THE CANADIAN BAR ASSOCIATION
L'ASSOCIATION DU BARREAU CANADIEN

Vol. 29 | 2016 | N° 1

CANADIAN COMPETITION LAW REVIEW

REVUE CANADIENNE DU DROIT DE LA CONCURRENCE

CALL FOR PAPERS

The *Canadian Competition Law Review* (formerly the *Canadian Competition Record*) is published twice a year by the Canadian Bar Association National Competition Law Section. The Can Comp L Rev welcomes submissions of original articles, case comments, book reviews, and essays on significant current issues of competition law and economics in French or English. Submissions are subjected to an editorial review process and are peer-reviewed by selected scholars and practitioners before acceptance for publication. Submissions are only accepted electronically at the following address: cancomplrev@cba.org. Please contact us by email at the same address for more information on our publishing procedures and policies.

DEMANDE DE COMMUNICATIONS

La *Revue canadienne du droit de la concurrence* (anciennement le Canadian Competition Record) est publiée deux fois par an par la Section nationale du droit de la concurrence de l'Association du Barreau canadien. La *Revue* accepte les articles, commentaires d'arrêts, comptes rendus critiques de livres, et essais originaux en français et en anglais sur des développements significatifs et actuels en matière de droit et économie de la concurrence. Les textes soumis seront examinés par le comité de rédaction et par un comité de lecture composé d'universitaires et d'avocats en pratique privée avant d'être sélectionnés pour publication. Les textes sont uniquement acceptés en format électronique à l'adresse suivante : cancomplrev@cba.org. Veuillez communiquer avec nous à la même adresse pour en savoir davantage sur nos politiques de publication.

EDITORIAL BOARD / COMITÉ DE RÉDACTION

ABOUT THE CANADIAN COMPETITION LAW REVIEW

Material published in the Can Comp L Rev does not express the views or the position of the Canadian Bar Association and the National Competition Law Section, or of the organization to which the authors belong. The Can Comp L Rev is distributed regularly to members of the Canadian Bar Association National Competition Law Section. To obtain further information on subscriptions, please contact cancomplrev@cba.org or visit us on the web: http://www.cba.org/Publications-Resources/CBA-Journals/Canadian-Competition-Law-Review.

À PROPOS DE LA REVUE CANADIENNE DU DROIT DE LA CONCURRENCE

Les textes publiés dans la *Revue* ne représentent pas l'opinion ou la position de l'Association du Barreau canadien, de la Section nationale du droit de la concurrence, ou de l'organisation dont fait partie l'auteur. La *Revue* est distribuée régulièrement aux membres de la Section nationale du droit de la concurrence de l'Association du Barreau canadien. Pour plus de détails sur nos abonnements, veuillez nous contacter à l'adresse suivante : cancomplrev@cba.org ou visitez notre site web http://www.cba.org/Publications-Resources/CBA-Journals/Canadian-Competition-Law-Review?lang=fr-CA.

ANNOUNCEMENT

Congratulations to the winners of the

2016 WILLIAM (BILL) MILLER MEMORIAL AWARD

RALPH A. WINTER

"*TERVITA* AND THE EFFICIENCY DEFENCE IN CANADIAN MERGER LAW"

and

PIERRE-CHRISTIAN COLLINS HOFFMAN & GUY PINSONNAULT

"THE PURPOSE, NATURE AND CONSTITUTIONALITY OF THE PRESUMPTIONS OF SECTION 69 OF THE *COMPETITION ACT*"

About the Award

This Award was generously created by the CBA Competition Law Section in honour of Bill Miller, former General Counsel of the Competition Bureau Legal Services division of the Department of Justice, who passed away suddenly in 2013. Up to two awards of $1,250 each are given annually to the authors of the best contributions to the *Canadian Competition Law Review* during the previous calendar year.

ANNONCE

Félicitations au gagnants du

PRIX COMMÉMORATIF WILLIAM (BILL) MILLER 2016

RALPH A. WINTER

« *TERVITA* AND THE EFFICIENCY DEFENCE IN CANADIAN MERGER LAW »

et

PIERRE-CHRISTIAN COLLINS HOFFMAN & GUY PINSONNAULT

« L'OBJECTIF, LA NATURE ET LA CONSTITUTIONNALITÉ DES PRÉSOMPTIONS DE L'ARTICLE 69 DE LA LOI SUR LA CONCURRENCE »

À propos du prix

Ce prix a été créé, grâce à la générosité de la Section du droit de la concurrence de l'ABC, pour rendre hommage à Bill Miller, ancien avocat général des Services juridiques du Bureau de la concurrence au ministère de la Justice, qui est décédé subitement en 2013. Un ou deux prix d'une valeur de 1 250 $ chacun sont remis annuellement aux auteurs des meilleurs articles publiés dans la *Revue canadienne du droit de la concurrence* au cours de l'année civile précédente.

TABLE OF CONTENTS / TABLE DES MATIÈRES

2015 JAMES H. BOCKING MEMORIAL AWARD WINNER
LAURÉAT DU PRIX COMMÉNTORATIF JAMES H. BOCKING 2015

ARTICLES

ISSN 1929-6851 (Online) / ISSN 1929-6843 (Print)

THE CANADIAN
BAR ASSOCIATION

L'ASSOCIATION DU
BARREAU CANADIEN

ARTICLES

VISA-MASTERCARD AND THE IDENTIFICATION OF COLLUSIVE PRACTICES IN TWO-SIDED MARKETS

Duy D Pham[1]
Federal Trade Commission, Washington, DC

In the last couple of decades, several new businesses have come to dominate the high-tech sector, such as Google and Amazon. Pioneering research by French economists Jean-Charles Rochet and Jean Tirole has identified these businesses as two-sided markets or platforms. Two-sided platforms are novel because they require a business to bring on board two sets of customers so that they can engage in mutually beneficial interactions. The more users there are on the platform the more indirect network effects that are generated. Nevertheless, two-sided platforms are complex and this complexity makes it difficult to determine when their practices are anticompetitive and when they are procompetitive. A recent case that tries to grapple with the complex issues presented by two-sided platforms is the Competition Tribunal's decision in Commissioner of Competition v Visa-MasterCard (Visa-MasterCard)*. The decision addresses allegedly collusive practices engaged in by credit card networks. These networks are two-sided platforms where banks, merchants and credit cardholders interact. The purpose of this Paper is to provide guidance on how to properly identify collusive practices in two-sided markets. First, the Paper provides an overview of the economics of two-sided markets. Second, it analyzes the* Visa-MasterCard *decision to demonstrate the errors that should be avoided when trying to differentiate procompetitive from anticompetitive behaviour in two-sided markets. Third, it analyzes the U.S. Department of Justice's Apple e-books case to provide a fuller picture of collusive practices in two-sided markets. Lastly, it lays out plausible collusive theories of harm.*

