

B, U

-> padd = 2, state = ND, r_city = GRAND FORKS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.78706	12.73111	46.19048	134.18
rp_unb	361	76.0914	13.03037	44.89975	137.45

B, U

-> padd = 2, state = ND, r_city = JAMESTOWN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.67585	12.88409	45.61404	133.78
rp_unb	361	75.92855	13.04064	44.94987	133.36

B, U

-> padd = 2, state = ND, r_city = MINOT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.9696	12.56293	47.68171	126.68
rp_unb	0				

B

-> padd = 2, state = NE, r_city = COLUMBUS_NE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.66418	12.79725	43.33333	132.08
rp_unb	361	73.18872	12.87899	42.41854	132.17

B, U

-> padd = 2, state = NE, r_city = DONIPHAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.17388	12.8911	43.19549	132.32
rp_unb	361	73.27534	13.18158	42.31829	136.77

B, U

-> padd = 2, state = NE, r_city = GENEVA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.04569	12.81922	42.89474	131.39
rp_unb	361	72.57993	12.93908	41.74186	132.19

B, U

-> padd = 2, state = NE, r_city = LINCOLN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.26038	12.93502	43.58396	132.82
rp_unb	361	73.34849	13.24918	42.53286	137.94

B, U

-> padd = 2, state = NE, r_city = NORFOLK_NE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.98355	12.71126	44.12281	132.54
rp_unb	361	73.5365	12.91602	42.85714	134.81

B, U

-> padd = 2, state = NE, r_city = NORTH PLATTE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.62631	12.78517	43.97243	133.02
rp_unb	361	74.07978	12.95487	43.28321	133.93

B, U

-> padd = 2, state = NE, r_city = OMAHA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.01448	12.98851	43.47118	132.72
rp_unb	361	73.14804	13.03359	42.65233	136.35

B, U

-> padd = 2, state = NE, r_city = OSCEOLA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.68642	12.93284	42.69424	132.4
rp_unb	361	73.00262	12.89899	42.11779	133.93

B, U

B-165
U-155

-> padd = 2, state = NE, r_city = SIDNEY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.20576	12.88202	45.58897	124.51
rp_unb	361	75.53381	12.97786	44.38596	127.42

B, U

-> padd = 2, state = OH, r_city = AKRON/CANTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.97659	13.36789	37.50299	137
rp_unb	361	72.91705	13.78471	37.04898	141.44

B, U

-> padd = 2, state = OH, r_city = CINCINNATI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.87836	13.05086	38.98447	117.97
rp_unb	361	71.98588	13.23112	37.72999	113.75

B, U

-> padd = 2, state = OH, r_city = CLEVELAND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.15826	13.55981	38.62605	137.9
rp_unb	361	72.73148	14.15837	36.61888	145.94

B, U

-> padd = 2, state = OH, r_city = COLUMBUS_OH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.00154	13.4883	38.18399	136.31
rp_unb	361	72.23221	13.90224	36.39188	141

B, U

-> padd = 2, state = OH, r_city = DAYTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.92686	13.57619	38.63799	136.33
rp_unb	361	71.91255	13.9961	36.66667	143.69

B, U

-> padd = 2, state = OH, r_city = LEBANON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.38438	13.2384	38.76941	127.13
rp_unb	361	71.04952	13.31565	38.62605	118.8

B, U

-> padd = 2, state = OH, r_city = LIMA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.88167	13.71441	38.08841	135.28
rp_unb	361	71.47633	13.93818	35.8184	141.61

B, U

-> padd = 2, state = OH, r_city = LORAIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	0				
rp_unb	361	72.79099	13.98213	36.37993	146.9

U

-> padd = 2, state = OH, r_city = MARIETTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.58024	12.8282	40.08363	121.31
rp_unb	361	73.56749	13.14152	39.48626	122

B, U

-> padd = 2, state = OH, r_city = SCIOTOVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.2606	12.55255	41.67264	114.98
rp_unb	361	74.44445	13.3748	40.83632	114.43

B, U

-> padd = 2, state = OH, r_city = TIFFIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	0				
rp_unb	361	72.84105	14.55033	36.32019	147.65

U

-> padd = 2, state = OH, r_city = TOLEDO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.86073	13.76155	38.06452	139.75
rp_unb	361	71.83431	14.30195	35.84229	147.04

B, U

-> padd = 2, state = OH, r_city = TOLEDO/BP

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.81225	13.63992	39.42653	137.2
rp_unb	361	72.17767	14.14882	36.43967	147.05

B, U

-> padd = 2, state = OH, r_city = TOLEDO/SUN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.4492	13.71781	37.71804	141.65
rp_unb	361	71.42858	14.06231	35.96177	143.9

B, U

-> padd = 2, state = OH, r_city = YOUNGSTOWN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.9109	13.57438	38.8172	137.73
rp_unb	361	72.54688	13.72831	36.43967	141.8

B, U

-> padd = 2, state = OK, r_city = ARDMORE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.26383	12.93565	41.31579	128.79
rp_unb	361	71.00507	13.0939	39.24812	132.9

B, U

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-> padd = 2, state = OK, r_city = ENID

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.58831	12.873	41.21554	128.5
rp_unb	361	71.35125	13.13837	40.10025	133.57

B, U

-> padd = 2, state = OK, r_city = OKL/GROUP 3 REF.

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.5972	12.79903	42.29323	129
rp_unb	361	69.61697	12.97865	37.90727	128.75

B, U

-> padd = 2, state = OK, r_city = OKLA/CONOCO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.28031	12.88346	41.10276	129.08
rp_unb	361	71.18198	13.14134	39.87469	131.17

B, U

-> padd = 2, state = OK, r_city = OKLA/SUN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.25263	12.88018	40.88972	126.65
rp_unb	361	71.42821	13.13907	40.03759	131.5

B, U

-> padd = 2, state = OK, r_city = OKLA/WPL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.28365	12.8242	41.19048	127.86
rp_unb	361	71.12556	13.15205	39.94987	133.58

B, U

-> padd = 2, state = OK, r_city = OKLAHOMA CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.15657	12.83489	41.02757	128.07
rp_unb	361	71.04764	13.14128	39.93734	133.25

B, U

-> padd = 2, state = OK, r_city = PONCA CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.32505	12.82206	41.41604	127.9
rp_unb	361	71.16167	13.13871	39.81203	133.43

B, U

-> padd = 2, state = OK, r_city = SHAWNEE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.60029	12.86474	41.42857	128.39
rp_unb	361	71.0943	12.84973	40.82707	130.25

B, U

-> padd = 2, state = OK, r_city = TULSA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.21088	12.84852	41.71679	129.095
rp_unb	361	70.88157	13.17051	39.26065	132.35

B, U

-> padd = 2, state = OK, r_city = TULSA/SINCLAIR

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.98918	12.83416	41.02757	128.235
rp_unb	361	71.05804	13.12097	39.52381	132.82

B, U

-> padd = 2, state = OK, r_city = TULSA/WPL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.31991	12.82614	41.94236	129.095
rp_unb	361	71.30853	13.25261	39.57394	133.475

B, U

-> padd = 2, state = OK, r_city = TURPIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.07944	13.54975	45.72682	131.06
rp_unb	361	76.23408	13.63061	44.17293	135.5

B, U

-> padd = 2, state = OK, r_city = WYNNEWOOD

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.06142	12.96892	44.22306	128.1
rp_unb	361	71.81376	13.11468	41.19048	132.7

B, U

-> padd = 2, state = SD, r_city = ABERDEEN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.59357	12.72741	45.45113	133.67
rp_unb	361	75.47801	12.90265	44.64912	134.82

B, U

-> padd = 2, state = SD, r_city = MITCHELL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.78426	12.74082	45.26316	133.14
rp_unb	361	74.38929	12.93554	43.49624	132.39

B, U

-> padd = 2, state = SD, r_city = RAPID CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	79.5631	13.06217	48.21983	126.23
rp_unb	361	77.94323	13.3458	46.11708	126.25

B, U

-> padd = 2, state = SD, r_city = SIOUX FALLS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.67487	12.64453	44.21053	132.3
rp_unb	361	73.86221	13.02444	43.09524	136.94

B, U

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-> padd = 2, state = SD, r_city = WATERTOWN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.16163	12.90714	45.27569	133.64
rp_unb	361	75.34668	12.95911	43.45864	135.16

B, U

-> padd = 2, state = SD, r_city = WOLSEY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.66822	12.65081	46.10276	133.93
rp_unb	361	75.22693	12.82007	44.71178	135.98

B, U

-> padd = 2, state = SD, r_city = YANKTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.19884	12.85298	43.65915	132.19
rp_unb	361	73.7954	12.9423	42.83208	132.86

B, U

-> padd = 2, state = TN, r_city = CHATTANOOGA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.4842	12.0855	39.94026	102.61
rp_unb	361	68.7205	12.47562	37.75388	103.17

B, U

-> padd = 2, state = TN, r_city = KNOXVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.56453	12.2261	40.19116	103.09
rp_unb	361	69.03804	12.71043	37.75388	104.49

B, U

-> padd = 2, state = TN, r_city = MEMPHIS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.27468	12.26387	40.04779	103.805
rp_unb	361	69.40792	13.03399	37.57467	106.77

B, U

-> padd = 2, state = TN, r_city = NASHVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.78496	12.24013	40.05974	102.705
rp_unb	361	69.17196	12.72192	37.92115	104.58

B, U

-> padd = 2, state = WI, r_city = CHIPPEWA FALLS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.47861	13.11131	41.02748	132.78
rp_unb	361	74.95963	13.7503	40.58542	143.88

B, U

-> padd = 2, state = WI, r_city = GREEN BAY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.7696	13.56311	37.64635	135.23
rp_unb	361	71.64529	13.75455	35.94982	140.65

B, U

-> padd = 2, state = WI, r_city = JUNCTION CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.93708	13.14069	39.03226	132.99
rp_unb	361	73.16272	13.47217	38.25568	138.79

B, U

-> padd = 2, state = WI, r_city = MADISON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.75553	13.49133	38.25568	135.18
rp_unb	361	71.99144	13.87902	36.21267	141.9

B, U

-> padd = 2, state = WI, r_city = MILWAUKEE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.19903	13.50817	38.5902	134.43
rp_unb	361	70.9025	13.87177	35.66308	140.26

B, U

-> padd = 2, state = WI, r_city = SUPERIOR_WI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.54795	12.82941	45.35088	131.46
rp_unb	361	75.17039	12.684	44.01003	132.25

