TACKLING ALGORITHMIC COLLUSION WITHOUT REINVENTING THE WHEEL

JAMES H. BOCKING MEMORIAL AWARD ESSAY

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Self-learning pricing algorithms increasingly allow firms to sustain supra-competitive outcomes without explicit communication, exposing weaknesses in competition regimes that rely on finding "agreements" to establish conspiracy. This paper argues that abuse of dominance provisions, rather than traditional cartel or conspiracy rules, offer the most promising path for addressing algorithmically facilitated coordination across U.S., EU, and Canadian law.

The recent RealPage prosecution in the U.S. illustrates these challenges. Rather than solely prosecuting RealPage for collusion, the Department of Justice has alleged that RealPage's revenue-management system uses large pools of sensitive competitor data and machine-learning tools to shape common pricing behaviour across rental markets. The case shows how a single algorithmic intermediary can influence market-wide outcomes when competitors neither communicate nor intend to coordinate, underscoring the difficulty of fitting such conduct into agreement-based notions of cartels.

The analysis concludes that abuse of dominance-based tools provide a more coherent doctrinal framework for algorithmically facilitated coordination. However, the RealPage dispute also demonstrates that current legal standards were not designed for AI-mediated market structures. Ensuring effective oversight will require modernized regulatory frameworks capable of responding to coordination that arises from shared algorithms rather than traditional collusive intent.

Les algorithmes de tarification auto-apprenants permettent de plus en plus aux entreprises de maintenir des résultats supraconcurrentiels sans communication explicite, mettant ainsi en évidence les limites des régimes de concurrence fondés sur la preuve d'un « accord » pour établir l'existence d'une collusion. L'auteur soutient que les dispositions relatives à l'abus de position dominante, plutôt que les règles traditionnelles applicables aux cartels ou au complot, constituent l'outil le plus prometteur pour appréhender la coordination facilitée par des algorithmes en droit américain, européen et canadien.

Les poursuites récentes intentées aux États-Unis contre l'entreprise RealPage illustrent bien ces difficultés. Plutôt que de se limiter à alléguer une collusion de sa part, le département de la Justice soutient que le système de gestion des revenus de RealPage repose sur la collecte et l'agrégation de renseignements sensibles provenant des propriétaires sur le plan concurrentiel afin de générer des recommandations de prix sur les marchés locatifs. L'affaire démontre comment un seul intermédiaire algorithmique peut influer sur les résultats à l'échelle d'un marché, même en l'absence de communication ou d'intention coordonnée de la part des concurrents, ce qui met en lumière la difficulté d'inscrire de tels comportements dans une conception de la collusion fondée sur l'existence d'un accord.

L'auteur conclut que les mécanismes fondés sur l'abus de position dominante offrent un cadre doctrinal plus cohérent pour appréhender la coordination facilitée par des algorithmes. Toutefois, le litige RealPage révèle également que les normes juridiques actuelles n'ont pas été conçues pour des structures de marché médiatisées par l'intelligence artificielle. Assurer une surveillance efficace exigera une modernisation des cadres réglementaires afin de pouvoir répondre à des formes de coordination découlant de l'utilisation d'algorithmes partagés, plutôt que d'une intention collusoire traditionnelle.

I. Introduction

Algorithmic collusion is an issue that is of increasing concern to competition authorities worldwide. Essentially, algorithmic collusion refers to the use of artificial intelligence for coordinating actions among competitors, as algorithms can set prices or analyze market conditions distinctly from humans.[1] Research on algorithmic collusion remains in its nascent stage. However, computational modelling has been used to demonstrate the threat pricing algorithms can pose to competition such that, "in many instances self-learning pricing algorithms lead to collusive outcomes."[2]

Under most modern competition law frameworks, some form of tangible agreement to collude is required to establish collusion.[3] However, self-learning pricing algorithms can ostensibly monitor prices and consequently artificially inflate prices without competitors explicitly agreeing to collude. In this sense, pricing algorithms can result in "supra-competitive equilibria […] by aligning prices instead of competing."[4] As Nazzini notes, algorithms can make collusive schemes more stable and more straightforward to initiate from the outset.[5]

The caselaw in this area is sparse and there are limited doctrinal or jurisprudential sources that deal directly with this issue. However, recently, the United States Department of Justice (DoJ) filed a complaint[6] against RealPage, alleging that through its software, RealPage employs AI to artificially inflate rental prices by allowing

> "[l]andlords, who would otherwise be competing with each other, [to] submit on a daily basis their competitively sensitive information to RealPage. This nonpublic, material, and granular rental data includes, among other information, a landlord's rental prices from executed leases, lease terms, and future occupancy. RealPage collects a broad swath of such data from competing landlords, combines it, and feeds it to an algorithm."[7]

Interestingly, the DoJ's complaint does not rely solely on establishing an illegal information-sharing exchange. Rather, the complaint also argues that RealPage has engaged in monopolistic practices and abused its position of dominance in the market—an offence which engages civil, and not criminal, standards of review.

This paper will determine the extent to which enforcing algorithmic collusion through abuse of dominance provisions as opposed to more traditional—and stricter—cartel-related provisions (which deal explicitly with collusion) might prove more fruitful for competition enforcement agencies, specifically by assessing the merits of the arguments brought forward by the United States DoJ in the RealPage complaint. The paper will also briefly explore comparative issues in the Canadian and European competition law frameworks to assess the relative hypothetical strength of the DoJ's arguments under these regimes.

II. The Problem Contextualized

Due to the potential for pricing algorithms to allow competitors to collude without directly communicating, competition enforcement agencies have begun to test the waters, so to speak, by employing new tools to prosecute this type of conduct. According to modern competition law frameworks across many major competition enforcement jurisdictions, an agreement is necessary to engage cartel provisions in competition law.[8] As such, if firms independently use pricing algorithms to monitor competitor price fluctuations and adjust their prices based on the learnings of the algorithm, they could artificially inflate prices above competitive levels without ever communicating or "forming an agreement" to collude. While it is currently unclear as to whether firms that collude through algorithms would engage cartel-related provisions, many commentators are of the view that such an

outcome is unlikely.[9] Harrington remarks that "even though it is collusion which is harmful, jurisprudence has made the communication that facilitates it illegal"[10] [emphasis added]. Since communication between firms is often absent in the context of an algorithm, there appears to be no judicially enforceable remedy to deal with algorithmic collusion.[11]

A) The Caselaw: an Historical Evolution of the Collusion Doctrine and the Notion of the "Smoke-Filled Room"

Traditionally, economists and lawyers make reference to "smoke-filled rooms" when considering anticompetitive collusion.[12] While the concept originates from the trustbusting era of U.S. antitrust literature as a nod to the wealthy U.S. elite who would smoke their cigars while colluding to partition markets and fix prices, as Flannery notes, "[i]n many markets, a 'smoke-filled room' style of industry-wide communication is challenging if not impossible."[13] This, however, has not stopped major antitrust enforcers from attempts to make communication amongst cartel members more difficult.[14] Unfortunately, this approach has wrought a host of unforeseen consequences. Indeed, the problem with placing so much emphasis on communication—and the actual agreements that result from said communication—has been the unanticipated consequence of communication becoming so integral to the prosecution of cartels, that the law actually shields some collusive behaviour from legal scrutiny where collusion is achieved vis-à-vis means that *do not* require communication. For instance, signalling behaviours, which have been challenged in numerous instances, have often been found not to offend competition legislation. Indeed, in *Atlantic Sugar*[15] the Canadian Supreme Court noted that the posting or signaling of prices was insufficient to render conduct collusive, instead noting that "there must not only be a course of conduct from which acceptance may be inferred, there must also be communication of this offer."[16]

Various other courts have attempted to grappled with this issue. For instance, the Supreme Court of the United States dealt with the issue of tacit (unspoken) collusion in *Theatre Enterprises,*[17] but still reinforced the link between collusion and an *agreement*: "the crucial question is whether [the firms'] conduct […] stemmed from independent decision or from an agreement, tacit or express."[18] Consequently, the Court acknowledges that while the communication may not necessarily be direct—an agreement to collude is still necessary.

