Optimal Timing of Cartel Formation Under Uncertainty

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Introduction
Understanding and developing a framework for explaining why and how businesses form cartels is a difficult and challenging endeavor. When studying the optimal decision-making strategies for the antitrust authorities, Connor (2005) analyzed a firm’s decision-making process in forming a cartel or in joining an existing cartel by comparing the expected benefits of cartel formation (EB) to the expected costs related to the formation of the cartel (EC). He indicated a cartel is formed as long as $E(B) > E(C)$. Different methods rely primarily on measuring the future streams of benefits and costs without much regard for higher moments of the distribution. Thus, to the presence of uncertainty about future streams and litigation costs, NVP may miss important dimensions that shape the issue. The difference to form or join a cartel is, at a point, partially irreversible because the firm or its involved managers are exposed to litigation even after the cartel might be dissolved in the future. Because market demand and future profits are uncertain, firms are cautious about the timing of their cartel formation decision. In this paper, we rely on the aforementioned irreversibility of cartel joining and an uncertainty to extend the work by Connor (2005). Specifically, we apply a real-options approach to examine the optimal decision rules regarding the timing of cartel formation leading to policy useful for antitrust agencies.

Methods
In the domestic model, symmetric firms produce a homogenous product and compete with each other in quantity in an infinitely repeated game. The firms have an option to form a cartel and exercise joint monopoly power on the market. The market demand is subject to some stochastic shock at each period which follows a geometric Brownian motion. The threshold demand is a function of several parameters (in Table 1). Comparative dynamics analysis is conducted on these parameters.

<table>
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<tr>
<th>Parameters</th>
<th>Definition</th>
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<tbody>
<tr>
<td>$\alpha$</td>
<td>Expected Demand Growth</td>
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<tr>
<td>$\beta$</td>
<td>Market Size</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>Expected Cartel Duration</td>
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<tr>
<td>$\delta$</td>
<td>Coefficient in the Demand Function</td>
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<tr>
<td>$\epsilon$</td>
<td>Coefficient in the Demand Function</td>
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Figure 1. Range of natural obstacles (x) and the expected cartel duration (t) for possible cartel formation.

Table 1. Parameters Used in Domestic Model Simulation

In the international model, two symmetric firms producing homogenous products in country 1 and country 2 separately. Before the two firms enter each other’s market, there is no international trade, firms face different demand fluctuations in their own countries. If they decide to enter each other’s market, they both operate in the international market facing the same uncertainty. The demand shocks follow geometric Brownian motion, and the stochastic shock on the international market also follows a geometric Brownian motion.

<table>
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<tr>
<td>$\eta$</td>
<td>Natural Obstacle</td>
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<tr>
<td>$\kappa$</td>
<td>Market Size</td>
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Figure 2. Threshold demand as a function of expected demand growth ($x$) and market size ($\kappa$).

Table 1. Parameters Used in International Model Simulation

The expected social welfare under uncertainty is less than that under certainty.

Results

• Cartel formation or operation is never optimal if the discounted expected value of collusion is less than the sunk costs associated with cartel operation or if the threshold of cartel formation is too low for the benefits from collusion to cover the sunk costs (Figure 1).

• The cartel formation is more likely in economic boom periods; Cartel formations delays with a larger expected demand growth and speeds up with a higher discount rate (Figure 2).

• When there is a zero probability of cartel detection, the threshold level of demand associated with optimal timing of cartel formation under uncertainty exceeds the trigger demand level implied by the NVP method. And the difference between these two demand values increases with the market uncertainty.

• The expected social welfare under uncertainty is less than that under certainty.

For further information
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References


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