B, U

-> padd = 2, state = WI, r_city = WAUSAU

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.4002	13.49559	41.37395	139.55
rp_unb	361	73.88199	13.15991	40.9319	137.5

B, U

-> padd = 3, state = AL, r_city = ANNISTON/OXFORD

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.19236	12.05831	39.82079	102.81
rp_unb	361	68.15857	12.44225	37.27599	102.1

B, U

-> padd = 3, state = AL, r_city = BIRMINGHAM

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.15885	12.26195	39.5221	105.27
rp_unb	361	68.30567	12.84886	36.81004	107.58

B, U

-> padd = 3, state = AL, r_city = MOBILE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.59738	12.14969	40.83632	103.13
rp_unb	361	68.70141	12.77965	37.75388	103.85

B, U

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-> padd = 3, state = AL, r_city = MONTGOMERY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.59059	12.08735	40.05974	103.21
rp_unb	361	68.55735	12.42786	37.53883	102.83

B, U

-> padd = 3, state = AR, r_city = EL DORADO_AR

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.64517	12.57824	39.35484	105.79
rp_unb	361	69.10425	12.92207	37.39546	110.01

B, U

-> padd = 3, state = AR, r_city = FT. SMITH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.19547	12.89613	42.23058	129.9
rp_unb	361	71.86541	13.12023	40.56391	133.18

B, U

-> padd = 3, state = AR, r_city = LITTLE ROCK

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.01734	12.40933	39.84468	106.62
rp_unb	361	69.28886	12.57197	37.59857	106.85

B, U

-> padd = 3, state = AR, r_city = ROGERS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.90944	12.81256	43.29574	131.27
rp_unb	361	72.94978	13.18383	42.04261	136.12

B, U

-> padd = 3, state = AR, r_city = WEST MEMPHIS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.8575	12.29033	39.89247	104.16
rp_unb	361	68.83329	12.50872	37.32378	103.25

B, U

-> padd = 3, state = LA, r_city = ARCADIA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.15288	12.19702	41.03942	103.31
rp_unb	361	69.09029	12.83824	37.69415	107.45

B, U

-> padd = 3, state = LA, r_city = ARCHIE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.95554	12.33983	39.28315	104.12
rp_unb	361	67.99303	12.44289	36.9773	102.25

B, U

-> padd = 3, state = LA, r_city = BATON ROUGE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.5422	12.20535	38.94863	103.16
rp_unb	361	67.42334	13.29745	35.55556	111.155

B, U

-> padd = 3, state = LA, r_city = CHALMETTE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.35089	12.28155	39.47431	103.25
rp_unb	361	67.3611	12.727	35.83035	103.02

B, U

-> padd = 3, state = LA, r_city = CONVENT/GARYVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.33254	12.20411	38.5902	102.385
rp_unb	361	66.99148	12.37667	35.48387	101.3

B, U

-> padd = 3, state = LA, r_city = LAKE CHARLES

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	68.61264	12.39367	38.20789	102.62
rp_unb	361	66.86523	12.57632	35.44803	101.275

B, U

-> padd = 3, state = LA, r_city = MONROE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.44707	12.25654	41.07527	103.74
rp_unb	361	68.73782	12.48202	37.81362	102.32

B, U

-> padd = 3, state = LA, r_city = NEW ORLEANS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.6861	12.1914	39.37873	103.08
rp_unb	361	66.90779	12.56265	35.72282	101.42

B, U

-> padd = 3, state = LA, r_city = OPELOUSAS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.95275	12.43763	39.28315	103.5
rp_unb	0				

B

-> padd = 3, state = LA, r_city = SHREVEPORT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.20183	12.21184	40.62127	103.84
rp_unb	361	68.21704	12.4839	36.85783	102.87

B, U

-> padd = 3, state = MS, r_city = BILOXI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.92335	12.09718	41.11111	102.82
rp_unb	361	68.42912	12.31144	37.87336	104.74

B, U

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-> padd = 3, state = MS, r_city = COLLINS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.66872	12.05444	39.00836	102.07
rp_unb	361	67.57741	12.43428	36.2963	102.25

B, U

-> padd = 3, state = MS, r_city = GREENVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.59535	12.10633	39.68937	102.96
rp_unb	361	68.57024	12.90916	37.16846	105.67

B, U

-> padd = 3, state = MS, r_city = MERIDIAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.54327	12.12051	39.23536	102
rp_unb	361	67.83983	12.46778	36.77419	102.69

B, U

-> padd = 3, state = MS, r_city = PASCAGOULA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.27955	11.99975	40.32258	102.29
rp_unb	0				

B

-> padd = 3, state = MS, r_city = VICKSBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.62912	12.19258	40.21505	103.37
rp_unb	361	68.72786	12.50892	37.69415	103.4

B, U

-> padd = 3, state = NM, r_city = ALBUQUERQUE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.80363	12.46058	49.05615	106.91
rp_unb	361	77.83481	12.62624	49.0442	112.45

B, U

-> padd = 3, state = NM, r_city = ARTESIA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.911	12.22998	45.30075	109.08
rp_unb	361	76.51621	12.73281	42.9198	112

B, U

-> padd = 3, state = NM, r_city = BLOOMFIELD

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.99812	12.98298	55.8396	113.83
rp_unb	361	83.05946	12.90699	53.16607	114.5

B, U

-> padd = 3, state = NM, r_city = CINIZA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.2237	13.06988	54.69534	118.35
rp_unb	361	82.19413	13.28929	52.5687	118.5

B, U

-> padd = 3, state = TX, r_city = ABILENE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.16676	12.372	43.77539	108.24
rp_unb	361	73.1019	12.49279	42.7718	113.75

B, U

-> padd = 3, state = TX, r_city = AMARILLO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.86752	13.41934	40.02506	114.41
rp_unb	361	73.29171	13.62107	40.05013	125.95

B, U

-> padd = 3, state = TX, r_city = AUSTIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.05898	12.38811	39.89247	104.03
rp_unb	361	68.49413	12.68975	38.98447	103.75

B, U

-> padd = 3, state = TX, r_city = BEAUMONT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	68.34438	12.29084	37.26404	102.035
rp_unb	361	66.69292	12.6563	35.19713	102.555

B, U

-> padd = 3, state = TX, r_city = BIG SPRING

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.7343	13.00587	43.78446	112.62
rp_unb	0				

B

-> padd = 3, state = TX, r_city = BRYAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.0926	12.52603	38.08841	103.03
rp_unb	0				

B

-> padd = 3, state = TX, r_city = CADDO MILLS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.71173	12.53219	39.41458	105.05
rp_unb	361	68.97287	12.94099	36.82198	105.92

B, U

-> padd = 3, state = TX, r_city = CENTER

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.03356	12.30096	39.82079	104.11
rp_unb	361	69.39441	12.71277	38.29152	105.165

B, U

-> padd = 3, state = TX, r_city = CORPUS CHRISTI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	67.94358	12.67906	36.98925	102.795
rp_unb	361	66.49141	13.03871	35.78256	103.11

B, U

-> padd = 3, state = TX, r_city = DALLAS METRO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.1303	12.45722	39.05615	104.29
rp_unb	361	70.0145	12.63396	37.55078	104.16

B, U

-> padd = 3, state = TX, r_city = EL PASO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	78.02413	11.22761	48.1123	103.02
rp_unb	361	77.7795	11.66408	46.94146	111.37

B, U

-> padd = 3, state = TX, r_city = HARLINGEN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.50008	12.50898	40.11947	105
rp_unb	361	69.46762	12.84768	38.85305	105.62

B, U

-> padd = 3, state = TX, r_city = HEARNE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.29524	12.35975	39.13979	103.29
rp_unb	361	67.94121	12.58216	36.78614	102.42

B, U

-> padd = 3, state = TX, r_city = HIDALGO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.85186	12.48443	38.37515	103.76
rp_unb	0				

B

-> padd = 3, state = TX, r_city = LAREDO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.91166	12.43542	40.38847	103.92
rp_unb	361	70.06273	12.76591	40.10025	104.75

B, U

-> padd = 3, state = TX, r_city = LUBBOCK

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.48205	13.51839	39.78697	116.52
rp_unb	361	73.95835	13.56796	39.13534	119.52

B, U

-> padd = 3, state = TX, r_city = MIDLAND/ODESSA

B-250
U-235

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.01105	12.98983	44.24134	112.62
rp_unb	361	74.71607	13.03026	43.85965	111.17

B, U

-> padd = 3, state = TX, r_city = MT. PLEASANT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.93685	12.5345	40.83632	105.83
rp_unb	361	70.0735	12.68871	39.0681	104.69

B, U

-> padd = 3, state = TX, r_city = SAN ANGELO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.66567	12.71986	44.55197	113.55
rp_unb	361	75.04236	12.37369	43.30944	109.53

B, U

-> padd = 3, state = TX, r_city = SAN ANTONIO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	68.98312	12.4992	38.44683	102.44
rp_unb	361	67.5067	12.77091	36.69056	102.47

B, U

-> padd = 3, state = TX, r_city = SHERRIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.51611	13.41711	40.92732	119.33
rp_unb	361	74.79231	13.54556	40.41353	128

B, U

-> padd = 3, state = TX, r_city = TYLER

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.2218	12.34186	39.67742	104.35
rp_unb	361	69.35968	12.4712	37.64635	104.21

B, U

-> padd = 3, state = TX, r_city = VICTORIA/PLACEDO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.04715	12.58929	38.1123	102.635
rp_unb	361	67.75856	13.04259	35.77061	102.59

B, U

-> padd = 3, state = TX, r_city = WACO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.23223	12.6487	39.092	103.68
rp_unb	361	68.59535	12.88675	37.02509	103.34

B, U

-> padd = 3, state = TX, r_city = WICHITA FALLS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.9918	12.31412	41.46616	111.85
rp_unb	361	72.13088	12.69925	40.35842	116.11

B, U

-> padd = 4, state = CO, r_city = DENVER

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.33393	13.02212	42.04261	114.02
rp_unb	361	74.96744	13.26119	40.15038	122.57

B, 4

-> padd = 4, state = CO, r_city = FOUNTAIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.38784	12.8479	45.26316	115.07
rp_unb	361	76.86201	13.13196	43.19549	119.98

B, 4

-> padd = 4, state = CO, r_city = GRAND JUNCTION

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.78292	12.62443	49.82456	118.59
rp_unb	0				

B

-> padd = 4, state = ID, r_city = BOISE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	84.87268	14.15841	52.66428	118.11
rp_unb	361	84.56278	14.13789	52.12664	116.6

B, 4

-> padd = 4, state = ID, r_city = BURLEY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	84.46145	13.89159	50.86466	117.06
rp_unb	361	84.15814	13.83073	50.35842	116

B, 4

-> padd = 4, state = ID, r_city = POCATELLO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	84.53221	14.12221	51.19474	117.16
rp_unb	361	84.03766	13.90221	50.53764	114.93

B, 4

-> padd = 4, state = MT, r_city = BILLINGS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	84.47507	12.47256	46.24851	118.16
rp_unb	0				

B

-> padd = 4, state = MT, r_city = BOZEMAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	85.12683	12.52385	46.51135	119.43
rp_unb	361	82.60654	12.67214	45.10155	116.5

B, 4

-> padd = 4, state = MT, r_city = GLENDIVE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.67333	12.44859	44.4325	118.6
rp_unb	0				

B

-> padd = 4, state = MT, r_city = GREAT FALLS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	84.52671	11.77155	47.10872	119.68
rp_unb	0				

B

-> padd = 4, state = MT, r_city = HELENA_MT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	84.93278	12.08949	47.46714	119.55
rp_unb	0				

B

-> padd = 4, state = MT, r_city = MISSOULA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	84.50247	12.34655	48.12425	121.21
rp_unb	0				

B

-> padd = 4, state = NM, r_city = FOUR CORNERS REF.