In the EU, this concept is understood as a *concerted practice*. Similarly to the Supreme Court of the United States, the Court of Justice of the European

Union has buttressed the need for coordination and cooperation to establish collusion. In *Imperial Chemical,*[19] the Court iterated that a concerted practice "is a form of coordination between undertakings which, without having reached the stage where an agreement properly so called has been concluded, knowingly substitutes practical cooperation between them for the risks of competition."[20] Again here, the requirement of coordination and cooperation does not fully capture an instance where collusion is achieved via uncoordinated means—such as through the widespread use of pricing algorithms.

As noted above, in Canada, the Supreme Court in *Atlantic Sugar* found that tacit collusion can exist as a form of conscious parallelism known as "parallelism by tacit agreement."[21] The Court goes on to express that "[i] n order to make an agreement by tacit acceptance of an offer, there must not only be a course of conduct from which acceptance may be inferred, there must also be communication of this offer."[22] Indeed, according to the current Canadian competition law framework, an agreement—and a certain degree of communication—is necessary to engage the cartel provisions of the *Competition Act.*[23], [24] Therefore, collusive behaviour that is not coordinated, or not explicitly agreed to, would be unlikely to engage the Act. While subsection 45(3) of the Act allows the court to infer the existence of a conspiracy without direct evidence of communication between or among the alleged parties to it, there is still a requirement of proof beyond a reasonable doubt of a "meeting of the minds", which would be absent, presumably, in the independent adoption of the same pricing algorithm by many firms in an industry.

Consequently, the independent adoption of pricing algorithms by many firms in an industry, it would seem, may fly under this jurisprudential radar in all three jurisdictions.

B) Pricing Algorithms for Dummies

In 2017, Margrethe Vestager, then Commissioner of Competition for the European Union, made the following remarks at a conference in Germany, "[i]t's true that the idea of automated systems getting together and reaching a meeting of minds is still science fiction. [...] But we do need to keep a close eye on how algorithms are developing [...] so that when science fiction becomes reality, we're ready to deal with it."[25]

One might wonder if she knew just how close we were to 'science fiction becoming a reality' back in 2017. According to Timo Klein, professor in competition law and economics at Utrecht University, prices are increasingly set

by algorithms, and it is entirely possible for self-learning pricing algorithms to work out by themselves how to ensure high prices.[26] As has been noted above, but is reiterated by Klein, "[s]uch an outcome would be the same as in a price cartel, but without any overt act of communication or agreement required to establish a competition law infringement."[27]

In arriving at this conclusion, Professor Klein investigates the collusive capacity of reinforcement learning, or Q-learning, which he describes as "a foundational reinforcement learning algorithm upon which many of the recent breakthroughs in artificial intelligence are based."[28] Essentially, self-learning pricing algorithms, through reinforcement learning, are programmed to iteratively understand what the long-term repercussions are of taking certain discreet decisions, by tracking the consequences of specific actions they take in the short-term.[29] As they learn, they balance both the continued need to *explore* new options, so as to have an even stronger understanding of the repercussions of the discrete decisions they make, and *exploiting* their already developed understanding, to optimize the reward they are designed to achieve or maximize.[30]

Professor Klein, in running a series of simulations where self-learning pricing algorithms competed against one another, found that these algorithms often coordinate at collusive equilibria.[31] He notes that the algorithms start by learning that there is a short-term benefit to slightly undercutting a competitor's price—which leads to a gradual decline in prices.[32] However, as they continue exploring new actions, they recognize the long-term benefit of what Prof. Klein describes as "resetting" the price vis-à-vis a large increase in price once the gradual and persistent price undercuts have made the price too low.[33] In this respect, the competing algorithms will "often identify a stable high price as mutually optimal, with the gradual price decline functioning as temporary off-equilibrium punishment."[34] Then, as the number of discrete prices set by the algorithm increases—and thus, the greater the amount of data the algorithms have at their disposal to learn and extrapolate from—it becomes apparent that the pricing algorithms will "converg[e] to a stable supra-competitive Edgeworth price cycling pattern (in which periodic price jumps reset a gradual price decline)."[35] According to Klein, this cycling pattern is akin to pricing patterns observed in markets where tacit collusion is occurring; and these algorithm-learned patterns ultimately push average prices above their economically competitive level.[36] Therefore, despite the fact that the algorithms cannot communicate, they are able to collaborate based solely on the instruction that they should maximize their own profits, such that prices are artificially inflated above their competitive levels.[37] In

reinforcing his study, Klein demonstrates that his results stand even in the face of "reasonable changes to the [algorithms'] learning parameters."[38]

Essentially, pricing algorithms can compile a significant amount of data with respect to the consequences of discrete actions they take, and then use that "big data", in addition to reactionary competitor pricing information they collect, so that they coalesce at a price that is higher than the competitive price. What's more, they achieve all of this without communicating, such that this conduct is not captured as collusive under the law. Consequently, pricing algorithms can lead to anticompetitive harm and outcomes that could normally only be reached through collusion, but without engaging the legal requirements necessary to prosecute collusion.

Where pricing algorithms are used by multiple industry players, the anticompetitive harm can be compounded, especially in industries where competitors' prices are not observable. Where, as in the RealPage case, the same algorithm is widely adopted, and use of the algorithm requires each user to provide real-time information on actual prices (and other competitively sensitive information) to the algorithm, the anticompetitive harm *is* compounded. As a result of gathering and using non-public, real-time information about competitors' prices and sensitive business data, the algorithm achieves what individual market participants—absent information from their competitors—cannot, whether they use pen and paper, or a computerized pricing algorithm.

C) The Reluctance to Prosecute Against Algorithmic Collusion

Given the complicated nature of policing pricing algorithms under competition legislation, it should not come as a surprise that there is a woefully small number of cases where such conduct has been subject to judicial scrutiny.

i) The Jurisprudential History of Prosecuting Algorithmic Collusion

In the United States, a plea agreement was registered in 2015 in the case of *United States v. Topkins*[39]. *Topkins* represents the DoJ's first cartel prosecution involving algorithms.[40] However, the conspirators in *Topkins* pled guilty, depriving the court of the chance to render a formal judgment related to algorithmic collusion. That said, much can be gleaned from the plea agreement. In *Topkins*, the conspirators were alleged to have agreed to sell posters on Amazon for third-party sellers, and utilized pricing algorithms to coordinate prices.[41] The plea agreement explicitly acknowledged

that the conspirators "agreed to adopt specific pricing algorithms for the sale of the agreed-upon posters with the goal of coordinating changes to their respective prices."[42] Thus, while *Topkins* is interesting in demonstrating that algorithmic collusion is possible—and that enforcement agencies are prepared to prosecute this conduct—it is unfortunately of little use for the purposes of this paper, as, in *Topkins*, there was a formal agreement between the competitors on using specific pricing algorithms, and therefore the conduct would be captured as collusive under existing caselaw in both the United States and Canada. There have unfortunately not been any judicial decisions in the United States thus far where the conduct that was challenged involved collusion via autonomous pricing algorithms in the absence of an explicit agreement.

Before the advent of AI, some prosecution efforts attempted to deal with the issue of complex signaling between competitors vis-à-vis computerized online booking platforms. For instance, in the late twentieth century, the United States DoJ investigated a number of airline companies for allegedly using a common reservation platform and complex signaling through the posting of upcoming prices in a computerized booking system to collude. According to the DoJ's Antitrust Division,

> "over 50 separate price fixing agreements covering hundreds of routes [were identified]. By supplying or withdrawing changes in fares, the airlines told each other what fares they wanted to charge in which markets, what competitors' fares were acceptable to them, and what deals they were willing to make".[43]

To this effect, the Assistant Attorney General of the DoJ's Antitrust Division noted that the airlines used their fare dissemination system to engage in communications that were as direct and detailed as those historically conducted by conspirators via telephone or in private meetings; and while the means of communication were novel, the underlying conduct constituted straightforward price-fixing.[44] Ultimately, however, the matter settled, and thus did not result in a decision. The settlement allowed the airlines to continue to use their fare dissemination system, while eliminating "the information exchange features that let the airlines negotiate prices with each other".[45] While this case does not specifically raise the issue of algorithmic collusion, as no algorithms were involved, it highlights the possibility of prosecuting conduct surrounding the sharing of information via intermediary or "facilitating" networks. While in the present case the intermediary facilitating the collusive pricing was a computerized common booking system, there is nothing preventing a similar case from being raised with

respect to collusion based on competitive information exchanged via facilitating pricing algorithms.

