

West Coast Crude Oil and Gasoline Prices

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1. Introduction and Summary

I am Carl Shapiro, Transamerica Professor of Business Strategy at the Haas School of Business, and Director of the Institute of Business and Economic Research, both at the University of California at Berkeley. I regularly conduct research and provide economic advice in the area of antitrust economics and business strategy. I served as Deputy Assistant Attorney General for Economics in the Antitrust Division of the Department of Justice from 1995 to 1996, and have recently testified as an expert witness on behalf of the Department of Justice and the Federal Trade Commission in antitrust cases. My curriculum vitae is available on my web site at U.C. Berkeley, www.haas.berkeley.edu/~shapiro. I thank the Committee for inviting me to offer an economic analysis of West Coast crude oil and gasoline prices here today.

Two years ago, when BP Amoco (“BP”) and ARCO announced their plans to merge, I was retained by BP and ARCO to conduct an economic analysis of the antitrust issues associated with their merger. During the subsequent year, I closely studied West Coast crude oil and refined-product markets, focusing on the supply of Alaskan North Slope (“ANS”) crude oil and the role of ANS crude oil in West Coast crude oil and refined-product markets. My analysis included an examination of competition and pricing in these markets, BP’s strategy regarding the sale and disposition of its ANS crude oil, and the impact of ANS crude oil supply and exports on West Coast prices. I am now appearing before the Committee on my own behalf as an antitrust economist and California citizen, not on behalf of BP.

I offer the following observations to the Committee:

West Coast Crude Oil Prices

- The price paid by West Coast refineries for crude oil, including Alaskan North Slope crude oil, is governed by conditions in the worldwide crude oil market.
- Over the 1995 to 2000 time period, BP was a major supplier of ANS crude oil to West Coast refineries. During that time, the price BP received for its ANS crude oil was at a competitive level, not a level reflecting monopoly power. BP's exports did not have a material effect on the price of ANS crude oil, much less the price of gasoline.
- BP's historical trading strategies as a net seller of ANS crude oil are no longer relevant in today's markets. Today, BP is a net *buyer* of ANS crude oil to serve its refineries at Los Angeles and Puget Sound.

West Coast Gasoline Prices

- West Coast gasoline prices move up and down directly with movements in world crude oil prices. But crude oil prices do not explain the higher level of gasoline prices that prevails on the West Coast vs. the rest of the country.
- Re-imposing the ban on the export of ANS crude oil is not a solution to the problem of high West Coast gasoline prices. There have been no exports of ANS crude oil to the Far East since May 2000.
- The West Coast gasoline price premium is primarily explained by (a) the higher costs of refining gasoline to meet California's more stringent requirements for reformulated gasoline, (b) the limited amount of refinery capacity on the West Coast, along with (c) the cost of importing gasoline from refineries in other parts of the country.

2. Alaskan North Slope Crude Oil Prices Are Driven by World Crude Oil Prices

The West Coast is part of the worldwide crude oil market. Alaskan North Slope crude oil prices closely track the prices of other grades of crude oil. As shown in Exhibit 1, ANS crude oil prices move up and down extremely closely with other prices in the world crude oil market such as the widely traded benchmark crude oils West Texas Intermediate (WTI) and Brent. Exhibit 2 measures the correlation between ANS crude oil prices and the prices of some other benchmark crude oils. The correlations shown in Exhibit 2 are exceptionally high and indicate that ANS crude oil trades in a market with these other crude oils.

For the past five years, the West Coast has been a net importer of crude oil. From 1995 to 2000, Alaskan North Slope production declined by 516 thousands of barrels per day (“MBD”), and shipments of ANS crude oil to the West Coast declined by 302 MBD.¹ Since the production of California crude oil has been approximately constant, at roughly 800 to 900 MBD, and since total usage of crude oil on the West Coast also has been approximately constant, at roughly 2500 MBD, the shortfall created by declining ANS production has necessarily been made up by imports. Exhibit 3 shows the increasing volume of imports of crude oil into the West Coast from 1989 through 2000. As shown in Exhibit 4 — a pie chart of crude oil sources in 2000 — last year imports made up 28% of the supply of crude oil on the West Coast.