Au cours des vingt dernières années, plusieurs nouvelles entreprises comme Google et Amazon ont assis leur domination sur le secteur de la haute technologie. Des recherches novatrices menées par les économistes français Jean-Charles Rochet et Jean Tirole ont déterminé que ces entreprises constituaient des cas de marchés ou de plates-formes bifaces. Concept récent, les plates-formes bifaces obligent les entreprises à attirer deux catégories de clients qui interagissent de manière mutuellement bénéfique. Plus la plate-forme compte de clients, plus d'effets de réseau indirects apparaissent. Toutefois, la complexité des plates-formes bifaces fait qu'il est difficile de déterminer quand leurs pratiques sont anticoncurrentielles et quand elles sont bénéfiques pour la concurrence. Récemment, le jugement du Tribunal de la concurrence dans la cause Commissaire de la concurrence c Visa-MasterCard (« Visa-MasterCard ») *a mis en lumière cette réalité complexe des plates-formes bifaces. Ce jugement portait sur des allégations de pratiques*

collusoires par les réseaux de cartes de crédit. Ces réseaux sont des plates-formes bifaces caractérisées par l'interaction de banques, de commerçants et de détenteurs de cartes. Cet article indique des moyens de repérer les pratiques collusoires au sein des marchés bifaces. Tout d'abord, il est question des principes économiques régissant ce type de marché. Ensuite, une analyse de l'affaire Visa-MasterCard *permet de souligner les erreurs à éviter lorsqu'on tente de différencier les pratiques bénéfiques pour la concurrence des pratiques anticoncurrentielles dans les marchés bifaces. Puis, une analyse du jugement du ministère de la Justice des États-Unis dans l'affaire des iBooks d'Apple offre une perspective élargie des pratiques collusoires dans ces marchés. Enfin, on présente des théories plausibles des effets des pratiques collusoires.*

I. Introduction

Many revolutionary technologies have been introduced in the past few decades that have changed the way society engages in business and commerce. Many of these technologies have a common and novel economic structure. Economic literature has emerged over the last decade that has identified certain technologies as being "two-sided markets".[2] Broadly speaking, two-sided markets arise when an intermediary platform is required to coordinate two sets of users to allow them to engage in beneficial interactions.

Although the economic literature has identified the many benefits of two-sided markets, what is less clear is how competition agencies around the world should evaluate and scrutinize the practices of firms that participate in two-sided markets. Are the traditional tools of competition law adequate for analyzing two-sided markets? How do you identify anticompetitive practices in two-sided markets? What are some features of two-sided markets that can help illuminate the competitive effects of various practices?

In its decision in *Commissioner of Competition v Visa-MasterCard*,[3] the Competition Tribunal (the "Tribunal") handed down its latest decision involving collusive practices[4] in two-sided markets. The case dealt with credit card networks, which are complex two-sided platforms that mediate the interaction between banks, merchants and cardholders in order to facilitate credit card transactions. The Competition Bureau (the "Bureau") unsuccessfully tried to challenge practices employed by Visa and MasterCard, the two largest credit card networks operating in Canada, that it alleged resulted in merchants paying higher fees when cardholders used their credit cards to make purchases. This Paper has two primary purposes. First, the Paper provides a commentary on the Tribunal's analysis regarding collusive practices in two-sided markets and also compares its analysis with decisions from other jurisdictions involving credit card networks. This analysis will permit a comparison

of how tribunals and courts from different jurisdictions have tried to grapple with the difficult competition law issues presented by two-sided markets. Second, in order to provide a fuller discussion of collusive practices in two-sided markets, this Paper also analyzes cases in the online retail sector with a focus on the U.S. Apple e-books case. Online retailers are two-sided markets that mediate the interaction between buyers and suppliers. The online retail cases provide a prime example of two-sided platforms being used to facilitate collusion between users.

Part II of this Paper provides an overview of the economics of two-sided markets. Part III goes into greater detail regarding efficiencies and entry in two-sided markets. Part IV analyzes the Tribunal's *Visa-MasterCard* decision and several other important credit card cases. Part V analyzes cases in the online retail sector. Based on the analyses in Parts IV and V, Part VI identifies plausible collusive theories of harm in two-sided markets. Finally, Part VII provides some concluding remarks.

II. The Economics of Two-Sided Markets

The growth in research into two-sided markets can be traced to the pioneering work of French economists Jean-Charles Rochet and Jean Tirole.[5] Rochet and Tirole provide the following definition of a two-sided market:

> [A] market is two-sided if the platform can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side by an equal amount; in other words, the price structure matters, and platforms must design it so as to bring both sides on board.[6]

In technical terms, a market is two-sided if price structure is non-neutral and affects profits and the volume of transactions.[7] In a single-sided market, price structure is neutral with regard to a transaction. This is exemplified in the application of a value added tax. When a value added tax is applied in a single-sided market, regardless of whether it is applied to the buyer or seller, the transaction price will adjust to make the effect of the tax neutral.

In their research on two-sided markets, Rochet and Tirole's goal is to combine the economic research on network externalities with the research on multiproduct pricing.[8] The former is used to explain the importance of indirect network effects[9] for two-sided markets. In two-sided markets, a platform becomes more valuable for users on one side of the platform the more users there are on the opposite side. For example, in the videogame industry, a videogame console acts as a platform between videogame developers and videogame players. The more

videogame developers there are that produce games for a particular console the more valuable that console becomes for videogame players because they will have access to more games. Conversely, a videogame console with many videogame players will be more valuable to videogame developers because the videogame developers will have a larger market for their games.

With respect to the economic research on multiproduct pricing, Rochet and Tirole rely on this research to explain the greater importance in two-sided markets of price structure (*i.e.*, the distribution of the price of a transaction between the two-sides of the market) over price level (*i.e.*, the total price paid from the two-sides). Price structure is important for multiproduct firms because they structure the prices of their products to take into account the cross-elasticity of demand between the products. For example, a firm selling two complementary products will spread the prices over its products so that if one is sold at a high price then the other one will be sold at a low price.[10] This price restructure optimally balances the prices of the complementary products and allows the firm to maximize profits. In contrast, the firm would sell less products, and receive less profits, if it set the price of each complementary product at the profit maximizing level in isolation from one another. Similarly, a two-sided platform will create a price structure that ensures there is an optimal amount of users on both sides of the platform by taking into account the effect that users on one side of the platform have on the other. If there is not a sufficient amount of users on one side of the platform then the platform will not be valuable to users on the other side, and vice versa.

Furthermore, the economic literature on two-sided markets identifies factors that are important to determining the optimal price structure for a platform. First, the price structure will be dependent on the indirect network effects generated on each side of a two-sided market.[11] The price structure is intended to internalize the network externalities created by the two sets of users interacting on the platform. For example, readers of a newspaper create indirect network effects by creating an audience for an advertiser who advertises on the newspaper. The newspaper creates a price structure that internalizes these network externalities by charging a fee to advertisers and compensating readers with newspaper content that is offered for free or at below cost. The price structure reflects the value of readers to advertisers and ensures there will be enough readers and advertisers operating on the platform.

Second, the price structure will be affected by the elasticity of demand facing each side of the two-sided market.[12] The side with the more

elastic demand will pay a smaller share of the total price of a transaction relative to the other side. The reason is that providing a lower price to the more elastic side will have more of an effect on increasing the platform's total output. This provides a further explanation for the price structure of newspapers. Newspaper readers have many alternative options to obtain news and thus have more elastic demand than advertisers, who have relatively fewer advertising options. As a result, advertisers pay a larger portion of the price of a newspaper than readers, who often effectively receive the newspaper at a zero price.