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.99725	12.9713	55.69893	113.74
rp_unb	361	83.0521	12.91753	53.16607	114.5

B, 4

-> padd = 4, state = UT, r_city = SALT LAKE CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.24833	13.42786	46.42857	113.18
rp_unb	361	82.21225	13.7507	46.17682	115.28

B, 4

-> padd = 4, state = WY, r_city = CASPER

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.24664	12.3771	50.99164	114.68
rp_unb	0				

B

-> padd = 4, state = WY, r_city = CHEYENNE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	79.22641	13.10148	46.10514	119
rp_unb	361	78.83799	13.23918	45.43608	118.62

B, 4

-> padd = 4, state = WY, r_city = NEW CASTLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.42499	13.42182	48.93668	129.6
rp_unb	0				

B

B-267
4-244

B-282
U-256

-> padd = 4, state = WY, r_city = ROCK SPRINGS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.77904	12.73068	50.23895	111.25
rp_unb	0				

B

-> padd = 4, state = WY, r_city = SHERIDAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.52702	12.55712	49.02031	115.49
rp_unb	0				

B

-> padd = 4, state = WY, r_city = SINCLAIR

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.75633	12.81005	49.46236	115.72
rp_unb	0				

B

-> padd = 5, state = AZ, r_city = PHOENIX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.72382	14.35127	52.29391	123.33
rp_unb	361	81.04684	15.17315	49.56989	134.88

B, U

-> padd = 5, state = AZ, r_city = TUCSON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.21122	13.45544	52.0908	121.3
rp_unb	361	81.32274	14.71233	49.36679	128.73

B, U

-> padd = 5, state = NV, r_city = LAS VEGAS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	85.60754	15.15547	55.75866	134.65
rp_unb	361	82.55314	16.30046	53.94265	156.3

B, U

-> padd = 5, state = NV, r_city = SPARKS/RENO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.91098	16.45975	53.71565	132.78
rp_unb	361	83.29409	17.57641	52.48507	152.09

B, U

-> padd = 5, state = OR, r_city = EUGENE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.97424	14.55275	50.94385	124.07
rp_unb	361	80.05424	15.27511	41.78017	125.61

B, U

-> padd = 5, state = OR, r_city = PORTLAND_OR

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.1691	14.37156	48.8172	122.04
rp_unb	361	77.63008	15.29288	39.7491	123.88

B, U

-> padd = 5, state = WA, r_city = ANACORTES

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.30803	13.88362	49.48626	122.06
rp_unb	361	78.3476	14.60272	42.3178	122.75

B, U

-> padd = 5, state = WA, r_city = MOSES LAKE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.66832	13.7219	50.9558	117.02
rp_unb	0				

B

-> padd = 5, state = WA, r_city = PASCO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.76547	14.36687	48.53046	117.92
rp_unb	361	81.20213	15.17315	46.12903	123.49

B, U

-> padd = 5, state = WA, r_city = SEATTLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.55276	13.955	49.773	121.88
rp_unb	361	78.48583	15.96882	41.76822	125.58

B, U

-> padd = 5, state = WA, r_city = SPOKANE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.7379	13.53777	53.59618	114.75
rp_unb	361	82.95341	14.04402	51.97132	121

B, U

-> padd = 5, state = WA, r_city = TACOMA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.21952	14.12018	49.51015	122.65
rp_unb	361	78.20121	15.40051	41.57706	124.75

B, U

-> padd = 5, state = WA, r_city = WILMA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	0				
rp_unb	361	83.22132	14.974	47.49104	129.25

U

```
 9 .
10 *reformulated
11
12 .
13 . use "D:\My Documents\STATA\GRC\R_DATA1_fe.dta", clear

14 .
15 . bysort padd state r_city: sum rp_brn rp_unb
```

-> padd = 1, state = CT, r_city = HARTFORD/ROCKY HILL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.55483	14.28639	42.29391	111.23
rp_unb	305	75.88818	14.36663	41.4098	114.62

-> padd = 1, state = CT, r_city = NEW HAVEN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.5732	14.18687	42.18638	110.56
rp_unb	305	74.85535	14.39369	40.11947	112.64

-> padd = 1, state = DE, r_city = WILMINGTON_DE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.06763	14.06539	43.23775	110.38
rp_unb	305	74.15397	14.17303	39.30705	112.06

-> padd = 1, state = MA, r_city = BOSTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	77.90598	14.38655	43.07049	113.12
rp_unb	305	74.93969	14.83189	39.58184	113.85

-> padd = 1, state = MA, r_city = SPRINGFIELD_MA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	77.94644	14.31828	43.58423	111.92
rp_unb	0				

-> padd = 1, state = MD, r_city = BALTIMORE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.28026	13.42521	43.52449	110
rp_unb	305	74.78593	14.25045	39.60574	113.7

-> padd = 1, state = NJ, r_city = PAULSBORO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.14949	14.25076	42.73596	110.99
rp_unb	305	74.72118	14.72492	39.05615	112.91

-> padd = 1, state = NJ, r_city = TRENTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.48421	14.04543	44.50418	111.55
rp_unb	0				

-> padd = 1, state = NY, r_city = ALBANY_NY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	78.82641	14.29557	45.53166	112.79
rp_unb	305	77.05792	15.504	42.0908	121

-> padd = 1, state = NY, r_city = NEWBURGH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	77.92385	13.77593	44.6595	109.65
rp_unb	305	75.76115	14.32943	40.51374	113.68

-> padd = 1, state = PA, r_city = PHILADELPHIA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.44173	14.12462	42.87933	110.51
rp_unb	305	74.53604	14.59013	39.12784	112.52

-> padd = 1, state = RI, r_city = PROVIDENCE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	78.25879	14.52976	43.64397	113.4
rp_unb	305	76.0636	14.51875	41.1589	114.18

-> padd = 1, state = VA, r_city = FAIRFAX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.25432	13.46843	44.33692	109.2
rp_unb	305	74.78455	14.33531	40.05974	116.29

-> padd = 1, state = VA, r_city = NORFOLK_VA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.96594	13.61531	42.71207	111.6
rp_unb	305	74.05724	14.18869	38.82915	114.34

-> padd = 1, state = VA, r_city = RICHMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.75745	13.63152	42.22222	111.08
rp_unb	305	74.27152	14.08181	39.59379	114.09

-> padd = 2, state = KY, r_city = LOUISVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	79.87487	15.0178	41.24253	133.09
rp_unb	305	79.69659	16.32716	40.14337	144.02

-> padd = 3, state = TX, r_city = DALLAS METRO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.42464	13.73544	41.39785	110.71
rp_unb	305	73.11005	14.09219	38.47073	112.43

B, U

-> padd = 3, state = TX, r_city = DALLAS/ARLINGTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.39681	13.69932	41.51732	110.7
rp_unb	305	73.47022	14.40736	38.53046	113.15

B, U

-> padd = 3, state = TX, r_city = DALLAS/FT. WORTH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.85686	13.20752	41.23059	110.28
rp_unb	305	72.86522	14.12415	37.84946	111.45

B, U

-> padd = 3, state = TX, r_city = DALLAS/GRAPEVINE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.15147	13.68521	40.97969	110.53
rp_unb	0				

B

-> padd = 3, state = TX, r_city = DALLAS/SOUTHLAKE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.33926	13.83895	41.21864	111.3
rp_unb	305	73.76679	14.15033	40.29869	115

B, U

-> padd = 3, state = TX, r_city = HOUSTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	72.87419	13.64036	40.34647	111.06
rp_unb	305	71.6197	13.99014	37.24014	112.16

B, U

```
16 .
17 .
18 *CARB
19 .
20 . use "D:\My Documents\STATA\GRC\C_DATA1_fe.dta", clear

21 .
22 . bysort padd state r_city: sum rp_brn rp_unb
```

-> padd = 5, state = CA, r_city = BARSTOW

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	0				
rp_unb	242	88.28473	19.87704	50.99164	168.33

U

-> padd = 5, state = CA, r_city = COLTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	242	91.98409	17.75075	60.81242	148.05
rp_unb	242	86.78553	19.8106	49.67742	166.38

B, U

-> padd = 5, state = CA, r_city = IMPERIAL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	242	95.9858	17.27469	62.48507	150.77
rp_unb	242	91.38626	19.3823	56.57109	167.85

B, U

-> padd = 5, state = CA, r_city = LOS ANGELES

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	242	90.6813	17.9636	59.773	147.43
rp_unb	242	88.19126	21.28897	49.28315	165.25

B, U

-> padd = 5, state = CA, r_city = SACRAMENTO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	242	91.72781	17.77232	59.092	148.55
rp_unb	242	85.91825	20.30546	48.05257	154.31

B, U

-> padd = 5, state = CA, r_city = SAN DIEGO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	242	94.92573	18.29633	62.15054	152.7
rp_unb	242	87.81901	19.96236	50.65711	168.38

B, U

-> padd = 5, state = CA, r_city = STOCKTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	242	90.735	17.96091	59.00836	148.58
rp_unb	242	86.24518	20.60041	48.97252	155.7

B, U

```
23 .
24 .
25 . log close
       log:  D:\My Documents\STATA\GRC\grc_rcity_mktcon.smcl
  log type:  smcl
 closed on:  24 Jun 2004, 16:28:32
```