Under these conditions, the price of crude oil on the West Coast, including ANS crude oil, has been determined by the delivered price of *imported* crude oil to the West Coast. The fact that there has been no increase in the price of ANS relative to the prices of other crude oils, despite a very large decline of 302 MBD in ANS shipments to the West Coast, is powerful evidence that ANS crude oil prices on the West Coast are governed by world crude oil prices, *not* by the volume of ANS shipped to the West Coast. This is a classic economic demonstration that ANS crude oil competes directly with these other crude oils. Technically, the demand for ANS crude oil exhibits a very high price elasticity.² These facts are central to any assessment of the impact of ANS exports.

By looking at specific West Coast refineries, we can see just how competition between ANS crude oil with other grades of crude oil plays out in the marketplace. As ANS supplies and shipments have fallen, refineries have smoothly substituted imports for ANS crude oil. For example, market intelligence indicates that Chevron’s Richmond and El Segundo refineries replaced significant volumes of ANS crude oil with imported crude oils during 1995-2000, and that UDS eliminated ANS at its Wilmington refinery in favor of imports. Likewise, Valero

¹ Shipments of ANS crude oil to the West Coast were 1314 MBD in 1995, 1348 MBD in 1996, 1222 MBD in 1997, 1184 MBD in 1998, 1070 MBD in 1999, and 1012 MBD in 2000. Department of Energy, *Petroleum Supply Monthly*, DOE/EIA 0109, Table 28, various issues.

² Along with my colleagues John Hayes and Robert Town, I have performed an econometric analysis to estimate the elasticity of demand for ANS crude oil on the West Coast. This analysis shows an extremely high elasticity of demand for ANS crude oil. See John Hayes, Carl Shapiro, and Robert Town, “The Extent of the Market: Estimating the Effects of the BP/ARCO Merger.”

announced last November its plans to import crude oil from the Mideast to compete with Alaskan North Slope crude and drive ANS prices lower.³ I say this substitution has been very “smooth” because there has been no increase in the relative price of ANS crude oil. This tells us that a number of West Coast refineries were able to switch from ANS to imported crude oils at minimal expense. In contrast, when a freeze in Florida reduces the supply of oranges, the price of orange juice rises. In that case, many orange juice drinkers find it “costly” to switch to other drinks, and will keep drinking orange juice even if orange juice prices go up.

3. BP’s Historical Trading Strategies for Alaskan North Slope Crude Oil

I understand that the Committee is interested in BP’s historical ANS trading strategies, and specifically in understanding the impact of BP’s exports of ANS crude oil on West Coast crude oil and gasoline prices. I now address those issues.

I believe the starting place for this inquiry is to ask whether BP received prices for ANS crude oil from West Coast refineries that exceeded the prices that would prevail in a competitive market. In a perfectly competitive market, a company selling ANS crude oil would ship that oil to the location giving the highest price, net of transportation costs. This net price is known as the “netback,” in this case measured from Valdez, Alaska, where the oil exits the Trans-Alaska Pipeline and is put onto tankers. The “competitive price” for ANS crude oil on the West Coast is the price that yields equal netbacks (out of Valdez) to the Far East, which has been the most attractive alternative destination over the past five years.

In fact, the netback that BP received from its sales of ANS to the West Coast was no higher than the netback it received from its exports to the Far East.⁴ In other words, BP’s prices for Alaskan North Slope crude oil were at competitive levels. The prices BP actually received for its ANS crude oil simply do not indicate that BP had monopoly power.

³ According to a November 9, 2000 press release, “Valero plans to import crude to the US West Coast from the mideast over the next few months to compete with Alaska North Slope crude and drive ANS prices lower, a Valero official told analysts Thursday. The refiner will be bringing in three cargoes of imported crude which will ‘put pressure on the ANS price,’ improving the economics at the company’s Benicia, California refinery.”

Economists generally regard trading and arbitrage activities as an important part of the operation of competitive markets. When a market participant sells its output in the geographic location yielding the highest price, market efficiency is promoted because products flow to the buyers who value them most highly. This is a general principle in commodity markets, from crude oil to bulk chemicals to agricultural markets. In my opinion, BP's trading activities and exports are best seen in this light, namely as a normal part of the workings of competitive markets. Exports certainly are a normal part of competitive commodity markets. Given that BP had sufficient shipping capacity to send some ANS crude oil to the Far East rather than the West Coast, and given the willingness of some customers in the Far East to pay enough to compensate BP for the extra cost of shipping the oil to the Far East (so that the Far East *netback* was equal to the West Coast *netback*), we should expect to see exports in a competitive market.

