



Fuel tourism in Dutch border regions: Are only salient price differentials relevant?

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ABSTRACT

Based on a detailed data set of consumer payments, we find only limited evidence that fluctuations in cross-border fuel price differentials are relevant for Dutch consumers' fuel demand. Consumers living close to the German border did, however, react to a salient increase in Dutch excise fuel duties in January 2014. Even so, the associated increase of fuel tourism was very temporary. Furthermore, there are no robust indications that fuel tourism is relevant for Dutch consumers living further than 10 km from either the border with Belgium or Germany. The absence of fuel tourism may be explained by the low level of cross-border commuting by Dutch workers.

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1. Introduction

This paper finds that the fuel demand of Dutch consumers is fairly inelastic with respect to the variation in cross-border price differences. However, the salience of these price differences, in this paper due to a widely-discussed increase in excise duties, can be important in explaining the incidence of cross-border fuel purchases. This particular increase in excise duties was announced by the Dutch government in September 2013. Per January 2014, the excise duties on LPG and diesel would increase as part of a new tax scheme. The government's intention to raise excise duties was met by a lot of criticism. Many observers claimed that higher excise duties would increase fuel tourism, thus threatening the very existence of gas stations in Dutch border regions.¹

To begin with, those observers that worried about fuel tourism could have pointed to various papers presenting evidence that consumers react to international fuel price differentials.² For instance, Banfi et al.

(2005) estimate that a 10% decrease of the Swiss gasoline price increases demand in border regions by nearly 17.5%. Leal et al. (2009) find that relatively higher prices in Catalonia and Madrid raise the long-term demand for fuel in Aragon. Romero-Jordán et al. (2013) show, in addition, that at borders of locations with high excises, price shocks are not fully passed on to consumers, suggesting that retailers are sensitive to the likelihood of fuel tourism. One contribution of our paper is revisiting this prior evidence on fuel tourism, where the use of micro data on consumer purchases is an important methodological innovation.

Secondly, our paper contributes to the literature on energy taxation. For instance, using the variation in gasoline (and cigarette) taxes in four neighbouring regions in the U.S. allows Manuszak and Moul (2009) to estimate that consumers' willingness to travel an additional mile to buy gasoline is between USD 0.065 and USD 0.084. Tiezzi and Verde (2016) show how an increased gasoline tax can lead to a large long-run reduction in gasoline demand, while Filippini and Heimsch (2016) estimate a long-run price elasticity of fuel demand to CO2 taxes of -0.51 .

As noted, an important feature of our paper is the availability of detailed information on purchases made by a large sample of individual consumers. These transactions cover all days between September 2013 and June 2015. To the best of our knowledge, the only other papers using comparable microdata rather than aggregate series in this context are Tiezzi and Verde (2016), who use the 2007 to 2009 rounds of the U.S. Consumer Expenditure Survey, and Levin et al. (2016), who use city-level data on credit card payments.

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¹ See, for instance, "Pomphouders uit grensstreek stappen naar rechter om accijnsverhoging" Het Financieel Dagblad, 12 July 2014, or "Autobezitters tanken massaal over de grens" De Volkskrant, 8 March 2014.

² Cross-border purchases have been studied more widely, for example in the context of cigarettes and alcohol consumption (Asplund et al., 2007; Chiou and Muehlegger, 2008). Engel and Rogers (1996) is a seminal contribution studying cross-border pricing differentials.

Relative to other studies on fuel tourism, we find surprisingly little evidence that consumers are responsive to cross-border fuel price differences. Firstly, using a range of panel regressions, our baseline estimates indicate that the fuel demand of Dutch car owners living close to the border is fairly inelastic with respect to cross-border price differences computed at the country level. In a second step, we use information on fuel price differentials at the provincial level, but we continue to find virtually no indications for fuel tourism. We also consider evidence based on matching estimators and a regression continuity design, but once again there are no strong suggestions of fuel tourism. Overall, these findings suggest that changes in fuel excise duties have limited effect on fuel demand in Dutch border regions. Possible reasons for the weak evidence for fuel tourism include the low level of commuting from the Netherlands to Germany or Belgium.

At the same time, we do find evidence that during some periods the incidence of fuel tourism increases. In particular, we estimate a strong decline in fuel purchases at Dutch gas stations following a widely debated increase of Dutch fuel excise duties in January 2014. This finding suggests that the salience of the price differential can be an important factor in determining the incidence of fuel tourism.

Even so, we find that the impact of this widely debated price increase was temporary, as the decline in fuel demand is restricted to the quarter in which the higher excise duties were introduced. We rationalise the temporary nature of the increase in fuel tourism by pointing to the fact that most of the public debate did not distinguish between the products for which the higher excise were introduced. In fact, for most consumers the price differential did not increase by much, as these excise increases primarily applied to diesel and LPG, and to a much smaller extent to gasoline. The temporary nature of the decrease in fuel demand suggests a learning process in which consumers realise that price differentials are insufficiently large to make fuel tourism attractive.