A similar story has played out in Europe. Some cases have been brought forward, but all of them have involved simple pricing algorithms that are only used to enforce agreements to collude between competitors.[46] For instance, the UK Competition and Markets Authority launched an investigation into Trod Ltd. and GB Eye Ltd., a case which also involved parties trading on Amazon who agreed not to undercut each other and used automated pricing algorithms to monitor and adjust their prices to ensure they complied with their agreement.[47] In this case, the Competition and Markets Authority fined Trod £163,371.[48] However, this case is also not particularly novel, as here too the presence of the agreement renders the conduct collusive, irrespective of the use of the algorithm to implement the agreement. The European Commission has similarly investigated and fined *Asus*[49] and *Philips*[50] who used pricing algorithms to monitor compliance with an illegal retail price maintenance policy.[51] In the Canadian context, no cases explicitly involving algorithmic collusion have been presented before the courts.

Until recently, there seems to have been a reluctance on the part of competition enforcement agencies to bring these kinds of claims forward. This is likely due in part to the fact that they are concerned the conduct will not engage the respective competition legislations. It might also be related to the fact that algorithmic collusion is difficult to prove absent an agreement, given that one would still have to prove—under the criminal standard of beyond a reasonable doubt—that the conspirators intended to undermine competition through coordinated behaviour with others.

Suffice it to say, the DoJ's complaint in the RealPage matter is quite novel insofar as it is the first time algorithmic collusion is being prosecuted in its own right and in the absence of an explicit agreement. This, in turn, makes the litigation strategy the DoJ has employed in this case all the more worthy of detailed examination.

ii) Types of Algorithmic Collusion

It is also worth noting, for the purposes of this paper, that there are various types of algorithmic collusion. Some are more likely to offend competition legislation, while for others the potential to lessen competition is less obvious.

The *Topkins*, *Trod Ltd.*, *Asus*, and *Philips* cases are representative of a first type of algorithmic collusion, whereby an algorithm simply facilitates

the implementation of, or monitors compliance with, an illegal price-fixing policy. These types of algorithmic collusion schemes obviously offend competition laws, given they are used to maintain an illegal *agreement*.

A second type of algorithmic collusion occurs where a lessening of competition occurs spontaneously and with no human intent as machines form their own "agreement". These are the types of algorithmic collusion schemes discussed by Professor Timo Klein. As Klein notes, in these instances of algorithmic collusion, self-learning pricing algorithms compete against one another and often coordinate at collusive equilibria.[52] This type of algorithmic collusion becomes difficult to prosecute for the reasons noted above: chiefly, that there is no formal agreement or explicit communication between firms bearing witness to this as a desired outcome.

Another form of algorithmic collusion may occur at the intersection of these two types of algorithmic collusion. In such an instance, there may be no clear indication of an agreement or an intention to raise prices, but nonetheless the algorithm becomes widespread in an industry, and its ubiquitous adoption causes prices to rise. Here, the algorithm acts as a facilitating practice for a coordinated outcome. Again, this type of algorithmic collusion is difficult to prosecute in the absence of an explicit agreement.

The RealPage pricing algorithm seems to lie somewhere in this middle-ground by facilitating an industry-wide increase in prices vis-à-vis its use of competitive information and ubiquitous adoption by landlords in setting prices. Moreover, this outcome is achieved in the absence of a clear indication of an agreement between the individual landlords (i.e. competitors).

It is likely for this reason that the DoJ has opted, in addition to making the case against RealPage under two counts of conspiracy, to also make out the case against RealPage under abuse of dominance. In this sense, the DoJ alleges that RealPage has used anticompetitive coordination among customers as a means to achieve dominance and exclude rivals. In light of the DoJ's arguments, this paper seeks to explore the potential for more widespread use of abuse of dominance provisions to address this conduct, in case criminal enforcement proves elusive.

III. The RealPage Matter: a Blueprint for the Enforcement of Algorithmic Collusion?

A) A Brief Overview of the Complaint

RealPage operates in the real-estate industry globally and offers services that assist landlords in listing rental properties, among other things. These services are primarily offered through RealPage's "Revenue Management Software." The software, as described by the DoJ, uses competitively sensitive information provided to RealPage by landlords, combines it, and then runs it through an algorithm.[53] This information is "nonpublic, material, and granular rental data [that includes] among other information, a landlord's rental prices from executed leases, lease terms, and future occupancy."[54] The algorithm then spits out "daily, near real-time pricing 'recommendations' back to competing landlords":[55] recommendations that are directly attributable to sensitive information that RealPage's algorithm has processed from their competitors.[56]

The DoJ alleges that these recommendations are issued with the motivation of subverting competition. To this effect, the DoJ notes that RealPage monitors whether landlords have complied with their *recommendations*, and, in many cases, landlords "effectively agree to outsource their pricing function to RealPage with auto acceptance or other settings such that RealPage as a middleman, and not the free market, determines the price that a renter will pay."[57] RealPage has described the utility of its algorithm with the slogan "a rising tide raises all ships."[58] Through utilizing competitively sensitive information via its pricing algorithm, RealPage "eliminates the guessing game for landlords" so they might maximize rents.[59]

The DoJ has emphasized in its complaint that RealPage "has built a business out of frustrating the natural forces of competition."[60] Indeed, according to the DoJ, "RealPage replaces competition with coordination. It substitutes unity for rivalry. It subverts competition and the competitive process. It does so openly and directly—and American renters are left paying the price."[61]

Relying on communiqués and information RealPage has provided to landlords who use its software, the DoJ has highlighted that RealPage's messaging and strategy is inherently anticompetitive:

> "In its own words, RealPage '**helps curb [landlords'] instincts to respond to down-market conditions by either dramatically lowering price** or by holding price when they are losing velocity and/or occupancy … **Our**

> **tool [] ensures that [landlords] are driving every possible opportunity to increase price even in the most downward trending or unexpected conditions**' (emphases added)."[62]

Moreover, RealPage has described the utility of its software as a means of "avoid[ing] the race to the bottom in down markets" for landlords, that the software is aimed at "driving every possible opportunity to increase price", and that for landlords, "there is a greater good in everybody succeeding versus essentially trying to compete against one another in a way that actually keeps the entire industry down."[63] In this regard, the DoJ alleges that through RealPage's algorithm, landlords coordinate prices to ensure that rents stay above naturally competitive levels. Indeed, RealPage's algorithm is specifically designed to "nudg[e] other competing landlords to increase their rents" when it receives information from competitor landlords that they have increased their price:[64] coordinating prices above competitive levels. Indeed, in its complaint, the DoJ highlighted multiple instances of landlords understanding the impact of sharing their data through RealPage's algorithm:

> "a revenue management director at Landlord 1 testified that she understood that Landlord 1, and other competing landlords who used [RealPage's algorithm], agreed with RealPage to share their data, which was combined in a single data pool for use by [the algorithm]. An executive at Landlord 2 noted the advantages to using [the algorithm] at a property if others in the property's submarket—the small geographic area around the property—also used [RealPage's algorithm] because "the shared data between the models at different communities can be a benefit in getting accurate transactional data on a timely basis."[65]

Not only is this a blatant distortion of competition, but as the DoJ notes, it also reifies the dominant position RealPage has in the market—a position that is protected from genuine competition because of the significant data advantage it has over its competitors "due to its massive reservoir of ill-gotten competitively sensitive information from competing landlords. No other revenue management company can match RealPage's access to landlords' nonpublic, competitively sensitive rental data."[66] In this sense, RealPage has itself acknowledged that it controls at least 80% of the commercial revenue management software market, and that it "does not have any true competitors, mainly because [its] data is based on real lease transaction data."[67]

Essentially, the DoJ submits that "RealPage is an algorithmic intermediary that collects, combines, and exploits landlords' competitively sensitive

information. And in so doing, it enriches itself and compliant landlords at the expense of renters who pay inflated prices and honest businesses that would otherwise compete."[68]

The DoJ's complaint advances four alleged violations of U.S. competition law for which they seek relief.