I understand that FTC Chairman Robert Pitofsky has suggested that BP's exports may be indicative of monopoly power, because BP recognized that selling additional ANS crude oil on the West Coast at certain times would tend to lower the West Coast spot price of ANS. Of course, it is common for traders in competitive markets to have small, transitory effects on prices. In financial markets, for example, the price of a stock may fall by 1% (e.g., 25 cents for a \$25 stock) or more as a result of a single trader unloading his or her position. In BP's case, since BP sold significant volumes of ANS crude oil under long-term contracts with prices *indexed* to the West Coast spot price of ANS, BP naturally accounted for the fact that temporarily lowering the ANS spot price by, say 0.5% (10 cents per barrel on a \$20 barrel of oil) would lower BP's revenues under its term contracts.⁵

I believe it is mistaken to characterize this type of short-run impact on spot prices as monopoly power. As I indicated earlier, BP's sales of ANS crude oil to West Coast refineries were at competitive prices, not monopoly prices. Furthermore, we directly observe a reduction in ANS

⁴ My calculations show that BP's *netback* on sales to the West Coast were approximately equal to BP's *netback* on sales to the Far East over the 1997-1999 time period. These calculations include both spot and term contract sales.

⁵ Now that ANS term contracts (which Phillips has taken over from BP) are indexed to crude oil prices other than the ANS spot price, with these other crude oils being much more thickly traded, neither BP nor Phillips has the same incentives to refrain from specific ANS spot market trades that have the effect of temporarily lowering the spot price of ANS.

shipments to the West Coast from 1314 MBD in 1995 to 1070 MBD in 1999. Compare this number to the average level of ANS exports by BP during 1998 and 1999 of 60 MBD. We can ask how much lower West Coast ANS prices would have been, had BP exported no ANS crude oil, so that ANS shipments to the West Coast in 1999 would have been 1130 MBD rather than 1070 MBD. Well, we know that ANS prices were *not lower* relative to other crude oil prices even when ANS shipments were as high as 1314 MBD, as they were back in 1995. The inescapable conclusion is that 60 MBD more ANS shipments to the West Coast would not have led to lower ANS prices during the 1998-1999 time frame. BP's exports of ANS did not have any measurable impact on the West Coast price of ANS, much less the price of gasoline.

In any event, for three powerful reasons, BP's historical trading strategies are not a fruitful place to look to explain why West Coast gasoline prices are higher than gasoline prices elsewhere in the country.

First, while the overall level of worldwide crude oil prices directly affects gasoline prices, no connection has been found between the level of ANS crude oil prices (moving alone) and West Coast gasoline prices. The GAO studied this question and was unable to detect any impact on West Coast gasoline prices even when ANS prices rose by roughly \$1 per barrel. According to the GAO, "Despite higher crude oil prices for some refiners, no observed increases occurred in the prices of ... gasoline, diesel, and jet fuel."⁶ I have conducted my own study of the relationship between ANS crude oil prices and West Coast gasoline prices, and I find no statistically significant relationship between ANS prices (moving alone) and West Coast gasoline prices.

Second, even those who suggest that BP's exports of ANS crude oil led to higher prices on the West Coast recognize that any such effects are small as regards ANS crude oil prices, and smaller still when it comes to West Coast gasoline prices. The majority of the Federal Trade Commission indicated at the time of the BP/ARCO merger that ANS exports *at most* raised gasoline prices on the West Coast by one-half cent per gallon. Referring to BP's exports of ANS

⁶ General Accounting Office, "Alaskan North Slope Oil: Limited Effects of Lifting Export Ban on Oil and Shipping Industries and Consumers," GAO/RCED-99-191, July 1999, p.6.

crude oil, Commissioners Anthony, Swindle, and Leary said: “We have reason to believe that the upward price effects of these sporadic sales amounted to no more than one-half cent per gallon at the pump.”⁷ They go on to say: “We acknowledge the public concern over the relatively high price of gasoline on the West Coast, but people will be cruelly disappointed if they are led to believe that the export restriction would have a detectable effect on the situation.”

In fact, going back to the model from which the FTC majority calculated the half-cent per gallon of gasoline *upper bound*, it is clear that the *actual effect* estimated using this model would be no more than one-tenth of a cent per gallon of gasoline. The underlying model upon which the FTC relied translated 60 MBD of exports to a temporary increase of about one-half cent per gallon in the price of *ANS crude oil*. But higher ANS crude oil prices, moving apart from other crude oil prices, simply do not translate one-for-one into higher gasoline prices. In fact, during 1998 and 1999, only around 25% of the crude oil used on the West Coast was sold at prices tied to the ANS spot price. So, even if refiners fully passed on an increase of one-half cent per gallon in the price of ANS crude oil, this would only correspond to an increase in gasoline prices of about one-tenth of a penny per gallon.⁸ Furthermore, for the reasons I gave above, I believe it is mistaken to rely on a short-run trading model, rather than longer-term data on ANS production and shipments, to estimate the effects of ANS exports on ANS crude oil prices. Looking at longer-term production and shipment data, 60 MBD of exports in 1998 and 1999 had no measurable effect on the price of ANS.