Document VI
Appendix II - Description of Merger Overlaps by City and Fuel Type

APPENDIX II

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STATA™
Statistics/Data Analysis

User: john a karikari
Project: Rack Cities: mergers

```
      log:  D:\My Documents\STATA\GRC\grc_rcity_mergers.smcl
 log type:  smcl
opened on:  24 Jun 2004, 16:13:37

1 .
2 . set more off
3 .
4 . *conventional gasoline
5 .
6 . *tosco-unocal: not available
7 .
8 .
9 . *uds-total
10 . use "D:\My Documents\STATA\GRC\G_DATA2_fe.dta", clear
11 . keep if udstotal==1
(96387 observations deleted)
12 . bysort padd state r_city: sum rp_brn rp_unb
```

B = Branded
u = Unbranded

B - 19
u - 18

-> padd = 2, state = KS, r_city = SCOTT CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.8889	12.98325	44.98747	132.51
rp_unb	361	74.83816	13.23677	43.08271	135.08

B, u

-> padd = 2, state = OK, r_city = ARDMORE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.26383	12.93565	41.31579	128.79
rp_unb	361	71.00507	13.0939	39.24812	132.9

B, u

-> padd = 2, state = OK, r_city = ENID

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.58831	12.873	41.21554	128.5
rp_unb	361	71.35125	13.13837	40.10025	133.57

B, u

-> padd = 2, state = OK, r_city = OKLA/WPL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.28365	12.8242	41.19048	127.86
rp_unb	361	71.12556	13.15205	39.94987	133.58

B, u

-> padd = 2, state = OK, r_city = OKLAHOMA CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.15657	12.83489	41.02757	128.07
rp_unb	361	71.04764	13.14128	39.93734	133.25

B, u

-> padd = 2, state = OK, r_city = PONCA CITY

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Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.32505	12.82206	41.41604	127.9
rp_unb	361	71.16167	13.13871	39.81203	133.43

B, u

-> padd = 2, state = OK, r_city = TULSA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.21088	12.84852	41.71679	129.095
rp_unb	361	70.88157	13.17051	39.26065	132.35

B, u

-> padd = 2, state = OK, r_city = TULSA/SINCLAIR

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.98918	12.83416	41.02757	128.235
rp_unb	361	71.05804	13.12097	39.52381	132.82

B, u

-> padd = 2, state = OK, r_city = TULSA/WPL

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.31991	12.82614	41.94236	129.095
rp_unb	361	71.30853	13.25261	39.57394	133.475

B, u

-> padd = 2, state = OK, r_city = TURPIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.07944	13.54975	45.72682	131.06
rp_unb	361	76.23408	13.63061	44.17293	135.5

B, u

-> padd = 2, state = OK, r_city = WYNNEWOOD

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.06142	12.96892	44.22306	128.1
rp_unb	361	71.81376	13.11468	41.19048	132.7

B, u

-> padd = 3, state = AR, r_city = FT. SMITH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.19547	12.89613	42.23058	129.9
rp_unb	361	71.86541	13.12023	40.56391	133.18

B, u

-> padd = 3, state = AR, r_city = LITTLE ROCK

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.01734	12.40933	39.84468	106.62
rp_unb	361	69.28886	12.57197	37.59857	106.85

B, u

-> padd = 3, state = TX, r_city = AMARILLO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.86752	13.41934	40.02506	114.41
rp_unb	361	73.29171	13.62107	40.05013	125.95

B, u

-> padd = 3, state = TX, r_city = BIG SPRING

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.7343	13.00587	43.78446	112.62
rp_unb	0				

B

-> padd = 3, state = TX, r_city = DALLAS METRO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.1303	12.45722	39.05615	104.29
rp_unb	361	70.0145	12.63396	37.55078	104.16

B, U

-> padd = 3, state = TX, r_city = LUBBOCK

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.48205	13.51839	39.78697	116.52
rp_unb	361	73.95835	13.56796	39.13534	119.52

B, U

-> padd = 3, state = TX, r_city = WICHITA FALLS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.9918	12.31412	41.46616	111.85
rp_unb	361	72.13088	12.69925	40.35842	116.11

B, U

-> padd = 4, state = CO, r_city = DENVER

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.33393	13.02212	42.04261	114.02
rp_unb	361	74.96744	13.26119	40.15038	122.57

B, U

```
13 .
14 *marathon-ashland
15 . use "D:\My Documents\STATA\GRC\G_DATA2_fe.dta", clear

16 . keep if map==1
(87362 observations deleted)

17 . bysort padd state r_city: sum rp_brn rp_unb
```

B - 43
U - 44

-> padd = 1, state = GA, r_city = ALBANY_GA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.58567	12.06214	39.9761	103.06
rp_unb	361	68.57509	12.53208	37.32378	103.3

B, U

-> padd = 1, state = GA, r_city = ATHENS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.36293	12.3587	39.76105	105.195
rp_unb	361	68.63322	12.87639	37.28793	108.79

B, U

-> padd = 1, state = GA, r_city = ATLANTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.35902	12.30367	39.53405	105.965
rp_unb	361	69.20237	13.30392	37.29988	114.22

B, U

-> padd = 1, state = GA, r_city = BAINBRIDGE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.73727	12.00167	40.28674	103.25
rp_unb	361	68.69339	12.44477	37.71804	103.58

B, U

-> padd = 1, state = NC, r_city = CHARLOTTE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.37685	12.09948	40.13142	103.29
rp_unb	361	68.63935	12.46363	37.33572	103.415

B, U

-> padd = 1, state = NC, r_city = GREENSBORO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.42659	12.15993	39.80884	103.295
rp_unb	361	68.76332	12.51421	37.39546	103.66

B, U

-> padd = 1, state = NC, r_city = SELMA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.76116	12.17016	40.29869	103.8
rp_unb	361	69.08201	12.64717	37.74194	104.905

B, U

-> padd = 1, state = PA, r_city = PITTSBURGH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.4738	12.98363	38.94863	107.22
rp_unb	361	71.65158	13.38595	38.47073	109.83

B, U

-> padd = 1, state = SC, r_city = BELTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.62048	12.00067	40.13142	102.93
rp_unb	361	68.33914	12.45564	37.06093	102.78

B, U

-> padd = 1, state = VA, r_city = ROANOKE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.44141	11.96346	39.71326	101.78
rp_unb	361	69.01244	12.4522	37.87336	103.74

B, U

-> padd = 2, state = IL, r_city = CHAMPAIGN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.83171	13.51791	36.76225	133.29
rp_unb	361	70.6973	14.01744	34.80287	136.68

B, U

-> padd = 2, state = IL, r_city = CHICAGO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	0				
rp_unb	361	71.0552	14.72545	35.42413	145.56

U

-> padd = 2, state = IL, r_city = KANKAKEE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.82522	13.34215	37.84946	134.8
rp_unb	361	70.95843	14.22408	34.76702	145.37

B, U

-> padd = 2, state = IL, r_city = ROCKFORD

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.43101	13.53901	37.59857	134.27
rp_unb	361	71.2053	13.91698	35.8184	138.81

B, U

-> padd = 2, state = IN, r_city = EVANSVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.82962	12.54502	39.48626	114.53
rp_unb	361	70.34095	12.71558	38.08841	113.26

B, U

-> padd = 2, state = IN, r_city = HAMMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.69159	13.47054	37.15651	132.97
rp_unb	361	70.61638	14.52656	34.54002	149.05

B, U

-> padd = 2, state = IN, r_city = HUNTINGTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.56877	13.32124	38.41099	131.61
rp_unb	361	72.28019	14.01358	37.49104	141.37

B, U

-> padd = 2, state = IN, r_city = INDIANAPOLIS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.46488	13.2172	36.55914	127.57
rp_unb	361	70.38855	13.75848	35.97372	135.06

B, U

-> padd = 2, state = IN, r_city = MUNCIE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.92789	13.3125	36.9534	128.1
rp_unb	361	70.25551	13.65219	34.46834	130.2

B, U

-> padd = 2, state = KY, r_city = ASHLAND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.00226	12.00384	42.43727	112.68
rp_unb	361	73.02665	12.54447	39.78495	112.58

B, U

-> padd = 2, state = KY, r_city = COVINGTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.6399	12.94944	39.21147	115.5
rp_unb	361	71.84485	12.96411	39.22342	113.68

B, U

-> padd = 2, state = KY, r_city = LEXINGTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.87516	12.84896	40.13142	117.57
rp_unb	361	72.91488	12.8476	39.94026	115.47

B, U

-> padd = 2, state = KY, r_city = LOUISVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.9564	12.97796	39.02031	115.16
rp_unb	361	71.78457	13.20611	38.55436	117.24

B, U

-> padd = 2, state = KY, r_city = PADUCAH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.67495	12.42085	39.85663	107.93
rp_unb	361	70.17416	12.84827	37.80167	108.75

B, U

-> padd = 2, state = MI, r_city = BAY CITY_MI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.73056	14.33488	39.49821	144.01
rp_unb	361	74.2808	14.72347	38.19594	150.68

B, U

-> padd = 2, state = MI, r_city = DETROIT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.80241	14.06496	37.15651	140.545
rp_unb	361	72.2191	14.73559	35.93787	144.095

B, U

-> padd = 2, state = MI, r_city = FERRYSBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.26065	14.12813	37.81362	144.17
rp_unb	361	72.37082	14.45744	36.58303	145.23

B, U

-> padd = 2, state = MI, r_city = JACKSON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.19395	14.05362	38.3871	142.055
rp_unb	361	71.64791	14.53512	36.12903	148.99

B, U

-> padd = 2, state = MI, r_city = MUSKEGON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.50571	14.07963	38.33931	144.3
rp_unb	361	71.93469	14.30962	36.33214	145.75

-> padd = 2, state = MI, r_city = NILES

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.27804	13.85346	37.16846	139.19
rp_unb	361	71.11786	14.3833	35.05376	148.54

-> padd = 2, state = OH, r_city = CLEVELAND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.15826	13.55981	38.62605	137.9
rp_unb	361	72.73148	14.15837	36.61888	145.94

-> padd = 2, state = OH, r_city = COLUMBUS_OH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.00154	13.4883	38.18399	136.31
rp_unb	361	72.23221	13.90224	36.39188	141

-> padd = 2, state = OH, r_city = DAYTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.92686	13.57619	38.63799	136.33
rp_unb	361	71.91255	13.9961	36.66667	143.69