The remainder of this paper is organised as follows: **Section 2** discusses background information on fuel price differentials between the Netherlands and its two neighbouring countries: Belgium and Germany. **Section 3** discusses the collection of the detailed transaction data by individual consumers, discusses the fuel price data, offers descriptive statistics, and discusses the econometric methodology. **Section 4** outlines the baseline empirical results based on national fuel price differentials, while **Section 5** presents additional analyses based on provincial price differences, matching estimators, and a regression discontinuity design. **Section 6** offers concluding comments and thoughts on policy implications.

2. Background on Dutch fuel prices and price differentials

As background, we first discuss the relevant features of fuel price formation in the Netherlands, where we also discuss the role of excise duties. Subsequently, we pay attention to the differences with the Belgian and German fuel markets. With respect to the description of fuel price formation in the Netherlands, we heavily rely on [Faber \(2010\)](#) and on information from BOVAG/RAI (2016).

In the Netherlands, there were approximately 4200 gas stations in the period 2013–2015. Oil company SHELL is market leader with a market share of 20%, followed by oil companies BP, Esso (both 10%), Total and Texaco (both 8%). Together these five oil companies have a market share of 56% (BOVAG/RAI based on estimations by Petrolview, 2016). These oil companies announce suggested gasoline prices on a daily basis, which are publically available. The factors determining these suggested prices are the price of crude oil, the exchange rate, the production cost of gasoline, excises, the distribution margin and VAT. In practice, the suggested prices act as a reference price for gas stations. Subsequently, dealer operated gas stations may decide themselves whether to give a discount on the suggested price or not. Price transparency is very high. The (suggested) fuel prices and discounts (if any) are

clearly announced by the gas stations, in the form of signs placed nearby their entrance. Furthermore, there are several websites (e.g. ANWB or United Consumers) that publish each day the suggested fuel prices by the large oil companies or provide information on fuel prices charged by gas stations in a specific residence. In principle, this allows drivers living in the border regions to compare fuel prices in cities at both sides of the border (e.g. www.benzine-prijzen.info). It turns out that gas stations along the highway, which are often owned by the large oil companies, follow the suggested fuel prices quite closely, but gas stations located elsewhere give discounts which they advertise explicitly. Differences in cost structure and higher competition at local roads may explain this. According to [Faber \(2010\)](#) the regime of suggested prices 'has a coordinating effect across brands and within brands'. He also investigates the occurrence of asymmetric pricing by gasoline stations, meaning that prices rise more rapidly after a cost increase than they go down in case of a cost decrease. About 38% of the gas stations price asymmetrically. Characteristics of asymmetrically pricing gas stations turn out not to differ from those of other gas stations. Also distance to the German or Belgian border does not influence gasoline stations price setting. This is an important finding for our study as it indicates that gas stations located nearby the border do not react differently to increases in excise duties than gas stations located further away from the border.

Car fuel markets in Belgium and Germany are to some extent different from the Dutch car fuel market and to some extent the same. In all three countries fuel prices charged by gas stations along the highways are higher than along the local roads. In the Netherlands and Germany oil companies determine the fuel prices along the highways daily respectively several times a day, whereas in Belgium they mirror the maximum prices set weekly by the Belgian government. According to [Ecorys \(2009\)](#) in both Belgium and Germany it is easier for an entrepreneur to enter the local car fuel markets than in the Netherlands. According to [Meerbeek \(2003\)](#) the discounts given by Belgian gas stations within a local market are fairly similar, but between local markets the discounts may differ a lot. As in the Netherlands, price transparency in Belgium is high: car drivers can compare fuel prices of different gas stations on different websites. However, despite the high price transparency, both [Rietveld et al. \(2001\)](#) and [Ecorys \(2009\)](#) conclude that price competition in Belgium is relatively modest due to the maximum fuel prices set by the government. Price competition in the German car fuel market may be higher than in the Netherlands, but it is unclear to what extent car drivers benefit. Price transparency for car drivers is low due to the high search costs for the gas station with the lowest fuel prices ([Ecorys, 2009](#)).

In our baseline analysis, we use information on fuel prices from the Oil Bulletins that are published weekly by the European Commission (EC). The prices listed in these Bulletins refer to prices effective on Monday.³ [Figure 1](#) displays information on the price levels in the Netherlands and its two neighbouring countries (Belgium and Germany) for three fuel types (gasoline, diesel, and LPG). The period is July 2013 to June 2015. During the first year of this period, price

³ We do not have access to daily data from individual gas stations, in contrast to [Faber \(2010\)](#). The reason is straightforward: These data are only available on the day itself, but not retrospectively. Therefore, in the baseline analysis we rely on fuel price information provided by the European Commission. Each week, the EC publishes an Oil Bulletin including average fuel prices for each of the 28 Member States of the EU. The fuel prices refer to consumer prices effective on Monday, distinguishing between prices for gasoline (unleaded), diesel and LPG. The Oil Bulletin provides information on prices including and excluding taxes and excise duties. The Member States are responsible for reporting the required information to the EC. Statistics Netherlands collects price information for the Netherlands based on information from 3800 gas stations out of approximately 4200 gas stations. The German Federal Ministry of Economy and Technology collects price information from international oil companies and independent gas stations for Germany. For each fuel type the market coverage is at least 70 per cent. Belgium has information from different reporting bodies. The prices are collected from a sample of 30 gas stations, which is modified on a weekly basis and covers all types of gas stations (from oil companies, independent operators and large stores).

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