Third, BP’s historical trading strategies and exports of ANS are simply not relevant in today’s market. BP produces about 280 to 290 MBD of ANS and uses about 350 to 400 MBD of ANS crude oil at its two West Coast refineries at Carson and Cherry Point. So BP is a net *buyer* of

⁷ See Statement of Commissioners Anthony, Swindle, and Leary in BP Amoco/ARCO, April 13, 2000, available at <http://www.ftc.gov/os/2000/04/bpstateasl.htm>. It is my understanding that the FTC’s economic expert in the BP/ARCO case, Professor Preston McAfee, agrees that BP’s ANS exports had at most a very small effect on West Coast gasoline prices.

⁸ Even this number is too high, for two reasons: (1) There is no allegation that all of BP’s exports to the Far East were at netbacks less than BP could have earned selling those cargoes on the West Coast. Even Chairman Pitofsky objects to BP’s exports only when the Far East netback is less than the West Coast netback. Therefore, a number smaller than 60 MBD should be used for these calculations. (2) There is no reason to expect 100% of any increases in refineries’ cost of purchasing ANS crude oil to be passed on to motorists in the form of higher gasoline prices.

ANS crude oil of more than 70 MBD. Phillips, which acquired ARCO Alaska as part of the settlement between BP and the FTC, also inherited term contracts that BP had signed with Equilon, U.S. Oil, and Tosco. None of these term contracts are now indexed to ANS spot prices. As a result, both buyers and sellers in the (very thin) ANS spot market no longer have incentives to influence the ANS spot price as a result of having term contracts tied to that price. Finally, there have been no exports of ANS since May 2000.⁹ Phillips appears to lack sufficient shipping capacity to export its ANS to the Far East, even when netbacks to the Far East (calculated based on excess tonnage economics) are higher than netbacks on the West Coast.

4. Explaining the West Coast Gasoline Price Premium

The evidence is compelling that the higher West Coast gasoline prices we are now experiencing, in comparison with the rest of the country, are not the result of higher West Coast prices for crude oil, either for imported crude oil or for Alaskan North Slope crude oil. The West Coast gasoline price premium certainly is not today, and has not been, the result of ANS exports.¹⁰ What *does* explain these prices differences, and what can be done to reduce gasoline prices on the West Coast?

The causes of the West Coast gasoline price premium have been closely studied by many others, including the Energy Information Administration and the California Energy Commission. Happily, there is considerable consensus as to the causes of the West Coast gasoline price premium. I will simply summarize what I consider the consensus findings on this issue, adding in my own observations on possible policy responses.

Generally, the passthrough rate for higher input costs depends upon how much *marginal* costs are affected, and the ratio of the elasticities of supply and demand.

⁹ See Department of Energy, *Petroleum Supply Monthly*, DOE/EIA-0109, Table 46, various issues.

¹⁰ As noted above, there have been no exports of ANS for nearly a year. Re-imposing the ban on ANS exports would not have any material impact on West Coast crude oil or gasoline prices.

First, refinery capacity on the West Coast is limited. Building new refineries appears to be nearly impossible, and existing refineries have limited ability to expand their capacity.¹¹ The result is that the West Coast is perilously close to having insufficient refinery capacity to meet its needs. Since the demand for gasoline is quite inelastic, this creates a situation where disruptions in supply (e.g., from refinery outages) create a genuine scarcity, causing price to rise sharply to clear the market. In other words, at the refinery level, West Coast gasoline markets are habitually tight, leaving no margin for error. Inventories are not sufficient to buffer shocks resulting from supply disruptions. Consumers on the West Coast are thus vulnerable to price spikes as a result of refinery outages or breaks in pipelines. Policies to encourage the addition of refinery capacity on the West Coast would help ease these problems. The Federal Trade Commission should also scrutinize any mergers or joint ventures that would increase the concentration of ownership of West Coast refinery capacity.