-> padd = 2, state = OH, r_city = LEBANON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.38438	13.2384	38.76941	127.13
rp_unb	361	71.04952	13.31565	38.62605	118.8

-> padd = 2, state = OH, r_city = LIMA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.88167	13.71441	38.08841	135.28
rp_unb	361	71.47633	13.93818	35.8184	141.61

-> padd = 2, state = OH, r_city = MARIETTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.58024	12.8282	40.08363	121.31
rp_unb	361	73.56749	13.14152	39.48626	122

-> padd = 2, state = OH, r_city = TOLEDO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.86073	13.76155	38.06452	139.75
rp_unb	361	71.83431	14.30195	35.84229	147.04

-> padd = 2, state = OH, r_city = YOUNGSTOWN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.9109	13.57438	38.8172	137.73
rp_unb	361	72.54688	13.72831	36.43967	141.8

-> padd = 2, state = TN, r_city = KNOXVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.56453	12.2261	40.19116	103.09
rp_unb	361	69.03804	12.71043	37.75388	104.49

-> padd = 2, state = TN, r_city = NASHVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.78496	12.24013	40.05974	102.705
rp_unb	361	69.17196	12.72192	37.92115	104.58

-> padd = 2, state = WI, r_city = GREEN BAY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.7696	13.56311	37.64635	135.23
rp_unb	361	71.64529	13.75455	35.94982	140.65

-> padd = 2, state = WI, r_city = MADISON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.75553	13.49133	38.25568	135.18
rp_unb	361	71.99144	13.87902	36.21267	141.9

-> padd = 2, state = WI, r_city = MILWAUKEE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.19903	13.50817	38.5902	134.43
rp_unb	361	70.9025	13.87177	35.66308	140.26

-> padd = 3, state = AL, r_city = BIRMINGHAM

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.15885	12.26195	39.5221	105.27
rp_unb	361	68.30567	12.84886	36.81004	107.58

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B-22
U-21

```
18
19  *shell-texaco I (Equilon)
20  use "D:\My Documents\STATA\GRC\G_DATA2_fe.dta", clear

21  . keep if shelltexaco==1
    (95304 observations deleted)

22  . bysort padd state r_city: sum rp_brn rp_unb
```

-> padd = 1, state = PA, r_city = HARRISBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.75536	12.82235	39.02031	103.49
rp_unb	361	71.27363	12.97055	39.36679	106.29

B, U

-> padd = 2, state = IA, r_city = BETTENDORF

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.60097	12.91302	42.61649	132.34
rp_unb	361	73.89585	13.57775	40.05974	144.02

B, U

-> padd = 2, state = MO, r_city = CAPE GIRARDEAU

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.67726	12.31728	40.227	107.11
rp_unb	361	70.16745	12.84547	38.53046	110.79

B, U

-> padd = 2, state = MO, r_city = MT. VERNON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.98563	12.90386	44.04762	131.33
rp_unb	361	72.69768	12.98224	42.5188	136.28

B, U

-> padd = 2, state = MO, r_city = ST. LOUIS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.51978	13.76126	38.1601	129.83
rp_unb	361	71.19231	14.13546	36.76225	140.41

B, U

-> padd = 3, state = AR, r_city = LITTLE ROCK

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.01734	12.40933	39.84468	106.62
rp_unb	361	69.28886	12.57197	37.59857	106.85

B, U

-> padd = 3, state = NM, r_city = ALBUQUERQUE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.80363	12.46058	49.05615	106.91
rp_unb	361	77.83481	12.62624	49.0442	112.45

B, U

-> padd = 3, state = NM, r_city = BLOOMFIELD

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Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.99812	12.98298	55.8396	113.83
rp_unb	361	83.05946	12.90699	53.16607	114.5

B, U

-> padd = 3, state = NM, r_city = CINIZA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.2237	13.06988	54.69534	118.35
rp_unb	361	82.19413	13.28929	52.5687	118.5

B, U

-> padd = 4, state = CO, r_city = GRAND JUNCTION

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.78292	12.62443	49.82456	118.59
rp_unb	0				

B

-> padd = 4, state = NM, r_city = FOUR CORNERS REF.

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.99725	12.9713	55.69893	113.74
rp_unb	361	83.0521	12.91753	53.16607	114.5

B, U

-> padd = 4, state = UT, r_city = SALT LAKE CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.24833	13.42786	46.42857	113.18
rp_unb	361	82.21225	13.7507	46.17682	115.28

B, U

-> padd = 5, state = AZ, r_city = PHOENIX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.72382	14.35127	52.29391	123.33
rp_unb	361	81.04684	15.17315	49.56989	134.88

B, U

-> padd = 5, state = AZ, r_city = TUCSON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.21122	13.45544	52.0908	121.3
rp_unb	361	81.32274	14.71233	49.36679	128.73

B, U

-> padd = 5, state = NV, r_city = LAS VEGAS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	85.60754	15.15547	55.75866	134.65
rp_unb	361	82.55314	16.30046	53.94265	156.3

B, U

-> padd = 5, state = NV, r_city = SPARKS/RENO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	83.91098	16.45975	53.71565	132.78
rp_unb	361	83.29409	17.57641	52.48507	152.09

B, U

-> padd = 5, state = OR, r_city = EUGENE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.97424	14.55275	50.94385	124.07
rp_unb	361	80.05424	15.27511	41.78017	125.61

B, U

-> padd = 5, state = OR, r_city = PORTLAND_OR

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.1691	14.37156	48.8172	122.04
rp_unb	361	77.63008	15.29288	39.7491	123.88

B, U

-> padd = 5, state = WA, r_city = ANACORTES

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.30803	13.88362	49.48626	122.06
rp_unb	361	78.3476	14.60272	42.3178	122.75

B, U

-> padd = 5, state = WA, r_city = PASCO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.76547	14.36687	48.53046	117.92
rp_unb	361	81.20213	15.17315	46.12903	123.49

B, U

-> padd = 5, state = WA, r_city = SEATTLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	81.55276	13.955	49.773	121.88
rp_unb	361	78.48583	15.96882	41.76822	125.58

B, U

-> padd = 5, state = WA, r_city = SPOKANE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	82.7379	13.53777	53.59618	114.75
rp_unb	361	82.95341	14.04402	51.97132	121

B, U

```
23
24 . *shell-texaco II (Motiva)
25 . use "D:\My Documents\STATA\GRC\G_DATA2_fe.dta", clear
26 . keep if texacoshell==1
(84835 observations deleted)
27 . bysort padd state r_city: sum rp_brn rp_unb
```

B-51
U-50

-> padd = 1, state = FL, r_city = JACKSONVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.09482	11.78923	42.36559	104
rp_unb	361	69.89292	12.69027	38.24373	105.03

B, U

-> padd = 1, state = FL, r_city = MIAMI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.2558	12.05125	41.79211	103.415
rp_unb	361	69.70525	12.64036	38.74552	104.865

B, U

-> padd = 1, state = FL, r_city = ORLANDO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.60421	11.873	42.65233	104.64
rp_unb	361	71.17735	12.59601	39.55795	105.15

B, U

-> padd = 1, state = FL, r_city = PENSACOLA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.34976	12.29978	40.48985	103.17
rp_unb	361	69.06821	12.7813	38.72163	104.55

B, U

-> padd = 1, state = FL, r_city = TAMPA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.41576	12.0092	40.14337	102.065
rp_unb	361	69.1942	12.60504	37.64635	103.5

B, U

-> padd = 1, state = GA, r_city = ATLANTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.35902	12.30367	39.53405	105.965
rp_unb	361	69.20237	13.30392	37.29988	114.22

B, U

-> padd = 1, state = GA, r_city = BAINBRIDGE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.73727	12.00167	40.28674	103.25
rp_unb	361	68.69339	12.44477	37.71804	103.58

B, U

-> padd = 1, state = GA, r_city = COLUMBUS_GA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.66818	11.99942	40.07169	103.04
rp_unb	361	68.61484	12.42833	37.51493	103.16

B, U

-> padd = 1, state = GA, r_city = MACON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.37931	12.00763	39.7491	102.82
rp_unb	361	68.42514	12.41632	37.27599	103

B, U

-> padd = 1, state = GA, r_city = SAVANNAH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.02511	11.95245	42.06691	104.38
rp_unb	361	70.69299	12.70314	39.56989	106.24

B, U

-> padd = 1, state = MD, r_city = BALTIMORE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.93723	12.17893	40.38232	103.26
rp_unb	361	70.28919	12.64906	38.45878	103.97

B, U

-> padd = 1, state = NC, r_city = CHARLOTTE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.37685	12.09948	40.13142	103.29
rp_unb	361	68.63935	12.46363	37.33572	103.415

B, U

-> padd = 1, state = NC, r_city = GREENSBORO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.42659	12.15993	39.80884	103.295
rp_unb	361	68.76332	12.51421	37.39546	103.66

B, U

-> padd = 1, state = NC, r_city = SELMA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.76116	12.17016	40.29869	103.8
rp_unb	361	69.08201	12.64717	37.74194	104.905

B, U

-> padd = 1, state = NC, r_city = WILMINGTON_NC

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.50661	11.98253	41.8638	104.55
rp_unb	361	70.13934	12.48298	39.21147	104.95

B, U

-> padd = 1, state = NY, r_city = ALBANY_NY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.78182	12.94653	40.63321	104.52
rp_unb	361	71.75308	12.86085	39.67742	108.15

B, U

-> padd = 1, state = SC, r_city = CHARLESTON_SC

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.69434	11.99278	41.4098	104.33
rp_unb	361	69.69428	12.54132	38.85305	104.65

B, U

-> padd = 1, state = SC, r_city = NORTH AUGUSTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.56964	12.05609	39.92831	102.6
rp_unb	361	68.66424	12.4559	37.76583	103.12

B, U

-> padd = 1, state = SC, r_city = SPARTANBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.3668	12.06949	39.73716	102.89
rp_unb	361	68.53473	12.50605	37.26404	103.07

B, U

-> padd = 1, state = VA, r_city = FAIRFAX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.75279	12.0505	41.17085	102.33
rp_unb	361	69.74862	12.41212	38.18399	103.6

B, U

-> padd = 1, state = VA, r_city = NORFOLK_VA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.07999	12.19071	39.53405	101.54
rp_unb	361	69.16794	12.37736	37.61052	103.1

B, U

-> padd = 1, state = VA, r_city = RICHMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.03955	12.10756	39.47431	101.92
rp_unb	361	69.10936	12.51542	37.81362	103.77

B, U

-> padd = 1, state = VA, r_city = ROANOKE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.44141	11.96346	39.71326	101.78
rp_unb	361	69.01244	12.4522	37.87336	103.74

