Measuring the intensity of competition in aviation markets

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Extended abstract

The impact of low-cost carriers and high speed rail on competition in medium distance transport markets is still an ongoing debate amongst scholars, see e.g., Yang and Zhang (2012), Adler and Liebert (2014), and Jiang and Zhang (2014). The empirical measurement of the intensity of competition is an unexplored territory in this debate. We develop a measure of market competitiveness that takes into account product differentiation. We apply our measure to the high-speed rail and aviation transport market between the UK and the Northwest of the European mainland.

The measurement of (the intensity of) competition is not without problems. Concentration measures, such as the HHI, the Gini-coefficient and market shares of the largest firms, provide easy-to-measure and highly intuitive measures of competitive-
ness. They fail, however, to measure the intensity of competition. This may lead to erroneous results if concentration is the outcome of the competitive process, as is the case for cost or quality differences. Product differentiation complicates the measurement of the intensity of competition. Most measures assume products to be homogeneous, whereas this is rarely the case in reality. Lijesen (2004) adjusts the HHI for imperfect substitutes, but the approach used can only be applied to observable and measurable aspects of product differentiation and requires information on market prices, which is generally hard to obtain for many markets.

We develop a measure that is as intuitive as market concentration measures and has the same level of data requirements. Nonetheless it is more flexible and will pick up the intensity of competition, whether it follows from observed or unobserved aspects of product differentiation, differences in firm’s beliefs or information; costs or quality differences. The indicator can be applied at various levels of aggregation and the interpretation is consistent over time and markets.

Our approach is based on the measurement of the best responses of firms. We model a $n$-firm oligopoly with inverse demand following a quadratic utility function. Our measure of market competitiveness can then be defined as the marginal change in total market output with respect to a marginal change in the output of one of the firms; our measure ranges from 0 (fully competitive) to 1 (no competition).

We test our theoretical framework by analysing flights between the United Kingdom on the one hand and Belgium, France, Germany, The Netherlands, and Switzerland on the other hand. Civil aviation markets provide a great opportunity to illustrate our framework, as capacity decisions reflect strategic choices in a quantity
game. Product differentiation is a common feature of civil aviation, both in terms of branding and product quality and in terms of access to the nodes in the network. Imperfect substitutes are available, in the form of high speed rail, conventional rail or road transport. In fact, any flight between an airport pair can be considered to be an imperfect substitute to a flight between any other airport pair. This raises the question to what (geographical) extent substitution is present. It is straightforward that a flight from London Luton airport to Paris Charles de Gaulle airport competes with a flight from London Heathrow to Paris Orly. But to what extent do these flights compete with a flight from Liverpool to Amsterdam?

Based on monthly airline scheduling data over the years 2004-2010, we estimate a zero truncated negative binomial model with the number of flights supplied per carrier and origin destination as the dependent variable. The explanatory variables are the aggregated, weighted by distance, and differentiated by type of airline supplied number of flights a year earlier. This analysis allows us to apply a geographical boundary on the concept of the relevant market. In a similar manner, we can assess the geographical scope of the High speed rail links to London. Preliminary results show that the responses in number of flights, expressed in semi-elasticities, are in the other of magnitude of about 1 a 2 % for one extra flight a week by a competitor; in particular low cost carriers react strong to the high speed rail; and that in most origin destination markets the intensity of competition is rather limited according to our measure.
Bibliography