Second, refinery costs are higher in California than in the rest of the country, due in part to California's stringent rules for reformulated gasoline (RFG), specifically the California Air Resources Board (CARB) standard for RFG. The CARB standard raises the cost of gasoline refining by about four cents per gallon.¹²

Third, it is costly for the West Coast to import gasoline from other parts of the country.¹³ On top of these transportation costs is the fact that California standards for RFG are more stringent than federal standards, so refineries elsewhere in the country cannot simply ship to California the gasoline they normally produce. In fact, there are a limited number of refineries outside

¹¹ Many West Coast refineries have expanded their capacity over time through debottlenecking and other capital expenditures. However, the ability of these refineries further to expand capacity is limited by a range of permitting requirements and environmental restrictions, as well as various other factors.

¹² Since its introduction in 1996, the wholesale price for CARB has averaged roughly 4 cents per gallon more than conventional gasoline. "Report on Gasoline Pricing in California," Staff Report and Attorney General's Comments and Recommendations, May 2000, p. 5. Before CARB regulations were implemented in 1996, the California Air Resources Board estimated the new formulation would cost between 5 and 15 cents more per gallon than conventional gasoline. Keith Leffler and Barry Pulliam. "Preliminary Report to the Attorney General Regarding California Gasoline Prices," November 22, 1999, n. 11.

¹³ It costs 8 to 12 cents per gallon to import gasoline from the Houston area. Keith Leffler and Barry Pulliam. "Preliminary Report to the Attorney General Regarding California Gasoline Prices," November 22, 1999, p. 7 (citing *Octane Week*, August 2, 1999).

California that produce CARB gasoline.¹⁴ Thus, refinery capacity outside PADD V has very limited ability to keep West Coast gasoline prices in line with gasoline prices elsewhere in the country. Policies designed to reduce the cost of transporting gasoline from the Gulf Coast to the West Coast would help integrate gasoline markets on the West Coast with those in the rest of the country.

Unfortunately, there is reason to believe that the West Coast gasoline price premium is likely to *grow* rather than shrink in the near future. First, as West Coast demand for gasoline slowly grows and refinery capacity does not, the basic problem of supply/demand imbalance on the West Coast will tend to worsen. Second, the price premium for CARB gasoline over conventional gasoline may rise as California refineries are forced to pay royalties to Unocal on Unocal's RFG patents.¹⁵ Third, as MTBE is phased out in California, effective refinery capacity will be further reduced and refinery costs will likely rise.¹⁶ Finally, the West Coast electricity mess may spill over and cause disruptions in the supply of gasoline on the West Coast.¹⁷

¹⁴ Refineries outside California that produce CARB include Valero (Gulf Coast), Amerada Hess (Caribbean), and Neste (Europe). "Report on Gasoline Pricing in California," Staff Report and Attorney General's Comments and Recommendations, May 2000, p. 5. These refineries do not produce CARB gasoline on a regular basis.

¹⁵ A jury decision awarding Unocal 5 ¾ cents per gallon on its '393 patent was affirmed on appeal in March 2000. Unocal claims a total of five RFG patents.

¹⁶ MTBE is prohibited in California gasoline after December 31, 2002. California Air Resources Board Press Release, March 10, 2000 (<http://www.arb.ca.gov/newsrel/ph3cbg.htm>). Removing MTBE from gasoline will cause effective production capacity to decline by from 5 to 11 percent. Gordon Schremp, "Staff Findings: Timetable for Phaseout of MTBE from California's Gasoline Supply," California Energy Commission, presentation dated June 18, 1999, and Keith Leffler and Barry Pulliam. "Preliminary Report to the Attorney General Regarding California Gasoline Prices," November 22, 1999, p. 8. Replacing MTBE with ethanol will initially add 4 to 7 cents per gallon to the price of gasoline; over the long term, removing MTBE is expected to raise gasoline prices by to 2 to 6 cents per gallon. "Supply and Cost of Alternatives to MTBE in Gasoline," California Energy Commission, P300-98-013, February 1999, and California Air Resources Board Press Release, March 10, 2000 (<http://www.arb.ca.gov/newsrel/ph3cbg.htm>).

¹⁷ The *Los Angeles Times* reported that blackouts have already shut down product pipelines, and threatened to shut down refineries in California. Chris Kraul, "Gas Shortage Possible as Crisis Affects Refineries, Pipelines," *LA Times*, January 20, 2001. I understand that BP reduced production at its Cherry Point refinery for a brief period of time because of the high price of electricity.