Does Online Search Predict Sales?
Evidence from Big Data for Car Markets in Germany and the UK

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BACKGROUND

- The widespread use of online search engines, most prominently Google, is producing big and fast-growing sets of micro-level data that can be used for empirical research. This type of data is used to forecast and predict a wide range of phenomena including: public health outcomes, consumption, unemployment, real estate and stock market investment, as well as political choices.

- This paper is concerned with the prediction of sales of cars in the UK and Germany. In contrast to most of the existing literature, the paper builds on a model of 'search motives' to anchor the empirical modelling. The model shows that predictions of sales will be biased if they rely on observable search data as a proxy for pre-purchase search. We show how to remove the biases and estimate the effect of pre-purchase search on sales. We exploit the 2008 financial crisis and searches for product brands to achieve this.

METHODOLOGY

- Data from search engines deliver large N and large T panel data at weekly or monthly frequency. This means that researchers have to grapple with seasonality, serial correlation, non-stationarity and possibly co-integration, as well as permanent and correlated shocks that affect different time-series to different extents.

- We address these challenges to estimation and inference by using recent econometric methods for large N and large T panels. The paper also demonstrates that reliance on methods more appropriate for shorter panels, e.g. fixed effects, can be very misleading.

KEY FINDINGS

- We confirm that the biases predicted by the model of search motives are present in the data. Once these are removed and the appropriate estimation methods are used (which have the effect of removing additional biases from correlated shocks and serial correlation), we find that product level search predicts sales with a lag of 4-8 weeks.

- We also show that scrappage subsidies caused significant short-run changes in search and sales, especially in Germany where the level of subsidy was much greater than in the UK. More generally, the effects of changes in pre-sale search on sales appear to be significantly bigger in Germany than in the UK.

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- Short-run prediction of economic, political and other choices from online search data is becoming increasingly popular. This paper demonstrates that search data can provide significant information for this purpose, but that it also requires modelling of search motives and attention to time series properties of the data that are not so important in shorter panel data. Additionally, the paper demonstrates the real and significant effects on demand for cars of short term subsidies for scrappage in 2008 and 2009 in the UK and Germany.

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