First, the DoJ alleges that RealPage has violated section 1 of the *Sherman Act*,[69] which renders illegal "[e]very contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations",[70] by unlawfully sharing information for use in competitors' pricing.[71] Here, the DoJ asserts that all of the landlords using RealPage's software are essentially agreeing with Realpage to pool competitively sensitive information to train the algorithm so it is best able to generate supra competitive-level price recommendations.[72]

Second, and in line with its first request for relief, the DoJ asserts that RealPage has further violated section 1 of the *Sherman Act* by establishing vertical agreements amongst landlords to align pricing.[73] Here, the DoJ asserts that landlords understand the price-fixing nature of RealPage's software, and alleges that this is the reason landlords opt to sign up for and pay for RealPage's services.[74] They further contend that the agreement by a landlord to use RealPage's software is a "[tacit] agreement to align users' pricing processes, strategies, and pricing responses."[75]

The first and second claims advanced by the DoJ form the basis of a classic hub-and-spoke conspiracy claim. In its most basic form, an information sharing hub-and-spoke conspiracy involves entities that engage in the sharing of sensitive information through a third party, who is generally not directly in competition with the other entities.[76] The cartelization is then achieved via independent agreements between each spoke (in this case, each landlord) and a singular hub (here, RealPage). While the spokes are not directly colluding with each other, they indirectly form a cartel through the sharing and pooling of competitively sensitive information with the hub, who then coordinates the implementation of artificially inflated and anticompetitive fixed prices[77] (here, through RealPage's algorithm's price "recommendations").

Third, the DoJ submits that RealPage has violated section 2 of the *Sherman Act* through the monopolization of the commercial revenue management software market.[78] Section 2 of the *Sherman Act* establishes that "[e]very person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the

trade or commerce among the several States, or with foreign nations, shall be deemed guilty of a felony."[79] Here, the DoJ asserts that RealPage has established monopoly power in the market for real-estate commercial revenue management software, and that it has illegally achieved this monopoly power through "unlawful exclusionary conduct."[80] Namely, by amassing a "massive reservoir of competitively sensitive data from competing landlords" to ensure "rivals cannot compete on the merits unless they enter into similar agreements with landlords, offer to share competitively sensitive information among rival landlords, and engage in actions to increase compliance."[81]

Finally, and in the alternative to their third claim, the DoJ posits that RealPage has violated section 2 of the *Sherman Act* for *attempting* to monopolize the commercial revenue management software market.[82] Here, the DoJ asserts (and warns) that "RealPage has acted with a specific intent to monopolize, and to eliminate effective competition", and, that "[t]here is a dangerous probability that, unless restrained, RealPage will succeed in monopolizing the commercial revenue management software market in violation of Section 2 of the Sherman Act."[83]

Ultimately, the DoJ is alleging that RealPage has constructed an unlawful scheme to decrease competition among landlords in rent pricing, and to subsequently monopolize the market for commercial revenue management software that landlords use to price apartments vis-à-vis its pricing algorithm, in contravention of both section 1 and section 2 of the *Sherman Act*.

In response to the DoJ's complaint, RealPage has denied all of the allegations.[84] RealPage asserts that its software "simply helps landlords make data-driven decisions in a competitive market" by reflecting market conditions and optimizing occupancy rates.[85] RealPage has even gone so far as to assert its software ultimately benefits renters "by ensuring the long-term viability of rental properties."[86]

Moreover, in August 2025, the DoJ entered into a proposed consent decree with Greystar, a large U.S.-based residential property manager, related to its use of RealPage's software.[87] The decree requires Greystar to: refrain from using any anticompetitive algorithm that generates pricing recommendations using its competitors' competitively sensitive data or that incorporates certain anticompetitive features; refrain from sharing competitively sensitive information with competitors; accept a court-appointed monitor if it uses a third-party pricing algorithm that is not certified pursuant to the terms of the consent decree; refrain from attending or participating in

RealPage-hosted meetings of competing landlords; and cooperate with the United States' monopolization claims against RealPage.[88] This recent development further highlights the merits of the DoJ's arguments.

B) The Merits of the DoJ's Arguments

There are essentially two prongs to the DoJ's litigation strategy. The first prong of its arguments seeks to assert that RealPage's algorithm is inherently conspiratorial insofar as it facilitates an informational hub-and-spoke conspiracy. The second prong of its arguments seeks to recognize RealPage's conduct of collecting competitively sensitive data and then mining it to provide price recommendations as monopolistic. The DoJ then attempts to demonstrate that RealPage is abusing its monopolistic position of dominance in the market.

i) Conspiracy Arguments

As is noted by Professor Benjamin Klein, professor of law and economics at UCLA, American jurisprudence has established that proving a hub-and-spoke conspiracy is critically dependent on the existence of horizontal agreements between the spokes.[89] He then describes these agreements as "the 'rim' that connects the spokes."[90] According to Klein, American courts will often reject claims of *per se* hub-and-spoke conspiracies where there is insufficient evidence "that the spokes agreed among themselves to comply with the hub's contract demands."[91] Consequently, in the context of the RealPage matter, for such a claim to be successful, the DoJ would have to demonstrate that these types of horizontal rim agreements exist between the landlords—not just between the individual landlords and RealPage.

Given the DoJ's complaint includes some statements from landlords acknowledging they were alive to how their data would be used by RealPage, it may be possible to support the argument that there were agreements between the individual landlords. However, these agreements, if they are even found to be agreements, would be tacit agreements, which have often been insufficient to establish collusion.[92] Indeed, the DoJ seems to imply in its arguments that there is a tacit agreement between the landlords (the spokes). In their second claim for relief, the DoJ posits that landlords recognize that by using RealPage's software they are engaging in price-fixing, and that their decision to send competitively sensitive data to RealPage and use RealPage's software is a tacit agreement amongst themselves to align their pricing via RealPage (the hub).

Moreover, the DoJ's argument that tacit agreements exist between the landlords insufficiently contends with the "rim agreements" issue present in hub-and-spoke conspiracy claims. Indeed, as is noted by Klein, parallel acceptance of hub contract terms alone is not sufficient to prove that a horizontal agreement exists between the spokes.[93] Klein goes on to assert that this is particularly true in cases where the hub benefits from market power—such as in this case. The reason is relatively straightforward: where the hub has market power, it is easier for the hub to enforce the vertical contract between itself and each individual spoke, absent any horizontal agreements between the landlords.[94] This is because the sanction—or threat—the hub can impose is sufficient to "obtain universal spoke compliance."[95] In this case, such an assertion seems to ring true: the sanction of depriving a landlord from accessing RealPage's algorithm is likely sufficient, in and of itself, to achieve compliance from each landlord. In other words, due to the market power of RealPage, and the massive amount of data it has, landlords would be harmed by losing access to RealPage. The landlords are therefore not reliant on horizontal agreements between themselves to facilitate RealPage's algorithm, as the algorithm is already well-developed.

As is noted by Klein, this phenomenon

> "vividly illustrates a counterintuitive result of hub-and-spoke analysis: the greater the market power of the hub, and therefore the more likely the vertical contract would fail […], the less likely a *per se* hub-and-spoke claim will succeed. **Because a hub with market power is more likely to have the ability to impose a sufficient sanction to obtain unilateral universal compliance, it is less likely that unambiguous evidence of an agreement among the spokes will exist**" [emphasis added].[96]

Indeed, in the RealPage matter the DoJ has thus far failed to provide unambiguous evidence of landlords communicating or agreeing between themselves.

Without this explicit agreement or communication, it remains to be seen whether the DoJ's conspiracy arguments will be successful. A pessimistic view is buttressed by the series of cases in which U.S. courts have found *per se* allegations of hub-and-spoke conspiracies insufficient without evidence of agreements between the spokes. Moreover, given RealPage's market power, the phenomenon described by Klein is most certainly at play in this case, further undermining the potential success of the DoJ's hub-and-spoke conspiracy claims.

