

Lingering effects in post-cartel pricing

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Introduction

After a cartel ends, its effects on prices may persist, sometimes for an extended period. This phenomenon is sometimes referred to as 'lingering effects' (also 'overhang effects') and may arise for a variety of reasons. First, explicit collusion might facilitate post-cartel tacit collusion. Second, firms may have a strategic incentive to keep post-cartel prices high to reduce the damages they may be liable for. Third, adjustment costs and other frictions may create cartel price persistence after the cartel. For instance, some cartels collude on capacity, and capacity takes time to build. Long-term contracts can also help sustain cartel-like outcomes after the cartel's breakdown.

When lingering effects are relevant, the harm caused by a cartel persists after the cartel's dissolution. This has two key implications. First, there is a risk of underestimating private damages and undercompensating cartel victims. Commonly used empirical approaches that rely on post-cartel prices to quantify damages would tend to underestimate the overcharge. Further, awards of damages arising from lingering effects are still very uncommon: compensation typically covers the 'official' cartel period only. This could further reduce compensation. Second, there is a risk of undermining antitrust deterrence. Antitrust fines are usually calculated on the basis of revenues during the 'official' cartel period. Hence, they do not consider collusive profits arising from lingering effects. This is likely to weaken the deterrent effect of such fines. Moreover, if private damages were understated, this would further weaken deterrence.

To deter cartels more effectively, we believe that antitrust policy should give due consideration to lingering effects. We set out several recommendations to achieve this goal. First, courts should consider biases stemming from lingering effects when scrutinising alternative methods to quantify damages. Second, courts should award damages caused by lingering effects when these have been demonstrated by sound evidence. Third, competition authorities should envisage ways to consider lingering effects when setting fines for cartel infringements. Fourth, competition authorities should enhance their remedy toolkit to mitigate post-cartel tacit collusion.

The rest of the article is organised as follows. First, we review the key evidence on lingering effects. Second, we explore their main sources. Third, we discuss the factors that make lingering effects more likely. Fourth, we explore the implications for antitrust policy and set forth our recommendations. Fifth, we conclude.

Evidence on lingering effects

Lingering effects are not uncommon. Many articles in the literature suggest that a cartel's effects on prices may persist after the cartel ends. Below we review some of the most relevant.

Harrington (2004) looks at the graphite electrodes cartel in the United States, which operated from 1992 to 1997. He finds that two years after the cartel's dissolution, prices were still 20% higher than before the cartel. He suggests that changes in input prices cannot explain this price discrepancy.

Kovacic, Marshall, Marx and Raiff (2007) analyse the international vitamins cartel, which ran from 1990 to 1999. They find that in vitamins markets with one or two firms, prices did not decrease after the two-year post-plea period considered, while in markets with more than two firms they find that pricing returned to pre-conspiracy levels, or lower, quite quickly.

Asker (2010) studies the international maritime shipping of chemicals cartel, which was active from 1998 to 2002. He finds that patterns in shipping data are consistent with cartel distortions persisting during the six-month post-cartel period considered.

Ordóñez de Haro y Torres (2014) assess pricing dynamics in the Spanish food sector after the prosecution of several food associations for engaging in collective price recommendations in 2007. They find that prices for most of the relevant food products remained largely unchanged and above counterfactual levels during the two-year post-intervention period examined.

Khumalo, Mashiane and Roberts (2014) focus on the South African precast concrete products cartel, which began in the 1970s and operated for some 30 years. They find that after explicit collusion arrangements ended in 2007, coordinated outcomes persisted for 12 to 18 months, depending on the provincial geographical market, before competitive pricing was restored.

Notaro (2014) studies the pasta cartel in Italy, which operated from 2006 to 2008. He finds that prices did not revert to pre-cartel levels during the two-year post-cartel period examined, despite input prices largely returning to pre-cartel values.