Lastly, the price structure will be affected by the marginal costs of serving each side of a two-sided market.[13] An increase in the marginal cost of serving one side of a market will have two effects. First, it will increase the overall price level. Second, assuming equal elasticities of demand on both sides, the price will increase less on the costlier side of the market relative to the other side. A two-sided platform will find it optimal to effectively subsidize the costlier side of the market because this results in a greater increase in output than if the price increases accurately reflected the increase in costs. In this case, subsidizing the costlier side has a greater effect on stimulating demand than it would on the other side of the market.

In addition to network externalities and price structures, there are two additional characteristics of two-sided markets that are important for competition law analysis. First, two-sided platforms are either organized as for-profit firms or not-for-profit associations.[14] The function of a for-profit platform is to maximize its own profits. For example, an online retailer sets its price structure in such a way as to maximize its profits from all the transactions that occur between buyers and suppliers on its platform. In contrast, the function of a platform organized as a not-for-profit association is to maximize output for the collective benefit of its members. For example, the purpose of a not-for-profit credit card association organized by banks is to maximize the total quantity of credit card transactions for the benefit of its member banks. Whether a platform is organized as a for-profit firm or a not-for-profit association has important implications for determining whether its practices are plausibly anticompetitive or procompetitive.

Second, users of two-sided platforms either single-home or multi-home.[15] Users that single-home only use one platform while those that multi-home use multiple platforms. For example, private users of Microsoft Windows normally single-home because the costs of buying an additional personal computer in order to obtain another operating system make multi-homing prohibitively costly. In contrast, many merchants multi-home by accepting cards from multiple credit card

networks because the costs of accepting an additional credit card brand are small. The prevalence of multi-homing is important because multi-homing encourages two-sided platforms to compete to steer a user's transactions toward their platform and away from rival platforms. This competition for a user's transactions puts downward pressure on the price level of two-sided platforms. For this reason, practices that deter or facilitate multi-homing are important from a competition law perspective.

III. Efficiencies and Entry

In order to accurately identify anticompetitive practices in two-sided markets, it is essential to understand potential procompetitive justifications. The primary efficiency justification that is specific to two-sided platforms is the need to coordinate demand on the two sides of the market. Two-sided platforms normally do this by instituting a price structure where one side of the market is charged prices significantly above marginal cost in order to cross-subsidize the other side. As stated above, whether a side is cross-subsidized is dependent on its elasticity of demand, ability to generate indirect network effects and marginal cost. This feature of two-sided markets provides an efficiency justification for many practices that in a single-sided market would be considered anticompetitive. For example, because a two-sided platform is charging a price to one side of the market that is below cost does not necessarily indicate it is engaging in predatory pricing.[16] The fact that Google gives away its Android mobile operating system does not necessarily mean it is engaging in a predatory strategy against Microsoft, which charges $23-31 per phone for a license to its mobile operating system.[17] Although it does not make money off Android directly, Google gains revenue indirectly from selling licenses to complementary products such as Google Maps[18] and from selling mobile ads.[19] In this situation, requiring Google to charge for Android a price that reflected cost would interfere with a business strategy it considers optimal. In order to make out a proper case of predatory pricing in a two-sided market, one would have to compare costs and revenues for the platform as a whole and not just for one side.

A two-sided platform could justify tying for similar reasons.[20] For example, a platform may find it optimal to offer users on one side of the platform a negative price. This situation may arise if a platform wants to pay potential users to use its platform in order to gain a foothold into a market. But because of adverse selection and opportunistic behaviour, it would not be practical for the platform to offer users direct cash payments. The platform could get around this problem by tying a complementary product and giving away the bundle for free.

Examples of this practice include shopping malls that give away free parking and online retailers that give away free shipping.

The ability to manipulate its price structure in the above ways is also important when a two-sided platform is attempting to enter a market. Entry is a particularly important and difficult stage in the life of a two-sided platform. The reason is that platforms need to be able to establish a critical mass of users on both sides of a two-sided market before they can become viable.[21] In the economics literature, this is referred to as the "chicken and egg problem".[22] The chicken and egg problem arises when a two-sided platform cannot get a sufficient amount of users on one side to commit to the platform because a sufficient amount of users on the other side will not commit, and vice versa. This problem can be demonstrated by looking at the online retail sector. An online retailer needs to get a critical mass of suppliers to sell their products on its platform before it can get buyers to start visiting its platform. Conversely, if an online retailer cannot attract a critical mass of buyers to use the platform then suppliers will not commit to selling on the platform. In this situation, an online retailer may be able to use its price structure to obtain critical mass by, for example, offering a negative price in the form of a free bundle of complementary services, such as free product reviews and descriptions, to buyers in order to reach critical mass on that side of the market.

Two-sided platforms can also employ other strategies to overcome the chicken and egg problem.[23] For instance, a platform can adopt a zigzag strategy by signing up one group of users first and then obtaining the other group at a later time. This strategy will work if the indirect network effects only go in one direction. For example, because search engine users place little to no value in ads, Google was able to obtain a critical mass of search engine users first before it attempted to sign up advertisers. Alternatively, if the indirect network effects go both ways, a platform can employ the zigzag strategy by vertically integrating upstream and self-supplying the product in order to attract users. Once it has obtained a critical mass of users then it can start attracting suppliers to the platform. An electronic device maker, for instance, could initially produce its own software applications before obtaining a critical mass of device users. Once it has obtained a sufficient amount of device users, the device maker could attract third-party software developers to produce their own applications for the device. Furthermore, a platform can solve the chicken and egg problem by obtaining pre-commitment. For example, videogame players will not commit to buying a videogame console unless they know there will be games available on the console that they wish to play. A videogame console

can solve this problem by obtaining contractual commitments from videogame developers to produce games for its console.[24]

An important point to keep in mind from a competition law perspective is that entry into two-sided markets can also be more difficult because the markets are prone to "tipping".[25] Tipping arises when a market has a natural tendency to gravitate towards having one dominant firm. Markets with network effects often experience tipping because of the positive feedback effects that occur when users gravitate toward a single firm. The prevalence of tipping in a market depends on the level of consumer heterogeneity and product differentiation. Examples of firms that have become dominant because of tipping are Facebook (social media) and eBay (online auctions). Once a market has tipped, the dominant firm may become entrenched because the opportunity cost of switching to a new entrant increases and users become locked in.[26] Markets that are prone to tipping are thus more difficult to enter. For this reason, whether users multi-home is important to determining whether a new entrant can overcome the network effect barrier to entry.[27] If users on one side of a platform multi-home then that becomes a viable entry point for a new entrant and provides a means for it to try to tip the market toward its platform. The prevalence of multi-homing thus disciplines the dominant platform even in the presence of tipping. Furthermore, although multi-homing may inhibit a market to tip towards only one platform, since users could always use multiple platforms, there may be instances where this would not be the case. For example, multi-homing may only be a practice that occurs initially but then dies out once a platform achieves a certain coverage of a market. This is likely what happened with respect to social media platforms. Users may have initially multi-homed on both MySpace and Facebook but once Facebook achieved a certain coverage of the market MySpace users abandoned multi-homing and started using Facebook exclusively.