Here again, we are faced with the problem presented by algorithms in the context of the prosecution of conspiracy: the lack of communication and tangible agreements that are characteristic of the use of algorithms could allow for conduct that is *prima facie* anticompetitive to fly under the legal radar.

That being said, in the *RealPage* case, the DoJ also brought forward a second prong of arguments related to monopolistic practices and abuse of dominance that may be more meritorious.

ii) Abuse of Dominance Arguments

Along with its conspiracy claims, the DoJ is challenging RealPage's alleged monopolization of the market for commercial revenue management software, and its subsequent abuse of its dominance in this market—which, according to the DoJ, has barred other firms from entering and competing in the market.

In the complaint, the DoJ highlights that RealPage's alleged monopoly power stems from its ability to unlawfully exclude competitors through the sheer amount of competitively sensitive data in its possession. By leveraging this data, RealPage excludes competitors, as "rivals cannot compete on the merits unless they enter into similar [anticompetitive] agreements with landlords."[97]

Of course, these arguments are also bolstered by the fact that RealPage does in fact benefit from a very high market concentration. Indeed, RealPage's internal documents indicate it has an 80% market share, which is exceptionally high.[98] Moreover, as the DoJ notes, the monopolistic conduct of RealPage creates a "self-reinforcing feedback loop of data and scale advantages."[99] In this sense, by sharing and compiling competitively sensitive information and then allowing landlords to benefit from this compiled and coordinated information, RealPage attracts more rival landlords, which then extends the amount of competitively sensitive information it has, which improves the quality of its algorithm, which further exacerbates the chasm between itself and its competitors, which in turn excludes more rivals, and so on. "Over time, RealPage has become more entrenched and has stymied alternatives unless they too enter into similar unlawful agreements with landlords to obtain and use nonpublic transactional data to price units. Even then, RealPage's unparalleled troves of competitively sensitive data provide an ill-gotten advantage", so says the DoJ.[100]

This chasm between RealPage's data and its competitors' data is the cornerstone of its monopoly power. RealPage has explicitly stated as much, often highlighting its "unmatched database" to clients.[101] A database filled with competitively sensitive information it has used "to develop an AI-driven revenue management solution that leverages the scale and scope of its data."[102] As this chasm grows through the self-reinforcing feedback loop of RealPage's business model, it will become exceedingly more difficult for other revenue management software to compete. To this specific point, the DoJ highlights an incident of a RealPage executive stating "[RealPage's] revenue management solution does not have any true competitors, mainly because our data is based on real lease transaction data from all kinds of third-party property management systems."[103] Another RealPage executive, when discussing a potential new entrant to the market, specifically highlighted the significant hurdles that exist for new entrants to procure the data necessary to achieve results as sophisticated as RealPage's software.[104]

Given all of this, the RealPage matter most certainly seems to fit the bill for a strong monopolistic practices/abuse of dominance claim. Indeed, in addition to the markedly high 80% market share RealPage benefits from, its business model inherently seems to bar new entrants and reinforces its position of dominance by widening the sophistication gap between its software and that of any potential competitors.

IV. Abuse of Dominance: an Appropriate Path Forward?

A) The Caselaw: How is Abuse of Dominance Established?

In U.S. antitrust law, monopoly power is regulated by section 2 of the *Sherman Act* and is broadly understood as the power or ability to control prices or exclude competitors.[105] However, the simple exercise or possession of monopoly power is not automatically illegal. In this sense, American competition law only prohibits anticompetitive conduct that has as its objective either the acquisition or maintenance of monopoly power.[106] This is often considered from the lens of whether the conduct used to achieve or maintain monopoly power is *predatory* or *exclusionary*.[107]

For the purposes of prosecuting abuse of dominance, American courts require that the anticompetitive conduct and the monopoly power be proven; then a causal connection must be demonstrated between the conduct and the creation or maintenance of monopoly power.[108] In this respect, American courts have held that this causal connection can be proven where "a defendant has engaged in anticompetitive conduct that 'reasonably appear[s] capable of making a significant contribution to […]

maintaining monopoly power.'"[109] Consequently, an algorithm that is used to maintain monopoly power—and exclude competitors from the market—would appear to engage section 2 of the *Sherman Act*.

In EU competition law, article 102 of the *Treaty on the Functioning of Europe*[110] broadly prohibits "[a]ny abuse by one or more undertakings of a dominant position within the internal market."[111] The Court of Justice of the European Union has subsequently articulated dominance as "a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by giving it the power to behave to an appreciable extent independently of its competitors, customers and ultimately of its consumers."[112] Under EU competition law, market shares are often used to provide an initial assessment of an undertaking's potential market power or dominance.[113] Moreover, in Europe, much like in the U.S., the mere fact an undertaking holds or acquires a dominant position in a market is not automatically a violation of European competition law; a dominant company only infringes article 102 if it takes advantage of (i.e., abuses) its dominant position *to restrict competition*.[114] To establish this is the case, the Commission must demonstrate that the undertaking's conduct prevented or created barriers to competition, as per the *Microsoft CJEU* case[115], that the conduct has resulted in anticompetitive effects[116], that the anticompetitive effects were reasonably likely to result from the conduct[117], and that the anticompetitive effects reinforce market power.[118]

Interestingly, at paragraph 1061 of the *Microsoft CJEU* judgment, the Court of Justice contends with the notion of a "positive feedback loop" as an indicia of abusive behaviour. The Court then borrows from the Commission's definition—which was itself borrowed from Bill Gates' testimony—that a positive feedback loop "describes the phenomenon where, the greater the number of users of a given software platform, the more there will be invested in developing products compatible with that platform, which, in turn reinforces the popularity of that platform with users."[119] This phenomenon is eerily reminiscent of the DoJ's complaint concerning the anticompetitive effects of RealPage's algorithm. It therefore seems likely that RealPage's conduct would sufficiently engage article 102 TFEU.

Finally, under Canadian competition law, abuse of dominance is regulated by section 79 of the *Competition Act*, which was recently amended to have its scope increased.[120] Section 79 of the Act "requires an assessment of whether 'one or more persons substantially or completely control, throughout Canada or any area thereof, a class or species of business.' In other

words, this first element of the Act's abuse of dominance provision requires a finding of 'dominance'."[121] According to the Bureau, a substantial degree of market power is necessary to establish whether a firm substantially or completely controls a market.[122] To this effect, the Supreme Court of Canada has held that market power consists of "the ability to 'profitably influence price, quality, variety, service, advertising, innovation or other dimensions of competition'."[123] In qualifying market power, Canadian courts will often rely on a combination of high market shares and assessing whether a firm's conduct results in significant barriers to entry.[124] This approach is quite similar to both the U.S. and European regimes. In Canada, however, the Competition Tribunal has gone so far as to say that a market share of over 50% indicates *prima facie* market power, and that in such circumstances, market power will be presumed dominant barring "compelling evidence of easy entry into the [market]."[125] Once there is a finding of dominance, abuse of dominance is established if the firm "engages in a practice of anticompetitive acts" that is intended to have predatory, exclusionary, or disciplinary effects, or to have an adverse effect on competition.[126] In this sense, "abuse" can result from intended predatory, exclusionary or disciplinary conduct, but also from conduct that is intended to adversely effect competition.

Recent amendments to the *Competition Act* empower the Competition Tribunal to make a prohibition order against a dominant firm (or group of firms) if their conduct meets either the anticompetitive intent or effect requirement. According to the Competition Bureau, "[t]his will provide a way of stopping dominant firm conduct that has either subverted competition in the marketplace or was intended to do so."[127] Where all three elements are established, a broader range of remedies is available to the Tribunal, including administrative monetary penalties and disgorgement of profits.[128] In this sense, the Tribunal can declare conduct as abusive and prohibit its continuation without having to find an anticompetitive effect. It is only if the Tribunal wishes to impose an administrative monetary penalty, or other penalty contemplated by the Act, that it must also be established that there is an anticompetitive effect to the conduct. This lower standard for acquiring a prohibition order brought on by restructuring the legal test for abuse of dominance in the recent amendments to the Act could precisely capture the type of conduct contemplated in the RealPage matter. Under the Canadian regime, RealPage would be presumed dominant, and would likely be found to have engaged in abusive behaviour through its intended exclusion of competitors from the market vis-à-vis its algorithm.