Turner (2024) analyses the international air cargo cartel, which operated between 1999 and 2006. Cargo airlines cartelised by developing a common

index to set fuel surcharges. He finds that prices remained at collusive levels throughout the six-year post-cartel period examined, even after accounting for changes in jet fuel prices. He also finds that fuel surcharges in the post-cartel period closely followed the surcharge implied by the cartel's agreed index.

Starc and Wollmann (2025) study a cartel in the generic drug industry, the largest price-fixing case in United States history, which operated from 2013 to 2015. Relying on a structural model of the industry, they find that collusive prices persisted during the nearly five-year post-conduct period examined.

In sum, the literature provides ample evidence suggesting that cartel effects may persist in the post-cartel period, sometimes for an extended period. In the next section, we explore the key reasons why this may occur.

What are the sources of lingering effects

Lingering effects may arise for a variety of reasons. First, explicit collusion might facilitate post-cartel tacit collusion (Harrington, 2004). Formal meetings and agreements may enable firms to develop a mutual understanding of each other's conduct, making it easier for them to tacitly collude following the cartel's breakdown. Fonseca and Normann (2012) provide experimental evidence suggesting that prior explicit communication makes firms better at tacitly colluding, giving rise to price persistence (e.g., prices are higher without communication when this is preceded by a phase of communication). Turner (2024) suggests that tacit collusion is a plausible explanation of lingering effects in the international air cargo cartel. Other articles also point to this factor as a likely driver of post-cartel price persistence (see, for instance, Kovacic *et al.*, 2007; Notaro, 2014; Starc and Wollmann, 2025).

Second, firms may have a strategic incentive to keep post-cartel prices high to reduce the damages they may be liable for (Harrington, 2004). Post-cartel prices are often used to estimate 'but-for prices' in damages claims. Hence, by keeping post-cartel prices high, firms raise the estimated 'but-for price'. This results in an underestimation of the overcharge and a reduction in estimated damages. Harrington argues that this incentive would only be relevant during litigation. Once litigation is settled, prices would tend to decrease. Erutku (2012) tests Harrington's model using a retail gasoline cartel in the Canadian province of Quebec and finds empirical support for it.

Third, adjustment costs and other frictions may create cartel price persistence after the cartel. For instance, some cartels collude on capacity, and capacity takes time to build. Fagart and Boshoff (2026) examine the impact of capacity cartels on price dynamics during and after collusion.

Their theoretical model concludes that once the cartel collapses, firms invest gradually to reach a non-collusive equilibrium. As a result, the effects of collusion persist in the post-cartel period. A return to competitive pricing can take time. Long-term contracts that persist after the cartel can also help sustain cartel-like outcomes. Asker (2010) suggests that long-term contracts were a likely cause of lingering effects in the international maritime shipping of chemicals cartel.

When are lingering effects more likely

There are several factors that make lingering effects more likely.

First, the cartel involved 'successful' cooperation. In some cases, cartels are prone to 'cheating', whereas in others, participating firms abide by the agreement and cooperate. In the latter case, post-cartel tacit collusion is more likely, since prior successful cooperation increases the perceived profitability of engaging in collusive strategies after the cartel ends. Chowdhury and Crede (2020) provide experimental evidence supporting this mechanism.

Second, the cartel's primary purpose was to coordinate rather than to monitor. In some cases, explicit collusion may seek both to coordinate prices and monitor adherence to the collusive agreement, while in others, it may primarily aim to coordinate prices. This is because in some settings monitoring can be effectively achieved through other means, like publicly available information. In this context, post-cartel tacit collusion is more likely, as monitoring can take place without explicit communication. Turner (2024) suggests that this mechanism was relevant in the air cargo cartel. Firms formed a cartel to coordinate prices and relied on publicly available firm-level website information on fuel surcharge indexes for monitoring. Once the cartel ended, the fact that firms could monitor each other effectively without explicit communication made post-cartel tacit collusion easier.