IV. *Commissioner of Competition v Visa-MasterCard*

As credit card networks, Visa and MasterCard are complex two-sided platforms.[28] Financial institutions participate in the platforms by acting as either issuers or acquirers. Issuers distribute credit cards to cardholders who are normally charged annual and transaction fees for the use of the card. Acquirers, on the other hand, process credit card transactions on behalf of merchants who accept credit cards as a form of payment from cardholders for purchases. Merchants pay a fee to the acquirer, referred to as the "merchant discount fee", for this service. The merchant discount fee consists of three components: a fee paid to the acquirer for processing the transaction (acquirer services fee),

a fee paid to the credit card network for use of the network (acquirer network fee) and a fee referred to as the "interchange fee". The interchange fee is the largest component of the merchant discount fee and is set by the credit card networks. The interchange fee is collected by the acquirer but is transferred entirely to the issuer who issued the credit card that was used in the transaction.

In addition to this complex fee structure, Visa and MasterCard impose two primary restraints on merchants: the "no-surcharge rule" and the "honour-all-cards rule".[29] The no-surcharge rule prevents merchants from levying fees on cardholders when they use their credit cards. The purpose of the rule is to prevent merchants from transferring the costs of the merchant discount fee onto cardholders.[30] The honour-all-cards rule requires merchants to accept all credit cards issued under a specific credit card brand.[31] The rule prevents merchants from discriminating against different types of credit cards that may charge different merchant discount fees. In addition to the above restraints, MasterCard also imposes the "no-discrimination rule".[32] The rule is an anti-steering provision that prevents merchants from steering business away from MasterCard toward another credit card network.

In *Visa-MasterCard*, the Bureau attempted to challenge as anticompetitive the merchant restraints imposed by Visa and MasterCard. The Bureau relied on Section 76 of the *Competition Act* (the "Act"),[33] which prohibits resale price maintenance, as the basis of its challenge against the restraints. At first glimpse, the decision to initiate the case under resale price maintenance appears to be a strange choice. The Bureau initially tried to argue that it was not required to prove that there was a resale of a product under Section 76(1)(a)(i) but merely that there was a vertical relationship.[34] The Tribunal reviewed the language of Section 76 and its legislative history and held that the Bureau's interpretation found no support.[35] Indeed, the Tribunal found that the clear legislative intent of Section 76 was to require a resale of a product. Alternatively, the Bureau tried to argue that if Section 76 requires a resale then that requirement was met because acquirers resell credit card network services from Visa and MasterCard to merchants.[36] The Tribunal also rejected this line of argument based on the fact that the evidence suggested that the credit card networks and acquirers provide different services to merchants.[37] The networks supply authorization, clearance and settlement of transactions services to acquirers while the acquirers provide credit card acceptance services to merchants.

The reason that the Bureau tried to awkwardly shoehorn its case under Section 76 is likely because its challenge to the merchant restraints did not comfortably fit under any other provision. The

Tribunal suggested that the case may have been more appropriately brought under Section 79, which prohibits abuses of dominance.[38] However, the Tribunal pointed out that it also would have been difficult for the Bureau to make its case under Section 79 because the provision requires an anticompetitive act that has the intent of excluding a competitor.[39] The Bureau's case was built on a collusive theory of harm rather than an exclusionary one. In other words, it alleged the merchant restraints resulted in reduced price competition rather than the exclusion of a rival credit card network. Alternatively, the Bureau could have attempted to argue that Visa and MasterCard's rules, by reducing competition between the credit card networks, were prohibited anticompetitive agreements under Section 90.1.[40] This line of argument also would have had difficulties, however. Section 90.1 only prohibits anticompetitive agreements between competitors. Visa and MasterCard's rules were agreements with their acquirers and they do not compete with their acquirers. Only an agreement between Visa and MasterCard or between the acquirers would have fallen under Section 90.1. The inability of the Bureau to challenge non-horizontal agreements that have collusive, rather than exclusionary, effects under any of the provisions in the Act other than Section 76 suggests the Act may have an enforcement gap. For example, the Bureau may not be able to challenge meet-or-release clauses under the Act even though these clauses are known to facilitate collusion by deterring cheating among cartelists.[41] These clauses are non-horizontal and can be employed by non-dominant firms to facilitate collusion.

With respect to its analysis of the interchange fees, the Tribunal erred by inferring that the credit card networks' ability to increase the interchange fee without losing market share alone was evidence of their market power.[42] The purpose of an interchange fee is to increase transaction volume on a credit card network by balancing the demand between the users on the two sides of the platform, in this case merchants and cardholders.[43] The fee does this by providing issuers with the funds to offer cardholders rewards and subsidized card fees. Exercises of market power result in reduced quantity rather than increased quantity. The fact that increased interchange fees may result in higher transaction volumes suggests the increases alone should not be considered evidence of market power. Indeed, the increased competition on the issuer side of the market can account for the observed historical rise in interchange fees.[44] Credit card networks increased their interchange fees on merchants in order to allow issuers to compete more aggressively for cardholders.

Furthermore, the Tribunal explicitly rejected the increased competition for cardholders resulting from increased interchange fees as an offsetting procompetitive benefit. In its decision, the Tribunal held that:

> The Merchant Rules may also have contributed to the observed increase in demand for Credit Card Network Services. Indeed, it is hard to imagine that either network would have agreed to set higher default Interchange Fees unless it anticipated that this would increase network volume. *To the extent that they have resulted in higher Interchange Fees than would otherwise have prevailed, the Merchant Rules may have provided Issuers with both the means and incentive to promote card use more heavily. In the Tribunal's view, this should not be interpreted as an offsetting pro-competitive effect of the No-Surcharge Rule* [emphasis added].[45]

This statement indicates that the Tribunal did not believe the increased interchange fees imposed on merchants could be offset by increased competition for cardholders. The Tribunal, however, overlooks the fact that the increased competition among issuers not only benefits cardholders, but also merchants. The reason is that when a credit card network competes and gains additional cardholders this amplifies the indirect network effects generated by the platform. The amplified indirect network effects increase the value for merchants of being part of the credit card network. Furthermore, the increased competition between issuers stimulates market demand for credit cards, which increases credit card use in absolute terms and not just for a single credit card network. The Tribunal acknowledged the possibility that the restrictions imposed by Visa and MasterCard may have resulted in increased transaction volumes, which would directly benefit merchants. If the merchant restraints plausibly result in benefits that accrue to merchants then this should be taken into consideration as an offsetting benefit.