B, U

-> padd = 2, state = TN, r_city = CHATTANOOGA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.4842	12.0855	39.94026	102.61
rp_unb	361	68.7205	12.47562	37.75388	103.17

B, U

-> padd = 2, state = TN, r_city = KNOXVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.56453	12.2261	40.19116	103.09
rp_unb	361	69.03804	12.71043	37.75388	104.49

B, U

-> padd = 2, state = TN, r_city = MEMPHIS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.27468	12.26387	40.04779	103.805
rp_unb	361	69.40792	13.03399	37.57467	106.77

B, U

-> padd = 2, state = TN, r_city = NASHVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.78496	12.24013	40.05974	102.705
rp_unb	361	69.17196	12.72192	37.92115	104.58

B, U

-> padd = 3, state = AL, r_city = BIRMINGHAM

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.15885	12.26195	39.5221	105.27
rp_unb	361	68.30567	12.84886	36.81004	107.58

B, U

-> padd = 3, state = AL, r_city = MOBILE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.59738	12.14969	40.83632	103.13
rp_unb	361	68.70141	12.77965	37.75388	103.85

B, U

-> padd = 3, state = AL, r_city = MONTGOMERY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.59059	12.08735	40.05974	103.21
rp_unb	361	68.55735	12.42786	37.53883	102.83

B, U

-> padd = 3, state = LA, r_city = BATON ROUGE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.5422	12.20535	38.94863	103.16
rp_unb	361	67.42334	13.29745	35.55556	111.155

B, U

-> padd = 3, state = LA, r_city = MONROE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.44707	12.25654	41.07527	103.74
rp_unb	361	68.73782	12.48202	37.81362	102.32

B, U

-> padd = 3, state = LA, r_city = NEW ORLEANS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.6861	12.1914	39.37873	103.08
rp_unb	361	66.90779	12.56265	35.72282	101.42

B, U

-> padd = 3, state = LA, r_city = SHREVEPORT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.20183	12.21184	40.62127	103.84
rp_unb	361	68.21704	12.4839	36.85783	102.87

B, U

-> padd = 3, state = MS, r_city = COLLINS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.66872	12.05444	39.00836	102.07
rp_unb	361	67.57741	12.43428	36.2963	102.25

B, U

-> padd = 3, state = MS, r_city = MERIDIAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.54327	12.12051	39.23536	102
rp_unb	361	67.83983	12.46778	36.77419	102.69

B, U

-> padd = 3, state = MS, r_city = VICKSBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.62912	12.19258	40.21505	103.37
rp_unb	361	68.72786	12.50892	37.69415	103.4

B, U

-> padd = 3, state = TX, r_city = ABILENE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.16676	12.372	43.77539	108.24
rp_unb	361	73.1019	12.49279	42.7718	113.75

B, U

-> padd = 3, state = TX, r_city = AMARILLO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.86752	13.41934	40.02506	114.41
rp_unb	361	73.29171	13.62107	40.05013	125.95

B, U

-> padd = 3, state = TX, r_city = AUSTIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.05898	12.38811	39.89247	104.03
rp_unb	361	68.49413	12.68975	38.98447	103.75

B, U

-> padd = 3, state = TX, r_city = BEAUMONT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	68.34438	12.29084	37.26404	102.035
rp_unb	361	66.69292	12.6563	35.19713	102.555

B, U

-> padd = 3, state = TX, r_city = BIG SPRING

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.7343	13.00587	43.78446	112.62
rp_unb	0				

B

-> padd = 3, state = TX, r_city = DALLAS METRO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.1303	12.45722	39.05615	104.29
rp_unb	361	70.0145	12.63396	37.55078	104.16

B, U

-> padd = 3, state = TX, r_city = EL PASO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	78.02413	11.22761	48.1123	103.02
rp_unb	361	77.7795	11.66408	46.94146	111.37

B, U

-> padd = 3, state = TX, r_city = HEARNE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.29524	12.35975	39.13979	103.29
rp_unb	361	67.94121	12.58216	36.78614	102.42

B, 4

-> padd = 3, state = TX, r_city = LUBBOCK

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.48205	13.51839	39.78697	116.52
rp_unb	361	73.95835	13.56796	39.13534	119.52

B, 4

-> padd = 3, state = TX, r_city = MIDLAND/ODESSA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.01105	12.98983	44.24134	112.62
rp_unb	361	74.71607	13.03026	43.85965	111.17

B, 4

-> padd = 3, state = TX, r_city = SAN ANGELO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	75.66567	12.71986	44.55197	113.55
rp_unb	361	75.04236	12.37369	43.30944	109.53

B, 4

-> padd = 3, state = TX, r_city = SAN ANTONIO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	68.98312	12.4992	38.44683	102.44
rp_unb	361	67.5067	12.77091	36.69056	102.47

B, 4

-> padd = 3, state = TX, r_city = TYLER

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.2218	12.34186	39.67742	104.35
rp_unb	361	69.35968	12.4712	37.64635	104.21

B, 4

-> padd = 3, state = TX, r_city = WACO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.23223	12.6487	39.092	103.68
rp_unb	361	68.59535	12.88675	37.02509	103.34

B, 4


```
28 .
29 *bp-amoco
30 use "D:\My Documents\STATA\GRC\G_DATA2_fe.dta", clear
31 . keep if bpamoco==1
(86640 observations deleted)
32 . bysort padd state r_city: sum rp_brn rp_unb
```

B – 46
4 – 46

-> padd = 1, state = FL, r_city = JACKSONVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.09482	11.78923	42.36559	104
rp_unb	361	69.89292	12.69027	38.24373	105.03

B, 4

-> padd = 1, state = FL, r_city = MIAMI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.2558	12.05125	41.79211	103.415
rp_unb	361	69.70525	12.64036	38.74552	104.865

B, 4

-> padd = 1, state = FL, r_city = ORLANDO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.60421	11.873	42.65233	104.64
rp_unb	361	71.17735	12.59601	39.55795	105.15

B, 4

-> padd = 1, state = FL, r_city = PANAMA CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.4437	11.98998	41.14695	103.14
rp_unb	361	68.82952	12.4922	37.71804	102.86

B, 4

-> padd = 1, state = FL, r_city = TAMPA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.41576	12.0092	40.14337	102.065
rp_unb	361	69.1942	12.60504	37.64635	103.5

B, 4

-> padd = 1, state = GA, r_city = ALBANY_GA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.58567	12.06214	39.9761	103.06
rp_unb	361	68.57509	12.53208	37.32378	103.3

B, 4

-> padd = 1, state = GA, r_city = ATLANTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.35902	12.30367	39.53405	105.965
rp_unb	361	69.20237	13.30392	37.29988	114.22

B, 4

-> padd = 1, state = GA, r_city = BAINBRIDGE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.73727	12.00167	40.28674	103.25
rp_unb	361	68.69339	12.44477	37.71804	103.58

B, 4

-> padd = 1, state = GA, r_city = MACON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.37931	12.00763	39.7491	102.82
rp_unb	361	68.42514	12.41632	37.27599	103

B, 4

-> padd = 1, state = GA, r_city = SAVANNAH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.02511	11.95245	42.06691	104.38
rp_unb	361	70.69299	12.70314	39.56989	106.24

B, 4

-> padd = 1, state = NC, r_city = CHARLOTTE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.37685	12.09948	40.13142	103.29
rp_unb	361	68.63935	12.46363	37.33572	103.415

B, 4

-> padd = 1, state = NC, r_city = GREENSBORO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.42659	12.15993	39.80884	103.295
rp_unb	361	68.76332	12.51421	37.39546	103.66

B, 4

-> padd = 1, state = NC, r_city = SELMA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.76116	12.17016	40.29869	103.8
rp_unb	361	69.08201	12.64717	37.74194	104.905

B, 4

-> padd = 1, state = NC, r_city = WILMINGTON_NC

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.50661	11.98253	41.8638	104.55
rp_unb	361	70.13934	12.48298	39.21147	104.95

B, 4

-> padd = 1, state = PA, r_city = ALTOONA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.85674	12.72174	41.26643	104.56
rp_unb	361	71.83069	12.91763	39.773	108.22

B, 4

-> padd = 1, state = PA, r_city = PITTSBURGH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.4738	12.98363	38.94863	107.22
rp_unb	361	71.65158	13.38595	38.47073	109.83

B, 4

-> padd = 1, state = SC, r_city = CHARLESTON_SC

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.69434	11.99278	41.4098	104.33
rp_unb	361	69.69428	12.54132	38.85305	104.65

B, 4

-> padd = 1, state = SC, r_city = NORTH AUGUSTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.56964	12.05609	39.92831	102.6
rp_unb	361	68.66424	12.4559	37.76583	103.12

B, 4

-> padd = 1, state = SC, r_city = SPARTANBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.3668	12.06949	39.73716	102.89
rp_unb	361	68.53473	12.50605	37.26404	103.07

B, 4

-> padd = 1, state = VA, r_city = FAIRFAX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.75279	12.0505	41.17085	102.33
rp_unb	361	69.74862	12.41212	38.18399	103.6

B, 4

-> padd = 1, state = VA, r_city = NORFOLK_VA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.07999	12.19071	39.53405	101.54
rp_unb	361	69.16794	12.37736	37.61052	103.1

B, 4

-> padd = 1, state = VA, r_city = RICHMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.03955	12.10756	39.47431	101.92
rp_unb	361	69.10936	12.51542	37.81362	103.77

B, 4

-> padd = 1, state = VA, r_city = ROANOKE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.44141	11.96346	39.71326	101.78
rp_unb	361	69.01244	12.4522	37.87336	103.74

B, 4

-> padd = 2, state = IN, r_city = EVANSVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.82962	12.54502	39.48626	114.53
rp_unb	361	70.34095	12.71558	38.08841	113.26

B, 4

-> padd = 2, state = IN, r_city = HAMMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.69159	13.47054	37.15651	132.97
rp_unb	361	70.61638	14.52656	34.54002	149.05

-> padd = 2, state = IN, r_city = HUNTINGTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.56877	13.32124	38.41099	131.61
rp_unb	361	72.28019	14.01358	37.49104	141.37

-> padd = 2, state = KY, r_city = LOUISVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.9564	12.97796	39.02031	115.16
rp_unb	361	71.78457	13.20611	38.55436	117.24

-> padd = 2, state = MI, r_city = DETROIT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.80241	14.06496	37.15651	140.545
rp_unb	361	72.2191	14.73559	35.93787	144.095