Third, the cartel employed a formal coordination method that could survive without explicit communication. In some cases, cartels coordinate in a relatively informal fashion, meeting regularly and agreeing prices on the basis of a range of information, whereas in others, they develop relatively sophisticated pricing rules or mechanisms. Once these are set, they may not require further communication and thus the terms of coordination are more likely to survive post-cartel. As a result, post-cartel tacit collusion becomes easier. Turner (2024) suggests this mechanism was relevant in the air cargo cartel. Firms agreed on a pricing index to pass on changes in fuel charges to fuel surcharges. This pricing mechanism survived the cartel's collapse and likely helped them tacitly collude post-cartel.

Fourth, the cartel operated over an extended period. Long-running cartels facilitate prolonged repeated interaction, which provides greater opportunities for learning and developing a mutual understanding between firms. Further, they enable participants to improve and refine their coordination mechanisms, potentially making them more likely to survive post-cartel. Finally, they may help create pricing inertia in the industry and thus delay the restoration of competitive dynamics post-cartel.

Fifth, the industry exhibits structural factors that tend to facilitate tacit collusion. The literature has explored these factors in depth and identified those that make collusion more likely (see Motta, 2004; Ivaldi, Jullien, Rey, Seabright and Tirole, 2007). Among the most relevant are a small number of competitors, high market shares, relevant barriers to entry and expansion, frequent interaction, market transparency, stability of demand, a low level of innovation, and cost and capacity symmetries. For instance, Kovacic *et al.* (2007) find that following the breakdown of the vitamins cartel, prices remained largely unchanged in relatively concentrated markets, possibly due to tacit collusion, while they declined in less concentrated ones. This is consistent with high market shares (a structural factor facilitating collusion) increasing the likelihood of post-cartel tacit collusion after a period of explicit collusion.

Sixth, the cartelised industry is shaped by factors that may contribute to cartel price persistence post-cartel, such as long-term contracts. As we explain above, these factors facilitate the development of lingering effects, so their presence would make them more likely.

Finally, pre-cartel data are not available to quantify damages. For instance, the cartel may be long-standing, so pre-cartel data may be more difficult to obtain or less complete than more recent post-cartel data. When pre-cartel prices cannot be used for quantification, the incentives to increase post-cartel prices to inflate the 'but-for price' become stronger (Harrington, 2004).

We note that while the above factors increase the likelihood of lingering effects, these effects may remain plausible even absent these factors.

Key policy implications and recommendations

When lingering effects are relevant, the harm caused by a cartel persists after the cartel's dissolution. This has two key implications. First, there is a risk of underestimating private damages and undercompensating cartel victims (Harrington, 2004; Fonseca and Normann, 2012; Chowdhury and Crede, 2020; Turner, 2024; Fagart and Boshoff, 2026). Commonly used empirical approaches that rely on post-cartel prices to quantify damages would tend to underestimate the overcharge. Further, awards of damages

arising from lingering effects are still very uncommon: compensation typically covers the 'official' cartel period only. This could further reduce compensation.

Second, there is a risk of undermining antitrust deterrence (Harrington, 2004; Fonseca and Normann, 2012; Notaro, 2014; Chowdhury and Crede, 2020; Turner, 2024). Antitrust fines are usually calculated on the basis of revenues during the 'official' cartel period (OECD, 2019). Hence, they do not consider collusive profits arising from lingering effects. This is likely to weaken the deterrent effect of such fines. Moreover, if private damages were understated, this would further weaken deterrence.

To deter cartels more effectively, we believe that antitrust policy should give due consideration to lingering effects. Below we set out several recommendations to achieve this goal.

First, courts should consider biases stemming from lingering effects when scrutinising empirical approaches that rely on post-cartel prices to quantify damages. There is precedent for courts attempting to do this in some jurisdictions. For instance, the UK Competition Appeal Tribunal (CAT) considered the possibility of lingering effects when evaluating the use of post-cartel prices to estimate the overcharge in the 'trucks cartel' (*Royal Mail Group Limited v DAF Trucks Limited and Others [2023]*, CAT 6). In the CAT's view, when looking at the 'before and after' analysis, it was sensible to bear in mind that there could have been an "overhang effect" that could lead to an underestimation of the overcharge (paras 352-353). Further, beyond considering the potential biases stemming from post-cartel prices, courts should favour approaches that do not rely on these prices, such as those based on pre-cartel prices and/or yardstick methods, when these approaches can be robustly applied to the case at hand.