Even assuming that one side of the market benefits from a restraint at the expense of the other, should that matter in a two-sided market case? In its decision involving the credit card sector, the European Court of Justice ("ECJ") suggested that one should not look at whether a restraint causes one side to benefit at the expense of another but rather whether the two-sided market as a whole is better off because of the restraint.[46] Specifically, the ECJ stated that:

> [I]n the case of a two-sided system such as the MasterCard scheme, in order to assess whether a measure which in principle infringes the prohibition laid down in Article 81(1) EC — in so far as it creates restrictive effects in regard to one of the two groups of consumers associated with that system — can fulfil the first condition laid down in Article 81(3) EC, *it is necessary to take into account the system of which that measure forms*

> *part, including, where appropriate, all the objective advantages flowing from that measure not only on the market in respect of which the restriction has been established, but also on the market which includes the other group of consumers associated with that system, in particular where, as in this instance, it is undisputed that there is interaction between the two sides of the system in question. To that end, it is necessary to assess, where appropriate, whether such advantages are of such a character as to compensate for the disadvantages which that measure entails for competition* [emphasis added].[47]

The ECJ's approach to the analysis of competitive effects in two-sided market cases is arguably preferable to the Tribunal's approach. Because the two sides are so intertwined in a two-sided market, it does not make sense to only look at competitive harms and benefits that accrue to one side. Both sides of the market are essential so it would often not be rational for a two-sided platform to harm one side, merely to benefit the other side, unless doing so would benefit the platform as a whole. What should matter is not whether a restraint benefits one side sufficiently to offset the harm done to it but rather whether the benefits and harms on the whole platform result in a net benefit. This approach would increase consumer welfare in comparison to the Tribunal's approach where benefits and harms are only examined from one side. The reason is that if a restraint causes one side of the market to be harmed marginally but the other side to receive substantial benefits, under the Tribunal's approach the benefits could not be taken into consideration.

Furthermore, in contrast to the Tribunal, the U.S. Court of Appeals for the Eleventh Circuit ("11th Circuit") in *NaBanco v Visa* correctly identified the efficiency rationale of interchange fees.[48] In that case, the 11th Circuit stated the following with respect to interchange fees:

> Another justification for evaluating the [interchange fee] under the rule of reason is because it is a potentially efficiency creating agreement among members of a joint enterprise. There are two possible sources of revenue in the VISA system: the cardholders and the merchants. *As a practical matter, the card-issuing and merchant-signing members have a mutually dependent relationship. If the revenue produced by the cardholders is insufficient to cover the card-issuers' costs, the service will be cut back or eliminated. The result would be a decline in card use and a concomitant reduction in merchant-signing banks' revenues.* In short, the cardholder cannot use his card unless the merchant accepts it and the merchant cannot accept the card unless the cardholder uses one. Hence, the [interchange fee] accompanies "the coordination of other productive or distributive efforts of the parties" that is "capable of increasing the integration's efficiency and no broader than required for that purpose." Bork, *The Rule of Reason and the Per Se Concept*, 75 Yale L.J. 373, 474 (1966) [emphasis added]…[49]

The 11th Circuit recognized that credit card networks use interchange fees to coordinate the demand between merchants and cardholders. Further, in the absence of interchange fees, a merchant would not be willing to pay a fee that took into consideration the indirect network effects generated by the credit card network because it does not fully internalize all the benefits that accrue since other merchants benefit from the effects generated. Thus, credit card networks set interchange fees in order to internalize the positive externalities that additional cardholders produce for all the merchants that transact on the network.

There are also efficiency justifications for why the interchange fee is set by the credit card network rather than negotiated independently between acquirers and issuers.[50] Bilateral negotiations between individual issuers and acquirers to determine interchange fees would significantly increase transaction costs. Furthermore, the bilateral negotiations would suffer from holdup problems because of the honour-all-cards rule. The rule would disadvantage acquirers in the negotiations because their merchants could not decline cards from issuers that require a large interchange fee.

In *Visa-MasterCard*, the Bureau only challenged the no-surcharge and honour-all-cards rules rather than the interchange fee itself. This is still problematic, however, because the merchant restraints provide efficiencies for the credit card networks. Allowing merchants to levy a surcharge to offset the interchange fee would defeat the demand coordinating function of the interchange fee.[51] The purpose of the fee is to cross-subsidize cardholders, who have more elastic demand relative to merchants, in order to attract them to the platform. If merchants were to charge cardholders a surcharge to offset the interchange fee, it would remove any subsidy the cardholders receive from the issuers. In addition, removing the honour-all-cards rule and allowing merchants to discriminate between a brand's low- and high-fee credit cards would devalue the credit card network.[52] If cardholders cannot rely on merchants to accept their credit cards when they advertise they accept a specific brand then it reduces the value of the brand.

The honour-all-cards rule provides a useful contrast to the no-discrimination rule that was used by MasterCard and successfully challenged by the U.S. Department of Justice ("DOJ") in the *Amex* case.[53] The DOJ challenged Amex's no-discrimination rule because it prohibited merchants from steering customers away from Amex to credit card brands with lower interchange fees, such as by stating a preference for a particular brand or by offering a discount or free services for using another brand. The U.S. District Court of the Eastern

District of New York ("Eastern New York District Court") held that the rule unjustifiably interfered with the interbrand competition between the credit card networks:

> [B]y preventing merchants from influencing their customers' payment choices, Defendants' [no-discrimination] rules render merchant demand for network services less responsive to changes in the price charged for those services. In so doing, the [no-discrimination rules] effectively remove the incentive for American Express or its network competitors to compete with one another by offering merchants a lower price, as without merchant participation in the point-of-sale payment decision, a lower price will not translate into increased volume for the network. In undermining the competitive process and price-setting mechanism in the market for GPCC card network services, the challenged restraints impede a critical form of horizontal, interbrand competition.[54]

The Eastern New York District Court recognized that the no-discrimination rule reduced the incentive of the credit card networks to offer lower interchange fees to merchants because they would not be rewarded with increased transaction volume since the rule prohibited merchants from steering their customers toward non-Amex credit cards. In contrast, the honour-all-cards rule only prevents merchants from discriminating between credit cards within a brand and not between the credit cards of different networks. Merchants that multi-home on several credit card networks are still able to steer their customers toward lower cost networks and thus incentivize the networks to offer lower fees in return for steering transactions toward them. The honour-all-cards rule thus only interferes with intrabrand competition and not interbrand competition. For that reason, the rule is less likely to be considered anticompetitive because competition law's "primary purpose…is to protect interbrand competition".[55] Although the Tribunal did not go into detail regarding the differences between the no-surcharge rule and the no-discrimination rule, the rules do have a crucial difference. The no-surcharge rule prohibits merchants from steering through surcharging while the no-discrimination rule prohibits any type of steering. As a result, the no-discrimination rule is clearly the more anticompetitive rule.

