

Algorithmic Pricing and Competition: Evidence from the German Retail Gasoline Market*

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Abstract

According to a German trade publication, mass adoption of algorithmic pricing in Germany’s retail gasoline market started around the summer of 2017. The purpose of this paper is to study how the adoption of algorithmic pricing affected behaviour and outcomes in Germany’s gasoline market. Theoretical work has provided ambiguous and contradictory predictions regarding the impact of algorithmic pricing on competition (see for instance Salcedo (2015), Tadelis and Uwe-Kuhn (2017), Calvano et al. (2019), Miklos-Thal and Tucker (2019), O’Connor and Wilson (2019)). We take advantage of a comprehensive high-frequency database on German retail gasoline prices available from Germany’s Market Transparency Unit for Fuels to empirically study this topic.

In a first step, we investigate whether the adoption of algorithmic pricing can be identified in the data. Algorithmic pricing should generate substantially different pricing strategies by gasoline stations as compared to previous simpler rule-based pricing mechanisms. We perform Quandt Likelihood Ratio tests in order to detect structural breaks in the pricing strategies of gasoline stations throughout our sample period. We test whether there are structural breaks around the supposed period of mass-AI adoption in the time series of (i) the number of price changes, (ii) the time it takes stations to respond to rivals’ price changes and (iii) price variance. We label stations that experience structural breaks in all three measures at the same time “AI adopters.”

In a second step, we investigate the impact of AI adoption on market outcomes. Key outcome measures are (i) price levels and (ii) margins over the price of crude oil. We use a difference-in-differences approach to identify the effects. We look at outcomes at the station level by

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comparing adopter and non-adopter stations before and after adoption takes place. We also look at outcomes at the market level by comparing markets where many/all stations adopted to similar markets where no stations adopted. The adoption decision by individual stations is possibly endogenous and correlated with time-varying station unobservables. We consider instruments for adoption. Adoption timing of stations by the same brand (i.e., Shell, Total) appears to be highly correlated and is likely driven by brand-level rather than station-level considerations. We can therefore use brand-level adoption as an instrument for station-level adoption.