-> padd = 2, state = MI, r_city = JACKSON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.19395	14.05362	38.3871	142.055
rp_unb	361	71.64791	14.53512	36.12903	148.99

-> padd = 2, state = MI, r_city = LANSING

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.31514	14.07594	38.66189	142.4
rp_unb	361	72.19327	14.69999	36.64277	149.7

-> padd = 2, state = MI, r_city = MUSKEGON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.50571	14.07963	38.33931	144.3
rp_unb	361	71.93469	14.30962	36.33214	145.75

-> padd = 2, state = MI, r_city = NILES

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.27804	13.85346	37.16846	139.19
rp_unb	361	71.11786	14.3833	35.05376	148.54

-> padd = 2, state = MI, r_city = TRAVERSE CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.57094	14.54793	41.13501	147.28
rp_unb	361	75.97374	14.52642	39.78495	148.8

-> padd = 2, state = MO, r_city = CAPE GIRARDEAU

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.67726	12.31728	40.227	107.11
rp_unb	361	70.16745	12.84547	38.53046	110.79

-> padd = 2, state = OH, r_city = TOLEDO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.86073	13.76155	38.06452	139.75
rp_unb	361	71.83431	14.30195	35.84229	147.04

-> padd = 2, state = TN, r_city = CHATTANOOGA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.4842	12.0855	39.94026	102.61
rp_unb	361	68.7205	12.47562	37.75388	103.17

-> padd = 2, state = TN, r_city = KNOXVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.56453	12.2261	40.19116	103.09
rp_unb	361	69.03804	12.71043	37.75388	104.49

-> padd = 2, state = TN, r_city = MEMPHIS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.27468	12.26387	40.04779	103.805
rp_unb	361	69.40792	13.03399	37.57467	106.77

-> padd = 2, state = TN, r_city = NASHVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.78496	12.24013	40.05974	102.705
rp_unb	361	69.17196	12.72192	37.92115	104.58

-> padd = 3, state = AL, r_city = ANNISTON/OXFORD

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.19236	12.05831	39.82079	102.81
rp_unb	361	68.15857	12.44225	37.27599	102.1

-> padd = 3, state = AL, r_city = BIRMINGHAM

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.15885	12.26195	39.5221	105.27
rp_unb	361	68.30567	12.84886	36.81004	107.58

-> padd = 3, state = AL, r_city = MOBILE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.59738	12.14969	40.83632	103.13
rp_unb	361	68.70141	12.77965	37.75388	103.85

B, u

-> padd = 3, state = AL, r_city = MONTGOMERY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.59059	12.08735	40.05974	103.21
rp_unb	361	68.55735	12.42786	37.53883	102.83

B, u

-> padd = 3, state = MS, r_city = COLLINS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.66872	12.05444	39.00836	102.07
rp_unb	361	67.57741	12.43428	36.2963	102.25

B, u

-> padd = 3, state = MS, r_city = GREENVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.59535	12.10633	39.68937	102.96
rp_unb	361	68.57024	12.90916	37.16846	105.67

B, u

-> padd = 3, state = MS, r_city = MERIDIAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.54327	12.12051	39.23536	102
rp_unb	361	67.83983	12.46778	36.77419	102.69

B, u

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33
34 . *exxon-mobil
35   use "D:\My Documents\STATA\GRC\G_DATA2_fe.dta", clear

36 . keep if exxonmobil==1
   (93860 observations deleted)

37 . bysort padd state r_city: sum rp_brn rp_unb
```

B - 26
u - 25

-> padd = 1, state = FL, r_city = JACKSONVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.09482	11.78923	42.36559	104
rp_unb	361	69.89292	12.69027	38.24373	105.03

B, u

-> padd = 1, state = GA, r_city = SAVANNAH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.02511	11.95245	42.06691	104.38
rp_unb	361	70.69299	12.70314	39.56989	106.24

B, u

-> padd = 1, state = MD, r_city = BALTIMORE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.93723	12.17893	40.38232	103.26
rp_unb	361	70.28919	12.64906	38.45878	103.97

B, u

-> padd = 1, state = ME, r_city = BANGOR

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.07266	12.91062	43.73955	107.55
rp_unb	0				

B

-> padd = 1, state = ME, r_city = PORTLAND_ME

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.71972	12.94379	41.93548	105.635
rp_unb	361	73.00485	13.1849	40.17921	110.11

B, u

-> padd = 1, state = NC, r_city = GREENSBORO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.42659	12.15993	39.80884	103.295
rp_unb	361	68.76332	12.51421	37.39546	103.66

B, u

-> padd = 1, state = NC, r_city = SELMA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.76116	12.17016	40.29869	103.8
rp_unb	361	69.08201	12.64717	37.74194	104.905

B, u

-> padd = 1, state = NY, r_city = ALBANY_NY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.78182	12.94653	40.63321	104.52
rp_unb	361	71.75308	12.86085	39.67742	108.15

B, u

-> padd = 1, state = NY, r_city = NEWBURGH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.55678	13.33462	44.06213	107.82
rp_unb	361	71.82399	13.20417	39.66547	107.38

B, u

-> padd = 1, state = PA, r_city = ALTOONA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.85674	12.72174	41.26643	104.56
rp_unb	361	71.83069	12.91763	39.773	108.22

B, u

-> padd = 1, state = PA, r_city = HARRISBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.75536	12.82235	39.02031	103.49
rp_unb	361	71.27363	12.97055	39.36679	106.29

B, u

-> padd = 1, state = PA, r_city = SCRANTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.53371	12.71558	40.82437	103.87
rp_unb	361	72.63728	12.98717	41.03942	107.16

B, u

-> padd = 1, state = VA, r_city = FAIRFAX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.75279	12.0505	41.17085	102.33
rp_unb	361	69.74862	12.41212	38.18399	103.6

B, u

-> padd = 1, state = VA, r_city = RICHMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.03955	12.10756	39.47431	101.92
rp_unb	361	69.10936	12.51542	37.81362	103.77

B, u

-> padd = 1, state = VA, r_city = ROANOKE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.44141	11.96346	39.71326	101.78
rp_unb	361	69.01244	12.4522	37.87336	103.74

B, u

-> padd = 3, state = LA, r_city = BATON ROUGE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.5422	12.20535	38.94863	103.16
rp_unb	361	67.42334	13.29745	35.55556	111.155

B, u

-> padd = 3, state = LA, r_city = CHALMETTE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.35089	12.28155	39.47431	103.25
rp_unb	361	67.3611	12.727	35.83035	103.02

B, u

-> padd = 3, state = LA, r_city = NEW ORLEANS

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	69.6861	12.1914	39.37873	103.08
rp_unb	361	66.90779	12.56265	35.72282	101.42

B, u

-> padd = 3, state = TX, r_city = AUSTIN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.05898	12.38811	39.89247	104.03
rp_unb	361	68.49413	12.68975	38.98447	103.75

B, u

-> padd = 3, state = TX, r_city = BEAUMONT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	68.34438	12.29084	37.26404	102.035
rp_unb	361	66.69292	12.6563	35.19713	102.555

B, u

-> padd = 3, state = TX, r_city = CENTER

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.03356	12.30096	39.82079	104.11
rp_unb	361	69.39441	12.71277	38.29152	105.165

B, u

-> padd = 3, state = TX, r_city = CORPUS CHRISTI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	67.94358	12.67906	36.98925	102.795
rp_unb	361	66.49141	13.03871	35.78256	103.11

B, u

-> padd = 3, state = TX, r_city = DALLAS METRO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	71.1303	12.45722	39.05615	104.29
rp_unb	361	70.0145	12.63396	37.55078	104.16

B, u

-> padd = 3, state = TX, r_city = HEARNE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.29524	12.35975	39.13979	103.29
rp_unb	361	67.94121	12.58216	36.78614	102.42

B, u

-> padd = 3, state = TX, r_city = SAN ANTONIO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	68.98312	12.4992	38.44683	102.44
rp_unb	361	67.5067	12.77091	36.69056	102.47

B, u

-> padd = 3, state = TX, r_city = WACO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	70.23223	12.6487	39.092	103.68
rp_unb	361	68.59535	12.88675	37.02509	103.34

B, u

```
38 .
39 . *map-uds
40 . use "D:\My Documents\STATA\GRC\G_DATA2_fe.dta", clear
```

B — 10

u — 10

41 . keep if mapuds==1
(99636 observations deleted)

42 . bysort padd state r_city: sum rp_brn rp_unb

-> padd = 2, state = MI, r_city = BAY CITY_MI

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.73056	14.33488	39.49821	144.01
rp_unb	361	74.2808	14.72347	38.19594	150.68

B, U

-> padd = 2, state = MI, r_city = CHEBOYGAN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	77.57306	14.58339	41.69654	150.84
rp_unb	361	76.34662	14.63881	39.91637	150.15

B, U

-> padd = 2, state = MI, r_city = DETROIT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.80241	14.06496	37.15651	140.545
rp_unb	361	72.2191	14.73559	35.93787	144.095

B, U

-> padd = 2, state = MI, r_city = FERRYSBURG

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.26065	14.12813	37.81362	144.17
rp_unb	361	72.37082	14.45744	36.58303	145.23

B, U

-> padd = 2, state = MI, r_city = FLINT

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	74.24209	14.09737	38.23178	141.99
rp_unb	361	73.29891	14.6938	36.73835	152.07

B, U

-> padd = 2, state = MI, r_city = JACKSON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.19395	14.05362	38.3871	142.055
rp_unb	361	71.64791	14.53512	36.12903	148.99

B, U

-> padd = 2, state = MI, r_city = LANSING

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.31514	14.07594	38.66189	142.4
rp_unb	361	72.19327	14.69999	36.64277	149.7

B, U

-> padd = 2, state = MI, r_city = MUSKEGON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	73.50571	14.07963	38.33931	144.3
rp_unb	361	71.93469	14.30962	36.33214	145.75

B, U

-> padd = 2, state = MI, r_city = NILES

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	72.27804	13.85346	37.16846	139.19
rp_unb	361	71.11786	14.3833	35.05376	148.54

B, U

-> padd = 2, state = MI, r_city = TRAVERSE CITY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	361	76.57094	14.54793	41.13501	147.28
rp_unb	361	75.97374	14.52642	39.78495	148.8

B, U

43 .
44 .
45 . *reformulated
46 .
47 . *tosco-unocal: not available
48 . *shell-texaco I (Equilon): not available
49 . *map-uds: not available
50 .
51 .
52 . *uds-total
53 . use "D:\My Documents\STATA\GRC\R_DATA1_fe.dta", clear

B – 1
U – 1

54 . keep if udstotal==1
(6405 observations deleted)

55 . bysort padd state r_city: sum rp_brn rp_unb

-> padd = 3, state = TX, r_city = DALLAS METRO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.42464	13.73544	41.39785	110.71
rp_unb	305	73.11005	14.09219	38.47073	112.43

B, U

56 .
57 . *marathon-ashland
58 . use "D:\My Documents\STATA\GRC\R_DATA1_fe.dta", clear

B – 4
U – 4

59 . keep if map==1
(5490 observations deleted)

60 . bysort padd state r_city: sum rp_brn rp_unb

-> padd = 1, state = VA, r_city = FAIRFAX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.25432	13.46843	44.33692	109.2
rp_unb	305	74.78455	14.33531	40.05974	116.29

B, U

-> padd = 1, state = VA, r_city = NORFOLK_VA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.96594	13.61531	42.71207	111.6
rp_unb	305	74.05724	14.18869	38.82915	114.34

B, U

-> padd = 1, state = VA, r_city = RICHMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.75745	13.63152	42.22222	111.08
rp_unb	305	74.27152	14.08181	39.59379	114.09

B, 4

-> padd = 2, state = KY, r_city = LOUISVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	79.87487	15.0178	41.24253	133.09
rp_unb	305	79.69659	16.32716	40.14337	144.02

B, 4