A more nuanced economic critique of Visa and MasterCard's merchant restraints is that they result in an excessive amount of credit card transactions because they partially externalize the cost of credit card usage.[56] The basic argument is that, because merchants cannot pass on the costs of credit card usage onto cardholders, it results in more credit card usage than is socially optimal. The inability of merchants to pass on the costs requires them to raise prices on all goods to recover these costs. This effectively requires non-credit card users, such as those

who pay with cash or cheque, to pay higher prices and to subsidize cardholders. This reasoning provides the basis for jurisdictions like the EU that require interchange fees to be set lower than they would be if they were set by the credit card networks. However, many merchants offer services that only benefit some customers but are paid for by all customers.[57] Examples include parking, advertising and extended store hours. More importantly, forcing credit card networks to lower their interchange fees interferes with their ability to cross-subsidize. The inability to cross-subsidize will result in fewer rewards and higher fees for cardholders.[58] This results in higher costs for cardholders and reduces credit card transactions to merchants. It is not clear that legal interference in the credit card market would enhance consumer welfare.[59] As a result of the ambiguous effect on consumer welfare of any judicial remedy, the Tribunal declined to provide the Bureau with a remedy under Section 76 of the Act and provided the following explanation:

> The Tribunal is mindful that a change in one part of the credit card system is likely to have consequences in other parts, such as cardholder fees and benefits while price reductions to consumers may be undetectable. The law of unintended consequences is likely to be a significant force. It is uncertain that the supposed 'cure' will not be worse than the 'disease'.[60]

V. Online Retailers

Online retailers are two-sided platforms that allow users to come together to buy and sell products. The viability of such platforms depends on their ability to sign up both buyers and suppliers. Competition agencies, however, have been scrutinizing various contractual clauses employed by online retailers with respect to their suppliers. Of particular concern are the use of Most-Favoured-Nation ("MFN") clauses.[61] MFN clauses require a supplier to sell a product to a buyer at a price that is not higher than the lowest price given to a rival buyer.[62] The competition law literature has identified the potential harms to competition from MFN clauses.[63] For example, MFN clauses can make price coordination among suppliers easier by providing a mechanism to deter cheating. Furthermore, MFN clauses dampen price competition by making it more costly for a supplier to lower prices since any decrease in price has to be applied to all buyers with the clauses. The clauses also deter downstream entry by preventing a potential entrant from obtaining a cost advantage through lower input prices from suppliers. However, firms may have procompetitive justifications for adopting MFN clauses. A buyer, for example, may be tied to a supplier because it has made product-specific investments. In this situation, an MFN clause can be used to constrain the supplier from raising prices

opportunistically and disadvantaging the buyer relative to its rivals. Furthermore, MFN clauses may be efficient because they reduce the transaction costs of having to renegotiate prices in industries where prices often fluctuate.

MFN clauses present unique competition law concerns in two-sided markets because many online retailers have combined them with an agency model of distribution. Under the agency model, a supplier sets prices for its products on the platform and compensates the online retailer by giving it a per transaction fee, usually a percentage of the price of the transaction.[64] In contrast, under a traditional wholesale model, the supplier sells its products to the retailer and the retailer resells the products at its own prices. The economic literature suggests that the combination of MFN clauses and the agency model has several potential anticompetitive effects. First, the arrangement reduces competition among online retailers to lower their fees and thus results in suppliers charging higher prices.[65] The reason is that an online retailer has an incentive to raise fees because any subsequent compensatory price increase by suppliers will be spread across all online retailers. The online retailer also does not have to worry about buyers switching to another online retailer because any supplier price increase will apply equally to the other online retailers. Second, the arrangement deters low-cost entrants from attempting to enter the market.[66] A potential low-cost online retailer wanting to enter the market by offering suppliers a smaller fee to induce them to offer lower prices is unable to do so because the MFN clause would prevent it from gaining an advantage on price. Lastly, in markets where some online retailers use the wholesale model, and thus act as resellers, and others use the agency model and MFN clauses, the result is higher retail prices as though there was industry-wide resale price maintenance.[67] The reason is that the resellers have no incentive to lower prices because any price cuts will be matched by the suppliers selling on platforms through the agency model. The resellers thus end up raising prices as though the suppliers had imposed resale price maintenance.

The EU and its Member States have been aggressive in attacking MFN clauses in the online retail industry. The EU recently announced that it is conducting an investigation into Amazon's use of MFNs in the sale of e-books.[68] Amazon already abandoned its use of MFN clauses in Germany and the UK after being investigated by the Bundeskartellamt and the Office of Fair Trading, Germany and the UK's competition agencies, respectively.[69] The Competition Commission, another UK competition agency, issued a report condemning the use of MFN clauses by auto insurance price comparison websites.[70] The Commission found that the clauses reduced the websites' incentive to innovate

and compete on price and deterred entry. Similarly, competition agencies in Germany, the UK, France, Sweden and Italy have attacked MFN clauses in the online hotel booking sector for reducing price competition and deterring entry.[71]

In the United States, the most notable competition law case involving MFN clauses in the online retail industry is the DOJ's case against Apple for colluding with a group of major publishers to raise the price of e-books.[72] In that case, the U.S. District Court for the Southern District of New York ("Southern District New York Court") found that the publishers had been looking for an opportunity to force Amazon to raise e-book prices because it had adopted a loss leader strategy that priced e-books at $9.99. Amazon's low e-book prices threatened the publishers' profits in the sale of print books. Apple knew of the discontent among the publishers and used its impending entry into the e-book retail market to facilitate a cartel to raise e-book prices. Apple adopted the agency model to give the publishers the power to set prices and adopted MFN clauses to ensure that it would not have to compete with Amazon on price. The publishers used their agreements with Apple to pressure Amazon to adopt the same pricing arrangement. Under these facts, the Southern District New York Court found Apple liable for colluding with the publishers to fix e-book prices.[73]

A critical part of the case against Apple was that it facilitated a horizontal price-fixing agreement among the publishers. Otherwise, the fact that Apple had employed the agency model and MFN clauses has potentially procompetitive justifications because they facilitated Apple's entry into the retail e-book market.[74] As a new entrant, Apple could not have had any market power. Consequently, Apple's use of MFN clauses could not in themselves have had any anticompetitive effects. Rather, the MFN clauses facilitated Apple's entry by ensuring that it would not be undercut on price by Amazon, the dominant incumbent. Although the MFN clauses would reduce price competition between Apple and Amazon, the two-sided nature of the market would just cause competition to be directed towards the other side of the market. This procompetitive explanation for the MFN clauses is evident from some of the facts relied on by the Court to find that Apple was part of the cartel:

> As described above, *Apple, quite simply, did not want to compete with Amazon on price.* Apple was confident that the iPad would be a revolutionary and wildly popular device. It was happy to compete with Amazon on that playing field, where it believed its strength resided. It would match its device — the iPad — against the Kindle. As HarperCollins executive Robert Zaffiris observed on January 20, *Apple is cutting a blanket agency deal to level the playing field and ultimately compete in two areas they feel good about — technology and iTunes* [emphasis added].[75]

With respect to the agency model, although it contributes to the theory that Apple was part of the cartel because it provides a means for Apple to extract a portion of the monopoly profits, there are still pro-competitive reasons why Apple would prefer the agency model over the wholesale model. For example, it is more efficient for a two-sided platform to give suppliers the power to set prices on the platform when they have better information on customer demand.[76] Furthermore, Apple used the agency model to sell apps through its App Store, which suggests that Apple may have legitimate business reasons for adopting such a pricing model for its platforms.[77]

The *Apple* case presents a useful contrast with the credit card cases analyzed in Part IV of this Paper. In *Visa-MasterCard*, the honour-all-cards rule reduced intrabrand competition between the credit card networks but not interbrand competition. Although the no-surcharge rule prevented merchants from steering through surcharges, it did not prevent merchants from engaging in other types of steering. In contrast, the no-discrimination rule employed by MasterCard and by Amex in the *Amex* case prevented steering of any type. As a result, the no-surcharge rule may reduce platform competition between the credit card networks but not to the same degree as the no-discrimination rule. The recognition that the no-discrimination rule may pose a greater risk to competition compared to the no-surcharge rule explains why the DOJ challenged the former but explicitly declined to challenge the latter in *Amex*.[78] In the *Apple* case, on the other hand, Apple's agreements with the publishers reduced both user and platform competition. The agreements facilitated a publisher cartel and thus reduced price competition between the publishers. The agreements also reduced platform competition because they forced Amazon to adopt the same distribution arrangement as Apple and reduced the price competition between the two platforms.

