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An econometric analysis of retail gasoline prices in a border metropolitan economy

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ABSTRACT

Previous studies show that a variety of different variables influence retail gasoline price fluctuations. In the case of El Paso, Texas, those variables would include wholesale gasoline prices, local economic conditions, weather, and, more uniquely, cross-border economic variables associated with Ciudad Juarez, Chihuahua, in Mexico. To analyze the contributions of these variables to monthly price movements for gasoline in El Paso, a theoretical model is specified. From the latter construct, a reduced-form equation is extracted. That specification is then expressed within an error correction framework to allow accounting for both long-run and short-run behaviors in this metropolitan economy. Results indicate that the border poses a fairly substantial barrier to normal trade and purchasing patterns for this product within this specific region.

1. Introduction

The purpose of this study is to examine the determinants of local gasoline prices in the El Paso metropolitan economy and how they vary over time. Many studies of the border region have analyzed gasoline demand, but not price (Ayala & Gutiérrez, 2004; Haro and Ibarrola, 1999; Ibarra and Sortres, 2008). This issue is of interest as many cities encourage ownership of personal vehicles due to urban sprawl and lack of options for pedestrians (Bento, Cropper, Mobarak, & Vinha, 2005; Sinha, 2003). Consequently, families allocate significant fractions of household income for gasoline purchases. Because

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of its location on the U.S.–Mexico border, consumers in El Paso can treat gasoline from either country as substitute goods (Fullerton, Muñoz Sapien, Barraza de Anda, & Domínguez Ruvalcaba, 2012). Gasoline prices, thus, provide one indicator of how closely the metropolitan components of the Borderplex economy are integrated with each other.

Gasoline prices in Mexico are set by the Ministry of Finance on a monthly basis that takes into account, among other things, production and distribution costs faced by Pemex (Plante & Jordan, 2013; Ramos, 2014). The price set by Pemex must be the same at all stations throughout the country with the exception of those along the border in northern Mexico. Although a single price is used for the entire region, northern border gasoline prices are lower than those charged in the rest of the country as a means for reducing fuel tourism to the United States. This implies that gasoline prices in El Paso can respond to price changes specifically observed in Ciudad Juarez, but the converse does not hold. Thus, there is no danger of simultaneity arising from any fuel price feedback between the cities.

The economic importance of crude oil and gasoline has fostered a broad range of related literature. Recurring research topics along these lines include price asymmetries (Borenstein, Cameron, & Gilbert, 1997; Galeotti, Lanza, & Manera, 2003; Karrenbrock, 1991), an Edgeworth cycles in gasoline markets (Eckert, 2002; Wang, 2009), and the impacts of regulation and tax incidence on gasoline prices (Bello & Contín-Pilart, 2012; Rietveld & van Woudenberg, 2005). Several studies also analyze the role of consumer behavior and the willingness of consumers to travel in response to cheaper substitutes (Banfi, Filippini, & Hunt, 2005; Manuszak & Moul, 2009). Much of this research uses national or state data, but research at the metropolitan level is scarce. Efforts that examine cross-border interactions tend to compare neighboring countries rather than city pairs.

This article uses monthly data from 2001 to 2013 to analyze average gasoline prices. The development of a structural model for gasoline prices at the city level is complicated by the lack of consumption data (Eckert, 2011). The approach utilized should overcome this problem. A theoretical model and reduced-form equation are developed to analyze price without consumption data. Parameter estimation is utilized to examine the various roles played by the variables incorporated in the analysis in long-run and short-run settings.

This paper proceeds as follows. Section 2 discusses the existing literature on retail gasoline prices. Section 3 discusses the data collected and hypothesized relationships between the explanatory variables and gasoline prices. Section 4 specifies a theoretical model and develops a reduced form equation. An error correction framework for the reduced-form equation is also specified. Section 5 reviews empirical estimation results. Section 6 provides a brief summary of the empirical findings and implications.

2. Literature review

A wide array of literature examines factors that influence gasoline prices. A substantial part of the research focuses on asymmetric price behavior. Pricing asymmetries occur when the lag time required for prices to react to changes in upstream prices is different for a price decrease than for a price increase. In the context of the gasoline industry, several studies document that gasoline prices generally respond more quickly to an increase in the price of crude oil than to a decrease, presumably because retailers attempt to capture larger profit margins as input prices go down (Borenstein et al., 1997; Chen, Finney, & Lai, 2005;Davis, 2007; Deltas, 2008; Grasso & Manera, 2007). Other studies (Angelopoulou & Gibson, 2010; Bachmeier & Griffin, 2003; Douglas, 2010; Galeotti et al., 2003) argue there is little evidence of asymmetrical response to price shocks. Karrenbrock (1991) claims that although there is evidence of price asymmetry in response to wholesale price changes, consumers eventually do benefit from price decreases as fully as they do for increases.

A recently growing related area of research proposes that gasoline prices follow Edgeworth cycles (Doyle, Muehlegger, & Samphantharak, 2010; Eckert, 2002; Noel, 2007; Zimmerman, Yun, & Taylor, 2013). Edgeworth price cycles, as described by Maskin & Tirole (1988), are characterized by a pattern of gradually falling prices followed by rapid hikes. Edgeworth cycles occur when prices oscillate due to the strategic behavior of firms rather than only due to changes in input prices or consumer demand. Competing firms begin by selling a product at a relatively high price, and each firm has an incentive to undercut its competitors by lowering the price. Firms continue to undercut each other during the