Project summary

Project title: Measuring the effect of cartels on price
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Project description

An increasing number of unlawful cartels have been detected in both Europe and the US in recent years.[1] In antitrust cases, Competition Authorities and courts ultimately want to determine how much higher prices were during cartel periods relative to competitive periods in order to calculate the size of the economic damage inflicted on consumers and/or downstream firms. While private antitrust cases involving damage calculations have also increased in number, claimants are often unsuccessful in such litigations (Renda et al., 2007). The European Commission's Green Paper published in 2005 stated that "…the robust quantification of the caused damage is one of the key barriers to a further promotion of antitrust damage action." (Hüschelrath et al., 2013, p. 98).

The evaluation method most commonly used, both in scientific and legal investigations, is to rely on aggregate field data and estimate a reduced form price equation by regressing the price on cost and demand shifters and a dummy variable that takes the value of one in time periods when the (suspected) cartel was active (e.g. European Commission, 2013). The estimated coefficient associated with the cartel dummy will reveal the difference between competitive prices and cartel prices. Using the formulation proposed by Davis and Garcés (2010, p. 354), the analyst gets a measure of the direct economic damage by multiplying the cartel coefficient with the traded quantity.

While this modelling strategy is simple and intuitive, it ignores theoretical findings that the cartel price does not begin and end with sudden level shifts, but rather that the price path gradually evolves from one equilibrium to the next. Generally, such transitions can occur because of 1) incentive compatibility, i.e. a joint desire to maintain the stability of the cartel, 2) concerns about detection, which may also affect lawful cartels since they might want to keep themselves hidden from industrial buyers, 3) the possibility of the cartelised product being provided by firms that are not cartel members, and 4) uncertainty about stability, driven by, for example, lack of trust among participating firms.[2] More specifically, Harrington (2004a) develops formal theory and shows that profit-maximising cartels raise the price gradually at the beginning of a cartel in order to trade the increasing profit against the increasing likelihood of detection. He shows that the slope of the price series during this transition depends on how patient firms are (the discount rate) and the number of firms. Moreover, after the dissolution of a cartel, Harrington (2004b) shows that the price can gradually move towards the competitive equilibrium when firms are engaged in post-cartel litigations. In this situation, he finds that the (absolute of the) downward slope is negatively correlated with the length of the cartel and the level of industry concentration, i.e. the longer the duration of the cartel and the higher the industry concentration, the slower the return to the competitive price level. Thus, the mechanisms influencing

[1] Statistics for Europe is provided by the European Commission; see http://ec.europa.eu/competition/cartels/statistics/statistics.pdf

[2] See the general cartel literature, e.g. Harrington and Skrzypacz (2011).

the characteristics of the price path during the two transitions are different, which implies that one cannot generally assume that the transitions are symmetric.

The important insight is that if a cartel is subject to gradual transitions and those transitions are ignored then the collusive effect is wrongly and inefficiently estimated. Naturally, this will lead to corresponding problems when calculating the size of the damage effect. One simple empirical approach to reduce these problems is to exclude transition data from the analysis (Harrington, 2004b). However, since the transition end dates are unknown, empiricists would potentially need to exclude several observations with a high probability of also discarding useful information. Since real investigations often suffer from limited access to data, this approach can substantially reduce efficiency, and still one cannot be sure of having excluded all transition observations. A second approach is to impose strong assumptions about the functional form of the transition periods, e.g. that the price path evolves linearly (such an approach is used by Hüschelrath el at., 2013). A third approach is to include the lagged price as an explanatory variable. An example that builds on that principle is Bolotova et al. (2008) who evaluate the citric acid and lysine price cartels. Such dynamic models predict a smooth price path and thus, transitions will be implicitly controlled for. However, there are two problems with dynamic models when applied to cartels with gradual transitions. First, the 'transitions' that are generated reflect the persistence of the entire price series and not the cartel transitions specifically. Second, if there are transitions both at the beginning and the end of the cartel, then the transitions will be symmetrical. As pointed out above, symmetry is generally a strong assumption and, as we show in the paper, that assumption is clearly violated in the empirical case that we investigate. Moreover, linear dynamic models contain no information about timing and duration of the transitions; they only incorporate the persistence of the price process via the autoregressive coefficient.

All these approaches either ignore the transitions or make strong assumptions about their characteristics, which greatly increases the risk that the size of the damage is inaccurately estimated. To remedy this problem, we consider an alternative approach based on Smooth Transition Regression (STR) models, where the transitions are modelled by smooth nonlinear functions. Importantly, the parameter estimates of a STR model provide information about the shape (as a function of time) and the start/end dates of the transitions. A priori, symmetry is not a restriction because each transition is modelled individually. To the best of our knowledge, we are the first to estimate the damage effect, taking the potential transition effects into account without making strong assumptions about the shape or timing of the transitions. Thereby we also provide an explicit way of empirically controlling for the theoretical findings by Harrington (2004a, b)

We apply the STR-model to the stock market price of the international uranium market that was influenced by a price cartel in the 1970s. The methodological approach is particularly well suited for this data since only one cartel episode took place and delayed, gradual transition periods are clearly visible in the data (details provided in Section 2 of our paper). A battery of statistical tests is applied, and strong empirical support in favour of the STR model is found. Our results also show that using the simple dummy-variable approach without transitions leads to a much worse data fit and a damage effect that is 18 times smaller than when we use the STR-model.