VI. Collusive Theories of Harm

The case law and economic literature analyzed in the previous parts of this Paper provide guidance on how to identify plausible collusive theories of harm in two-sided markets. First, platforms can potentially engage in collusion with other platforms. They can do this by expressly entering into a price-fixing agreement. MFN clauses can assist platforms to collude by reducing the incentives to cheat and deterring entry by maverick platforms. However, some characteristics of two-sided platforms make entering into a price-fixing agreement implausible or at least less likely. For example, a theory alleging that a platform organized as a not-for-profit association entered into a price-fixing agreement is implausible because its function is to maximize

output and not profits.[79] Furthermore, price-fixing by two-sided platforms is more complex because the cartelists have to coordinate on both sides of the market.[80] If the colluding platforms agree to restrict competition on only one side of the market, then competition will just shift to the other side to reduce the monopoly profits.[81] In addition, it is important to keep in mind that the fact that price is well above marginal cost on one side of the platform does not necessarily suggest there is collusion. The platform could be pricing high on that side in order to cross-subsidize the other.

Second, a two-sided platform can potentially facilitate collusion among its users. Again, looking at the organization of the platform would be important. A platform organized as a for-profit firm would not have an incentive to facilitate collusion among its users. The reason is that, since the platform is in a vertical relationship with its users, allowing them to collude would effectively raise the platform's costs. This situation would be analogous to a retailer facilitating collusion among its suppliers. This would not be in the retailer's interest unless it was vertically integrated upstream or it was receiving side-payments from the cartel to compensate it. But even if a two-sided platform had an incentive to facilitate an upstream cartel, it would be constrained by the fact that users raising price on one side of the market would induce users on the other side to exit. The exit of users would reduce the indirect network effects and thus reduce the value of the platform.[82] As a result, a platform would only facilitate collusion if it received side payments sufficient to offset the loss of profits from users exiting the platform. Alternatively, if users on the non-colluding side had inelastic demand or produced no indirect network effects,[83] then the platform would have more of an incentive to facilitate a cartel because the exit of users would be less likely or would result in less of a reduction in value to the platform.

If a two-sided platform implemented an agency model, rather than a wholesale model, then it would have more of an incentive to facilitate a user cartel. The reason is that the agency model provides a mechanism for the platform to extract a portion of the monopoly profits from the cartelists.[84] With the agency model, a platform would extract a portion of any monopoly profits since its fee is based on the price of the product being sold on its platform. A higher collusive price would mean a higher fee. Furthermore, if the platform is organized as an association then there is the heightened risk that the members will use it to facilitate a cartel. Associations can be useful mechanisms for facilitating cartels because they provide a means for members to reach a price-fixing agreement, to detect and punish cheaters and to prevent entry.[85] Similarly, members of a platform could use the platform to implement

a cartel agreement, to detect and punish members that cheat and to prevent the entry of potential members that would undercut the cartel.

VII. Conclusion

Courts and academics are still wrestling with the complex competition law issues surrounding two-sided markets. With respect to the online retail sector, the case law and literature all suggest that MFN clauses and the agency model of distribution may be used by two-sided platforms to lessen price competition and to deter entry by low-cost entrants. With respect to the credit card sector, however, the case law and literature are less clear. The restrictions on merchants may have anticompetitive harms but there are also plausible and substantial efficiency justifications for these practices. Consequently, it is not clear that with the current state of knowledge of two-sided markets that one can proclaim confidently that these practices have a negative effect on consumer welfare. Until we gain a better understanding of the effect on consumer welfare of these practices, a rule of thumb that can be applied in two-sided market cases is to treat as presumptively suspect any practices that have the effect of reducing competition between platforms, but to treat as permissible any practices that restrain competition within a platform if there are plausible and substantial efficiency justifications for such restraints.

As more competition law cases get litigated and economic analyses are conducted, our understanding of how to properly set competition law policy in two-sided markets will improve. This improved understanding will allow competition agencies to minimize error costs and maximize consumer welfare. This Paper hopes to contribute to this understanding by providing deeper insight into how to accurately identify collusive practices in two-sided markets.

Endnotes

[1] I would like to thank Professors Steven Salop and Mark Popofsky for their penetrating lectures on advanced antitrust economics and law and for their comments on my paper, both of which contributed immensely to its quality. I would also like to thank Professor Thomas Ross and an anonymous referee for their very helpful comments. All mistakes are my own. The views expressed in this paper are my own and do not reflect those of the Federal Trade Commission or any of its Commissioners.

[2] Some authors use the term "two-sided markets" and some use "two-sided platforms". The use of the word "market" in the two-sided market literature is not intended to have the same technical meaning as it does in the competition law context. In this paper, a platform that participates in a two-sided market is referred to as a "two-sided platform". Furthermore, although reference will

mostly be made to two-sided platforms, it should be noted that platforms can have more than two sides.

[3] (23 July 2013), CT-2010-010, online: Competition Tribunal <http://www.ct-tc.gc.ca/CMFiles/CT-2010-010_Reasons%20for%20Order%20and%20Order%20Dismissing%20the%20Commissioner%27s%20Application_337_38_7-23-2013_7109.pdf> [Visa-MasterCard].

[4] Collusive practices are practices which reduce the incentives of rival firms to compete with each other. These practices are often contrasted with exclusionary practices which reduce competition through the exclusion of a rival.

[5] See Jean-Charles Rochet & Jean Tirole, "Platform Competition in Two-Sided Markets" (2003) 1 J Eur Econ Ass'n 990 [Rochet & Tirole, "Platform Competition"]; Jean-Charles Rochet & Jean Tirole, "Two-Sided Markets: A Progress Report" (2006) 37 RAND J Econ 645 [Rochet & Tirole, "Two-Sided Markets"].

[6] *Ibid*, Rochet & Tirole, "Two-Sided Markets" at 664-65.

[7] See *ibid* at 648-49.

[8] See Rochet & Tirole, "Platform Competition", *supra* note 5 at 993-94.

[9] Direct network effects arise when a platform becomes more valuable to a user the more additional users there are on the platform. For example, a telephone network becomes more valuable to an individual telephone customer the more additional telephone customers there are because it makes possible more potential phone calls. In contrast, indirect network effects arise when a platform becomes more valuable because the existence of one set of users on a platform make it more valuable for another set of users.