Second, courts should award damages caused by lingering effects when these have been demonstrated by sound evidence. There is precedent for courts taking lingering effects into account when awarding damages in some jurisdictions. For instance, the Amsterdam District Court recently considered lingering effects in the 'trucks cartel' (*ECLI:NL:RBAMS:2026:3734*, 15 April 2026). While the European Commission set 18 January 2011 as the 'official' end date of the 'trucks cartel', the court considered that the cartel's effects had 'lingered' until 30 May 2013 (more than two years). It took this post-cartel period into consideration when calculating damages. Despite this and other precedents, awards of damages arising from lingering effects are still uncommon.

Third, competition authorities should envisage ways to consider lingering effects when setting corporate fines for cartel infringements. Lingering effects are likely to reduce the deterrent effect of antitrust fines since fining

methodologies only consider the 'official' cartel period. Part of the literature suggests that corporate antitrust fines may be too low for optimal deterrence (Smuda, 2014), yet this analysis is based on cartel gains over the 'official' cartel period. Hence, lingering effects imply that corporate antitrust fines might be even less deterrent than previously thought and therefore strengthen the case for increasing antitrust fines. We call on competition authorities to explore ways to increase corporate fines for cartel infringements to effectively deter collusion, including by considering lingering effects.

Fourth, competition authorities should enhance their remedy toolkit to mitigate post-cartel tacit collusion. One way would be to impose non-monetary sanctions on individuals, such as director disqualification or imprisonment, when the cartel is prosecuted and fines are imposed. These sanctions are available in only a few jurisdictions. Yet they are essential for deterrence because they help mitigate agency problems that lead to collusion but cannot be tackled through corporate fines (Ginsburg and Wright, 2010; OFT, 2009). They could also help to remedy post-cartel tacit collusion by enabling the removal of the managers who set up the cartel and thereby disrupting the mutual understanding that was built during the cartel. We consider that these types of sanctions should be used effectively across jurisdictions. Another potential remedy to mitigate post-cartel tacit collusion would be 'competitor coupons' (Harrington, 2023). This remedy would require each firm participating in the cartel to offer its past customers a coupon that could only be used to purchase rival firms' products. The coupon issued by a firm would provide its past customers with a discount if they switched to a rival. As a result, firms would be incentivized to undercut the collusive price post-cartel to reduce customer switching and coupon payments. Hence, 'competitor coupons' would make deviation more attractive and post-cartel tacit collusion less stable. We consider that competition authorities should explore the use of these coupons to mitigate post-cartel tacit collusion.

Conclusions

After a cartel ends, its effects on prices may persist, sometimes for an extended period. This phenomenon is sometimes referred to as 'lingering effects' (also 'overhang effects') and may arise for a variety of reasons, including post-cartel tacit collusion, strategic incentives to keep post-cartel prices high and thereby reduce estimated damages, or adjustment costs and other frictions contributing to cartel price persistence after the cartel's collapse.

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risk of underestimating private damages and undercompensating cartel victims. Commonly used empirical approaches that rely on post-cartel prices to quantify damages would tend to underestimate the overcharge. Further, awards of damages arising from lingering effects are still very uncommon: compensation typically covers the 'official' cartel period only. This could further reduce compensation. Second, there is a risk of undermining antitrust deterrence. Antitrust fines are usually calculated on the basis of revenues during the 'official' cartel period. Hence, they do not consider collusive profits arising from lingering effects. This is likely to weaken the deterrent effect of fines. Moreover, if private damages were understated, this would further weaken deterrence.

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