```
61 .
62 *shell-texaco II (Motiva)
63 . use "D:\My Documents\STATA\GRC\R_DATA1_fe.dta", clear
64 . keep if texacoshell==1
(3965 observations deleted)
65 . bysort padd state r_city: sum rp_brn rp_unb
```

B - 9
U - 9

-> padd = 1, state = MD, r_city = BALTIMORE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.28026	13.42521	43.52449	110
rp_unb	305	74.78593	14.25045	39.60574	113.7

B, 4

-> padd = 1, state = NY, r_city = ALBANY_NY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	78.82641	14.29557	45.53166	112.79
rp_unb	305	77.05792	15.504	42.0908	121

B, 4

-> padd = 1, state = VA, r_city = FAIRFAX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.25432	13.46843	44.33692	109.2
rp_unb	305	74.78455	14.33531	40.05974	116.29

B, 4

-> padd = 1, state = VA, r_city = NORFOLK_VA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.96594	13.61531	42.71207	111.6
rp_unb	305	74.05724	14.18869	38.82915	114.34

B, 4

-> padd = 1, state = VA, r_city = RICHMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.75745	13.63152	42.22222	111.08
rp_unb	305	74.27152	14.08181	39.59379	114.09

B, 4

-> padd = 3, state = TX, r_city = DALLAS METRO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.42464	13.73544	41.39785	110.71
rp_unb	305	73.11005	14.09219	38.47073	112.43

B, 4

-> padd = 3, state = TX, r_city = DALLAS/FT. WORTH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.85686	13.20752	41.23059	110.28
rp_unb	305	72.86522	14.12415	37.84946	111.45

B, 4

-> padd = 3, state = TX, r_city = DALLAS/SOUTHLAKE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.33926	13.83895	41.21864	111.3
rp_unb	305	73.76679	14.15033	40.29869	115

B, 4

-> padd = 3, state = TX, r_city = HOUSTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	72.87419	13.64036	40.34647	111.06
rp_unb	305	71.6197	13.99014	37.24014	112.16

B, 4

```
66
67 . *bp-amoco
68 . use "D:\My Documents\STATA\GRC\R_DATA1_fe.dta", clear
69 . keep if bpamoco==1
(5490 observations deleted)
70 . bysort padd state r_city: sum rp_brn rp_unb
```

B - 4
U - 4

-> padd = 1, state = VA, r_city = FAIRFAX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.25432	13.46843	44.33692	109.2
rp_unb	305	74.78455	14.33531	40.05974	116.29

B, 4

-> padd = 1, state = VA, r_city = NORFOLK_VA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.96594	13.61531	42.71207	111.6
rp_unb	305	74.05724	14.18869	38.82915	114.34

B, 4

-> padd = 1, state = VA, r_city = RICHMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.75745	13.63152	42.22222	111.08
rp_unb	305	74.27152	14.08181	39.59379	114.09

B, 4

-> padd = 2, state = KY, r_city = LOUISVILLE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	79.87487	15.0178	41.24253	133.09
rp_unb	305	79.69659	16.32716	40.14337	144.02

B, U

```
71 .
72 . *exxon-mobil
73 . use "D:\My Documents\STATA\GRC\R_DATA1_fe.dta", clear

74 . keep if exxonmobil==1
(2440 observations deleted)

75 . bysort padd state r_city: sum rp_brn rp_unb
```

B-14
U-14

-> padd = 1, state = CT, r_city = NEW HAVEN

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.5732	14.18687	42.18638	110.56
rp_unb	305	74.85535	14.39369	40.11947	112.64

B, U

-> padd = 1, state = DE, r_city = WILMINGTON_DE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.06763	14.06539	43.23775	110.38
rp_unb	305	74.15397	14.17303	39.30705	112.06

B, U

-> padd = 1, state = MA, r_city = BOSTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	77.90598	14.38655	43.07049	113.12
rp_unb	305	74.93969	14.83189	39.58184	113.85

B, U

-> padd = 1, state = MD, r_city = BALTIMORE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.28026	13.42521	43.52449	110
rp_unb	305	74.78593	14.25045	39.60574	113.7

B, U

-> padd = 1, state = NJ, r_city = PAULSBORO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.14949	14.25076	42.73596	110.99
rp_unb	305	74.72118	14.72492	39.05615	112.91

B, U

-> padd = 1, state = NY, r_city = ALBANY_NY

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	78.82641	14.29557	45.53166	112.79
rp_unb	305	77.05792	15.504	42.0908	121

B, U

-> padd = 1, state = NY, r_city = NEWBURGH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	77.92385	13.77593	44.6595	109.65
rp_unb	305	75.76115	14.32943	40.51374	113.68

B, U

-> padd = 1, state = PA, r_city = PHILADELPHIA

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.44173	14.12462	42.87933	110.51
rp_unb	305	74.53604	14.59013	39.12784	112.52

B, U

-> padd = 1, state = VA, r_city = FAIRFAX

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	76.25432	13.46843	44.33692	109.2
rp_unb	305	74.78455	14.33531	40.05974	116.29

B, U

-> padd = 1, state = VA, r_city = RICHMOND

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	75.75745	13.63152	42.22222	111.08
rp_unb	305	74.27152	14.08181	39.59379	114.09

B, U

-> padd = 3, state = TX, r_city = DALLAS METRO

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.42464	13.73544	41.39785	110.71
rp_unb	305	73.11005	14.09219	38.47073	112.43

B, U

-> padd = 3, state = TX, r_city = DALLAS/FT. WORTH

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.85686	13.20752	41.23059	110.28
rp_unb	305	72.86522	14.12415	37.84946	111.45

B, U

-> padd = 3, state = TX, r_city = DALLAS/SOUTHLAKE

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	74.33926	13.83895	41.21864	111.3
rp_unb	305	73.76679	14.15033	40.29869	115

B, U

-> padd = 3, state = TX, r_city = HOUSTON

Variable	Obs	Mean	Std. Dev.	Min	Max
rp_brn	305	72.87419	13.64036	40.34647	111.06
rp_unb	305	71.6197	13.99014	37.24014	112.16

B, U

```
76 .
77 .
78 . *CARB
79 .
80 . *uds-total: not available
81 . *marathon-ashland: not available
82 . *shell-texaco II (Motiva): not available
83 . *bp-amoco: not available
84 . *exxon-mobil: not available
85 . *map-uds: not available
86 .
87 .
88 . *tosco_unocal
89 . use "D:\My Documents\STATA\GRC\C_DATA1_fe.dta", clear

90 . keep if toscounocal==1
(242 observations deleted)

91 . bysort padd state r_city: sum rp_brn rp_unb
```

B-6
u-6

```
-> padd = 5, state = CA, r_city = COLTON

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      rp_brn |       242    91.98409    17.75075   60.81242     148.05
      rp_unb |       242    86.78553     19.8106   49.67742     166.38
```

B, 4

```
-> padd = 5, state = CA, r_city = IMPERIAL

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      rp_brn |       242     95.9858    17.27469   62.48507     150.77
      rp_unb |       242    91.38626     19.3823   56.57109     167.85
```

B, 4

```
-> padd = 5, state = CA, r_city = LOS ANGELES

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      rp_brn |       242     90.6813     17.9636     59.773     147.43
      rp_unb |       242    88.19126    21.28897   49.28315     165.25
```

B, 4

```
-> padd = 5, state = CA, r_city = SACRAMENTO

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      rp_brn |       242    91.72781    17.77232     59.092     148.55
      rp_unb |       242    85.91825    20.30546   48.05257     154.31
```

B, 4

```
-> padd = 5, state = CA, r_city = SAN DIEGO

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      rp_brn |       242    94.92573    18.29633   62.15054      152.7
      rp_unb |       242    87.81901    19.96236   50.65711     168.38
```

B, 4

```
-> padd = 5, state = CA, r_city = STOCKTON

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      rp_brn |       242      90.735    17.96091   59.00836     148.58
      rp_unb |       242    86.24518    20.60041   48.97252      155.7
```

B, 4


```
92 .
93 . *shell-texaco I(Equilon)
94 . use "D:\My Documents\STATA\GRC\C_DATA1_fe.dta", clear

95 . keep if shelltexaco==1
(968 observations deleted)

96 . bysort padd state r_city: sum rp_brn rp_unb
```

B-3
u-3

```
-> padd = 5, state = CA, r_city = COLTON

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      rp_brn |       242    91.98409    17.75075   60.81242     148.05
      rp_unb |       242    86.78553     19.8106   49.67742     166.38
```

B, 4

```
-> padd = 5, state = CA, r_city = IMPERIAL

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      rp_brn |       242     95.9858    17.27469   62.48507     150.77
      rp_unb |       242    91.38626     19.3823   56.57109     167.85
```

B, 4

```
-> padd = 5, state = CA, r_city = SACRAMENTO

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      rp_brn |       242    91.72781    17.77232     59.092     148.55
      rp_unb |       242    85.91825    20.30546   48.05257     154.31
```

B, 4

```
97 .
98 . log close
       log:  D:\My Documents\STATA\GRC\grc_rcity_mergers.smcl
  log type:  smcl
 closed on:  24 Jun 2004, 16:14:04
```