B) The RealPage Matter: an Appropriate Case Study for Abuse of Dominance via Algorithmic Collusion

Based on the legal tests required to establish abuse of dominance canvassed above, I believe that the RealPage matter is an appropriate case for prosecuting algorithmic collusion through the abuse of dominance provisions. Indeed, RealPage's conduct is very likely captured by section 2 of the *Sherman Act* in the U.S. (and would also likely be captured by article 102 TFEU in the EU, and section 79 of the *Competition Act* in Canada).

With respect to the question of dominance, it almost goes without saying that RealPage is dominant in its market. First, RealPage has admitted as much, acknowledging its software "does not have any true competitors."[129] Second, its market concentration is exceptionally high. In Canada, for instance, such a high market concentration would result in a presumption that RealPage is dominant, barring compelling evidence the market is easy to enter. In the case at bar, the evidence indicates quite the opposite.

Moreover, RealPage's conduct is assuredly exclusionary such that it can be qualified as abusive. Indeed, RealPage's algorithm is designed to unlawfully create barriers to entry through the leveraging of its "unparalleled troves of competitively sensitive data [that] provide an ill-gotten advantage."[130] As is noted by the DoJ, RealPage's leveraging of this competitively sensitive information has then stymied the entrance of competitors to the market, such that, unless competitors enter into the same kinds of "unlawful agreements with landlords to obtain and use nonpublic transactional data to price units" as RealPage, they have no genuine chance of market entry.[131] And, even if they do enter the market, the head start RealPage has in the form of its "troves" of data has created an almost insurmountable chasm between RealPage, as the dominant firm in the market, and any new entrants. This chasm is then reified by what the DoJ qualifies as RealPage's algorithm's "self-reinforcing feedback loop of data and scale advantages."[132]

Learning from the European jurisprudence, RealPage's self-reinforcing feedback loop can be seen as an *indicia* of an abuse of dominance.[133] The Court of Justice in *Microsoft CJEU* specifically noted that abuse of dominance provisions are "intended to prohibit a dominant undertaking from strengthening its position by recourse to means other than those based on competition on the merits."[134] Therefore, it has been accepted in European jurisprudence that this type of self-reinforcing conduct from dominant firms can result in anticompetitive conduct. Such a conception is not at odds with the American abuse of dominance regime as well. Indeed, a

self-reinforcing algorithm could fall within the framework established by the American *Microsoft* case, whereby a defendant—here, RealPage—"has engaged in anticompetitive conduct that 'reasonably appear[s] capable of making a significant contribution to … maintaining monopoly power'."[135] This, however, is not meant to suggest that the mere existence of network effects is itself an abuse of dominance, as network effects are a feature of a market and not necessarily a choice of a market participant. In this sense, it would be difficult to qualify the mere existence of a network effect as abusive without causation (i.e. whether the challenged conduct excluded competitors). In the case of RealPage the challenged conduct is self-reinforcing in that it benefits from widespread use (i.e., network effects), while also lessening competition among landlords. Thus, the only way for an entrant to challenge RealPage's dominance is to do something similar to what RealPage is doing. It is this causal link between the network effects and the lessening of competition that can constitute the abuse here.

In the present case, a strong doctrinal argument based in the evidence could be put forward—and has been in the DoJ's complaint—that the algorithmic model employed by RealPage is an abuse of RealPage's dominance in the commercial revenue management software market.

However, it bears noting that recourse vis-à-vis abuse of dominance is only possible in this case because of the overwhelming monopolistic power RealPage benefits from, both in terms of its market concentration and in terms of its comparative data advantage over competitors.

C) Abuse of Dominance Provisions are Not a One-Size-Fits-All Solution

Abuse of dominance, by definition, requires dominance. While this seems obvious, it bears emphasis because it is for this precise reason that abuse of dominance provisions cannot be a one-size-fits-all solution for tackling algorithmic collusion. In the RealPage matter, the DoJ's abuse of dominance claim is strong. However, the same could likely not be said for claims against similar conduct in less concentrated markets. Indeed, bringing forward an abuse of dominance claim will necessarily be a less successful strategy when the firm being prosecuted has less market power.

This, however, poses a significant enforcement paradox. If an enforcement agency has to wait until a firm is dominant, and the firm in question achieves dominance through the implementation of collusive conduct that causes it to attract customers with profits from ill-gotten gains that other law-abiding companies cannot offer, then we are rewarding cartel

behaviour and policing it after the train has left the station. Competition law enforcement agencies should not have to wait for cartels to become dominant—and subsequently cause damage to customers for the years required to become so—before challenging them.

As noted by Professor Chapdelaine at the University of Windsor Faculty of Law, a focus on abuse of dominance with respect to algorithmic pricing "necessarily narrows the analysis to larger suppliers," despite the fact that "large segments of e-commerce suppliers involve small to medium suppliers."[136] To this effect, Chapdelaine observes that abuse of dominance provisions might work where algorithmic pricing is employed by firms that benefit from significant market power.[137] However, "[t]o the extent that [algorithmic pricing] may occur in (imperfectly) competitive markets as well, [there is] a huge gap that the current regulation of macro-market anti-competitive practices does not address."[138] Indeed, this gets back to the fundamental problem resulting from algorithmic pricing and its subsequent potential for conspiracy: that this particular type of conduct is not squarely captured by competition provisions dealing with conspiracy, despite the fact that conspiracy provisions are the competition law provisions where algorithmic collusion would most comfortably fit, from a prosecutorial perspective. This is indeed, to borrow Professor Chapdelaine's words, a huge gap in the legislation.

Therefore, moving forward, in instances where abuse of dominance claims cannot be so easily relied on in the presence of algorithmic collusion, enforcement agencies may need to advocate for regulatory reform to ensure that these forms of collusion can be captured by competition legislation.

Of course, regulatory reform in this respect is not without its challenges. An outright ex ante prohibition making pricing algorithms illegal would prove difficult as pricing algorithms are ubiquitous and have been for some time. Similarly, an approach like "make those pricing algorithms that cause prices to be supracompetitive illegal" would require a fundamental reworking of Canadian competition law as it is essentially asking the Competition Bureau to implement what European competition law calls "excessive pricing," which fundamentally changes how prices are formed in market economies. While paragraph 78(1)(k) of the *Competition Act* now makes it an anticompetitive act under the abuse of dominance provisions to "directly or indirectly impos[e] excessive and unfair selling prices", the Commissioner has confirmed that he does not intend for the Bureau to become a price regulator, and that the Bureau reads paragraph 78(1)(k) of the Act in connection with the beginning of section 78—in this sense, he

notes, "that excessive and unfair pricing would be an anticompetitive act only when it is intended to have a predatory, exclusionary or disciplinary negative effect on a competitor or to have an adverse effect on competition. It is very circumscribed."[139]

Moreover, any potential amendments would need to keep in mind the risk of "false positives"—that is finding an infringement of competition law where no anticompetitive harm exists. Indeed, suppose an aggressive enforcement policy condemns the use of pricing algorithms by 100 firms. And also suppose that without that enforcement policy only one of the 100 would cause a lessening of competition, and there may be significant benefits in the form of increased output from 50 of those firms, it is far from clear that such a policy is the right one.

D) Recent Canadian Developments: Section 90.1 of the *Competition Act*

Along with many other recent amendments to the *Competition Act* in Canada comes the newly revamped section 90.1, which came into force on December 15, 2024. Prior to the amendments, section 90.1 of the Act addressed collaborations between competitors; that is, agreements or arrangements between actual or potential rivals that had the effect, or were likely to have the effect, of substantially lessening or preventing competition in a market. This provision empowered the Competition Bureau to examine collaborative agreements between competing businesses, including joint ventures and strategic alliances, to ensure that such otherwise lawful arrangements did not adversely affect competition. Moreover, before the amendments, the only remedies available to the Tribunal were prohibitive or prescriptive orders. As such, no administrative monetary penalties were previously available.

Following the amendments, section 90.1 of the Act not only contemplates anticompetitive agreements between competitors, but also anticompetitive agreements between non-competitors, where "a significant purpose of the agreement or arrangement, or any part of it, is to prevent or lessen competition in any market."[140] Furthermore, the Tribunal may now issue administrative monetary penalties not exceeding the greater of $10 million (or $15 million for subsequent offences) and "three times the value of the benefit derived from the agreement or arrangement, or, if that amount cannot be reasonably determined, 3% of the person's annual worldwide gross revenues."[141]

The amended s. 90.1 has yet to be tested before the courts. However, a few preliminary remarks can be made. Firstly, this provision seems as though it could capture conduct akin to RealPage's. Because of the broad application of the new s. 90.1, that is, its application to agreements (whether horizontal or vertical) that have an anticompetitive effect, there would no longer be a need to show a conspiracy among the spokes. All that would have to be established is that RealPage's agreements with its customers are causing a lessening of competition in rental markets. Once this is established, that would be sufficient to engage an order by the Tribunal.

A second observation, however, is that the provision is still rooted in an *agreement*. Consequently, while the provision is helpful in mitigating harm caused by agreements between non-competitors, as would likely be the case in a situation akin to the DoJ's complaint in RealPage, it still cannot get at a lessening of competition in the absence of an agreement. Consequently, where algorithms collude in the way Professor Timo Klein contemplates in his study—that is, where a lessening of competition occurs spontaneously and with no human intent—it is less clear to what extent s. 90.1 of the Act is applicable. Indeed, if Canadian courts continue to read communication into the term "agreement", as the Supreme Court did in *Atlantic Sugar*, collusive behaviour that is not explicitly coordinated or agreed to would still be unlikely to engage the Act.

Finally, it should be noted that s. 90.1 is a civil enforcement provision, not a criminal enforcement provision like many of the cartel-related provisions in the Act. Consequently, despite the potential fines the Tribunal is able to impose being relatively significant, they will not necessarily have the same deterring effect criminal sanctions might. Indeed, according to Wils, effective deterrence with only fines requires impossibly high fines; and based on his findings, the minimum level of fines required to completely deter price cartels is 150% of annual turnover.[142] Given the maximum fine contemplated by s. 90.1 of the Act is 3% of annual worldwide turnover, we are a long way from achieving complete deterrence.

V. Where Do We Go From Here?

A) Technology Moves Faster Than the Law

A general undercurrent to this nascent field of research is that technology often advances at a pace faster than the law. This phenomenon is understood as the "pacing problem."[143] Essentially, a consensus in the law and technology literature "recognizes that legal institutions' capacity to react to innovative technologies is diminishing because innovation driven by

science and technology is accelerating while [governmental] agencies' regulatory processes have slowed down."[144] Moreover, regulatory challenges can stem from "trial-and-error rule-making," attempts to find ways to regulate innovative technologies with existing regulatory frameworks, and considerations for "future contingencies in rulemaking" to ensure that when regulations are eventually enacted, that they do not become obsolete shortly thereafter.[145]

The law and technology literature proposes several remedies to this problem. For instance, *principles-based regulation*, which stresses "general and abstract guiding principles for desired regulatory outcomes," as opposed to more rigid rules.[146] This approach allows for greater adaptability in light of changing industry practices.[147] Other recommendations include temporary legislation with sunset clauses, built-in periodic parliamentary reviews of legislation, and enhanced powers to specialized courts and specialized administrative decision-makers.[148]

Through some of these proposed remedies it might be possible to reconceptualize collusion through regulatory reform.

B) Paths Forward: Reconceptualizing Collusion Through Regulatory Reform

While in some cases, abuse of dominance may be an acceptable and effective tool in tackling algorithmic collusion—it is not a one-size-fits-all solution, and there will certainly be cases where it cannot be used to curb anticompetitive algorithmic conduct. Indeed, in cases where a firm utilizing an algorithm is not dominant, or not specifically using the algorithm to restrict competition, abuse of dominance provisions are unlikely to apply. In such instances, it may not be possible to prosecute algorithmic collusion without regulatory reform.

While recent legislative amendments may prove fruitful at curbing and prosecuting certain instances of algorithmic collusion, such as the recent amendments to s. 90.1 of the *Competition Act* in Canada, they still do not appear capable of completely addressing all forms of algorithmic collusion. Indeed, potentially recognizing this, the Competition Bureau recently released a short paper and call for information on algorithmic pricing. Consequently, it appears the Bureau—and Canadian regulators more broadly—are beginning to turn their minds to this issue. As they do, they should ensure they assess the impact focussing on "communication" or a "formal agreement" will have on their ability (or potential lack thereof) to prosecute algorithmic collusion. To this effect, they may wish to make more

explicit provisions within the Act that specifically contemplate this type of collusion.

Indeed, courts cannot read the minds of individuals, that is why they have focused on making communication, or the "agreement" between firms, illegal.[149] However, Harrington posits that courts can in fact "read the mind" of an algorithm.[150] Consequently, he proposes updating competition frameworks to account for the use of algorithms and big-data by incorporating forms of conscious parallelism that rely on pricing algorithms into the cartel-related provisions of competition regimes.[151] To this effect, competition laws could make collusion via autonomous artificial intelligence illegal as a substitute for an agreement or communication. Alternatively, the judiciary might be persuaded to reconceptualize the jurisprudential test for collusion specifically in the context of pricing algorithms as an acknowledgement of the legislative gap that currently exists in this respect. There are indeed paths forward for reconceptualizing collusion, they may just require judicial or legislative buy-in.

VI. Conclusion

The RealPage matter highlights that competition frameworks are in fact capable of dealing with algorithmic collusion in certain contexts. For example, where the use of the algorithm facilitates the monopolization of a market and the subsequent abuse of that monopoly power to exclude competitors. However, many contexts remain in which algorithmic collusion may not be adequately captured by modern competition laws. In order to combat the anticompetitive practices algorithms can employ, competition enforcement agencies will need to either find creative ways to apply their existing competition laws to these new practices, or advocate for regulatory reform. Sometimes, the most effective solution is in fact reinventing the wheel.

ENDNOTES

[*] This paper was written as the author's master's research project at the University of Toronto and was completed during the 2024–2025 academic year. The views and opinions expressed in the paper reflect entirely the views of the author and are in no way indicative of the views of any of the author's previous or current employers.

[1] Renato Nazzini & James Henderson, "Overcoming the Current Knowledge Gap of Algorithmic 'Collusion' and the Role of Computational Antitrust" (2024) 4:1 Stanford Computation Antitrust 1 at 3 [Nazzini].

[2] *Ibid* at 1.

[3] Joseph Harrington, "Developing Competition Law for Collusion by Autonomous Artificial Agents" (2019) 14:3 J of Competition L & Econs 331 at 349 [Harrington].

[4] Nazzini, *supra* note 1 at 3.

[5] *Ibid*.

[6] *United States v RealPage Inc*, 1:24-cv-00710 (US Dist Ct MD NC 2024) (Complaint) [*Complaint*].

[7] *Ibid* at para 5.

[8] Harrington, *supra* note 3 at 349.

[9] *Ibid*.

[10] *Ibid*.

[11] *Ibid*.

[12] Timothy Flannery et al, "Is the 'smoke-filled room' necessary? An experimental study of the effect of communication networks on collusion" (2023) 89:4 Southern Econ J 1056 at 1056.

[13] *Ibid* at 1057.

[14] *Ibid*.

[15] *Atlantic Sugar Refineries Co Ltd et al v Attorney General of Canada*, [1980] 2 SCR 644 [*Atlantic Sugar*].

[16] *Ibid* at 657.

[17] *Theatre Enterprises v Paramount Film Distributing Corp*, 346 US 537 (1954).

[18] *Ibid* at 540.

[19] *Imperial Chemical Industries Ltd v Commission*, C-48/69, [1972] ECR 619.

[20] *Ibid* at 655.

[21] *Atlantic Sugar*, *supra* note 15 at 656.

[22] *Ibid* at 657.

[23] *Competition Act*, RSC 1985, c C-34.

[24] Canada, Competition Bureau, *Big data and innovation: key themes for competition policy in Canada* (Ottawa: Competition Bureau, 2018) at 9.

[25] Timo Klein, "Autonomous algorithmic collusion: Q-learning under sequential pricing" (2021) 52:3 RAND J of Econs 538 at 538.

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[27] *Ibid* at 539.

[28] *Ibid*.

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[31] *Ibid* at 540.
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[33] *Ibid*.
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[36] *Ibid*.
[37] *Ibid*.
[38] *Ibid*.
[39] *United States v Topkins*, 3:15-cr-00201-WHO (US Dist Ct ND Cal 2015) (Plea Agreement) [*Topkins*].
[40] Salil K Mehra, "*US v. Topkins*: can price fixing be based on algorithms?" (2016) 7:7 J of European Competition L & Practice 470 at 470.
[41] *Ibid* at 471–72.
[42] *Ibid* at 472.
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[44] *Ibid*.
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[46] Melanie Martin & Nazli Cansin Karga, "Managing the competition law risks of AI" (17 Novemeber 2023), online: *Dentons*.
[47] *Ibid*.
[48] *Re Online sales of posters and frames,* (2015), Case 50223 (Competition and Markets Authority) at 6.46.
[49] *Commission Decision of July 24, 2018 relating to a proceeding under Article 101 of the Treaty on the Functioning of the European Union*, Case AT.40465, [2018] (*Asus (vertical restraints)*), OJ (C 338).
[50] C*ommission Decision of July 24, 2018 relating to a proceeding under Article 101 of the Treaty on the functioning of the European Union*, Case AT.40181, [2018] (*Philips (vertical restraints)*), OJ (C 340).
[51] Christian Bergqvist & Camila Ringeling, "Finding the Ghost in the Shell: EU and US Antitrust Enforcement of AI Collusion" in *Artificial Intelligence and Competition Policy* (Paris: Concurrences, 2024) at 151.
[52] Klein, *supra* note 25 at 540.
[53] *Complaint*, *supra* note 6 at para 5.
[54] *Ibid*.
[55] *Ibid* at para 6.
[56] *Ibid*.
[57] *Ibid*.
[58] *Ibid*
[59] *Ibid*.
[60] *Ibid* at para 1.
[61] *Ibid* at para 3.

[62] *Ibid* at para 1.
[63] *Ibid* at para 7.
[64] *Ibid* at para 9.
[65] *Ibid* at para 19.
[66] *Ibid* at para 11.
[67] *Ibid*.
[68] *Ibid* at para 12.
[69] *Sherman Act*, 15 USC (1890) [*Sherman Act*].
[70] *Ibid* at § 1.
[71] *Complaint*, *supra* note 6 at paras 224–34.
[72] *Ibid* at para 225.
[73] *Ibid* at paras 235–43.
[74] *Ibid* at paras 237–38.
[75] *Ibid* at para 241.
[76] Ansruta Debnath, "Solving the Enigma of Hub-And-Spoke Cartels-Applicability and Enforcement" (2024) 3:1 The Competition and Commercial L Rev 1 at 3.
[77] *Ibid*.
[78] *Complaint*, *supra* note 6 at paras 244–48.
[79] *Sherman Act*, *supra* note 69 at § 2.
[80] *Complaint*, *supra* note 6 at para 246.
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[83] *Ibid* at para 253.
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[92] See *Theatre Enterprises, supra* note 17; See also *Atlantic Sugar, supra* note 15.
[93] *Ibid* at 164.
[94] *Ibid* at 130.
[95] *Ibid*.

[96] *Ibid* at 164.
[97] *Complaint*, *supra* note 6 at para 246.
[98] *Ibid* at para 154.
[99] *Ibid* at para 155.
[100] *Ibid* at para 156.
[101] *Ibid* at para 162.
[102] *Ibid* at para 163.
[103] *Ibid* at para 166.
[104] *Ibid* at para 167.
[105] Kenneth Reinker & Lisa Danzig, "United States" in Patrick Bock & Kenneth Reinker, *Dominance Guide 2020* (London: Meridian House, 2020) 244 at 244.
[106] *Ibid* at 245.
[107] *Ibid*.
[108] *Ibid* at 246.
[109] *United States v Microsoft Corp*, 253 F3d 34 (DC Cir 2001) at 79 [*Microsoft*].
[110] *Treaty on the Functioning of the European Union*, 7 June 2016, OJ, C 202/150 at art 102 [TFEU].
[111] *Ibid*.
[112] *United Brands v Commission*, C-27/76, [1978], ECR-207 at para 65.
[113] Patrick Bock & Henry Mostyn, "European Union" in Patrick Bock & Kenneth Reinker, *Dominance Guide 2020* (London: Meridian House, 2020) 85 at 85.
[114] *Ibid* at 86.
[115] *Microsoft v Commission*, T-201/04, [2007], ECR II-03601 at paras 1089–90 [*Microsoft CJEU*].
[116] *Post Danmark A/S v Konkurrencerådet*, C-23/14, [2015], ECLI:EU:C:2015:651 at paras 71–73.
[117] *Microsoft CJEU*, *supra* note 115 at para 1089.
[118] Bock, *supra* note 113 at 87.
[119] *Microsoft CJEU*, *supra* note 115 at para 1061.
[120] *Competition Act*, *supra* note 23 at s. 79.
[121] Canada, Competition Bureau, *Abuse of Dominance Enforcement Guidelines* (Ottawa: Competition Bureau, 2024) at para 1 [Enforcement Guidelines].
[122] *Ibid* at para 23.
[123] *Tervita Corp v Canada (Commissioner of Competition)*, 2015 SCC 3 at para 44, citing *Canada (Commissioner of Competition) v Canadian Waste Services Holdings Inc*, 2001 Comp Trib 3 at para 7.
[124] Enforcement Guidelines, *supra* note 121 at para 29.
[125] *Canada* (*Director of Investigation and Research) v Laidlaw Waste Systems Ltd* (1992), 40 CPR (3d) 289.
[126] Enforcement Guidelines, *supra* note 121 at paras 51-59.
[127] Canada, Competition Bureau, *Guide to the December 2023 amendments to the Competition Act* (Ottawa: Competition Bureau, 2023) at para 15.
[128] *Ibid* at para 16.
[129] *Complaint*, *supra* note 6 at para 166.
[130] *Ibid* at para 156.

[131] *Ibid*.
[132] *Ibid* at para 155.
[133] *Microsoft CJEU*, *supra* note 113 at paras 1061–70.
[134] *Ibid* at para 1070, citing *Deutsche Bahn v Commission*, T-229/94, [1997], ECR II-01689 at para 78.
[135] *Microsoft*, *supra* note 109 at 79.
[136] Pascale Chapdelaine, "Algorithmic Personalized Pricing: A Personal Data Protection and Consumer Law Perspective" (2024) 102:1 Can Bar Rev 1 at 8.
[137] *Ibid*.
[138] *Ibid* at 8–9.
[139] "Bill C-56, An Act to amend the Excise Tax Act and the Competition Act", 3rd reading, *Debates of the Senate*, Standing Committee on National Finance, *Evidence*, 44-1, No 88 (13 December 2023) at 88:27 (Matthew Boswell).
[140] *Competition Act*, *supra* note 23 at s. 90.1(1.01).
[141] *Ibid* at s. 90.1(1.3).
[142] Wouter Wils, "Is criminalization of EU competition law the answer?" (2006) 1:2006 Concurrences 1 at 11.
[143] Wulf A Kaal, "Dynamic Regulation for Innovation" in Springer, *Perspectives in Law, Business & Innovation* (New York: Springer, 2016) 1 at 5.
[144] *Ibid*.
[145] *Ibid* at 6.
[146] *Ibid* at 13.
[147] *Ibid*.
[148] *Ibid* at 14.
[149] Harrington, *supra* note 3 at 360.
[150] *Ibid*.
[151] *Ibid*.