[10] See Sandro Shelegia, "Multiproduct Pricing in Oligopoly" (2012) 30 Int'l J Indus Org 231.

[11] See Rochet & Tirole, "Platform Competition", *supra* note 5 at 1,017-18.

[12] See Richard Schmalensee, "Payment Systems and Interchange Fees" (2001) at 17, online: NBER <http://www.nber.org/papers/w8256.pdf> [unpublished].

[13] See Ricardo Gonçalves, "Policy Challenges in Two-Side Network Industries" (2003) 4 J Network Indus 327 at 334.

[14] See Rochet & Tirole, "Platform Competition", *supra* note 5 at 1,002-07.

[15] See Rochet & Tirole, "Two-Sided Markets", *supra* note 5 at 659-60.

[16] See David S Evans, "The Antitrust Economics of Multi-Sided Platform Markets" (2003) 20 Yale J Reg 325 at 367-70.

[17] See Andy Weir, "ZTE reveals cost of Windows Phone OS licensing", *Neowin* (19 January 2012), online: Neowin <http://www.neowin.net/news/zte-reveals-cost-of-windows-phone-os-licensing>.

[18] See Charles Arthur & Samuel Gibbs, "The hidden costs of building an Android device", The Guardian (23 January 2014), online: *The Guardian* <http://www.theguardian.com/technology/2014/jan/23/how-google-controls-androids-open-source>.

[19] See Ginny Marvin, "Android Closing Gap In Mobile Ad Revenue, Up 3 Percent In Q3 To 41.8 Pct. [Report]", *Marketing Land* (22 October 2014), online: Marketing Land <http://marketingland.com/android-closing-gap-mobile-ad-revenue-3-percent-q3-41-8-pct-report-105063>.

[20] See Andrea Amelio & Bruno Jullien, "Tying and Freebies in Two-Sided

Markets: Preliminary and Incomplete" (2007), online: Institut Économie Industrielle <http://idei.fr/doc/conf/sic/papers_2007/jullien.pdf>.
[21] See generally David S Evans, "How Catalysts Ignite: The Economics of Platform-Based Start-Ups" (2008), online: SSRN <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1279631>.
[22] See e.g. Bernard Caillaud & Bruno Jullien, "Chicken & egg: competition among intermediation service providers" (2003) 34 RAND J Econ 309; Andrei Hagiu, "Pricing and commitment by two-sided platforms" (2006) 37 RAND J Econ 720.
[23] See Evans, *supra* note 21 at 16-20.
[24] See Hagiu, *supra* note 22 at 720-21.
[25] See Michael L Katz & Carl Shapiro, "Systems Competition and Network Effects" (1994) 8 J Econ Persp 93 at 105-06.
[26] See Scott Andes, "Making the Market: How Interoperability and Tipping Points Can Influence Network Size" (2012) 9 Heinz J 1 at 7-8, online: The Heinz Journal <http://journal.heinz.cmu.edu/wp-content/uploads/2012/05/Final-Making-the-Market.pdf>.
[27] I want to thank Mark Popofsky for bringing this point to my attention.
[28] For a more detailed description of how credit card networks operate, see *Visa-MasterCard*, *supra* note 3 at paras 9-30.
[29] See *Visa-MasterCard*, *supra* note 3 at paras 35-42.
[30] See David S Evans & Richard Schmalensee, "The Economics of Interchange Fees and their Regulation: An Overview" in David S Evans, ed, *Interchange Fees: The Economics and Regulation of What Merchants Pay for Cards* (2011) 1 at 20-21, online: Competition Policy International <https://www.competitionpolicyinternational.com/assets/Hot-Tubs/Interchange-Fees-web.pdf>.
[31] See *ibid* at 12-13.
[32] See *Visa-MasterCard*, *supra* note 3 at paras 43-44.
[33] SC 1985, c C-34:

> **Price maintenance**
> **76.** (1) On application by the Commissioner or a person granted leave under section 103.1, the Tribunal may make an order under subsection (2) if the Tribunal finds that
> (a) a person referred to in subsection (3) directly or indirectly
> (i) by agreement, threat, promise or any like means, has influenced upward, or has discouraged the reduction of, the price at which the person's customer or any other person to whom the product comes for resale supplies or offers to supply or advertises a product within Canada, or
> (ii) has refused to supply a product to or has otherwise discriminated against any person or class of persons engaged in business in Canada because of the low pricing policy of that other person or class of persons; and
> (b) the conduct has had, is having or is likely to have an adverse effect on competition in a market.

[34] See *Visa-MasterCard*, *supra* note 3 at paras 113-14.
[35] See *ibid* at paras 115-30.
[36] See *ibid* at paras 141-42.

[37] See *ibid* at paras 148-52.

[38] *Competition Act*, *supra* note 33:

> **Prohibition where abuse of dominant position**
>
> **79.** (1) Where, on application by the Commissioner, the Tribunal finds that
>
> (a) one or more persons substantially or completely control, throughout Canada or any area thereof, a class or species of business,
>
> (b) that person or those persons have engaged in or are engaging in a practice of anti-competitive acts, and
>
> (c) the practice has had, is having or is likely to have the effect of preventing or lessening competition substantially in a market,
>
> the Tribunal may make an order prohibiting all or any of those persons from engaging in that practice.

[39] See *Commissioner of Competition v Canada Pipe Company Ltd*, 2006 FCA 233 at paras 63-73.

[40] *Competition Act*, *supra* note 33:

> **90.1** (1) If, on application by the Commissioner, the Tribunal finds that an agreement or arrangement — whether existing or proposed — between persons two or more of whom are competitors prevents or lessens, or is likely to prevent or lessen, competition substantially in a market, the Tribunal may make an order
>
> (a) prohibiting any person — whether or not a party to the agreement or arrangement — from doing anything under the agreement or arrangement; or
>
> (b) requiring any person — whether or not a party to the agreement or arrangement — with the consent of that person and the Commissioner, to take any other action.

[41] See Jürgen-Peter Kretschmer & Oliver Budzinski, "Advertised Meeting-the-Competition Clauses: Collusion Instead of Price Discrimination" (2009), online: SSRN <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1364208>. For a more thorough analysis of this flaw in the *Competition Act*, see Ralph Winter, "The Gap in Canadian Competition Law Following *Canada Pipe*" (2014) 27 Can Comp L Rev 293.

[42] See *Visa-MasterCard*, *supra* note 3 at paras 261-62.

[43] See Benjamin Klein et al, "Competition in Two-Sided Markets: The Antitrust Economics of Payment Card Interchange Fees" (2006) 73 Antitrust LJ 571 at 610-14.

[44] See Klein et al, *ibid* at 603-09.

[45] *Visa-MasterCard*, *supra* note 3 at para 374.

[46] See *MasterCard and Others v Commission*, C-382/12 P, online: Curia <http://curia.europa.eu/juris/document/document.jsf;jsessionid=9ea7d0f130de0acf97d61cff4e20bd0af05a4a47380f.e34KaxiLc3eQc40LaxqMbN4ObxiNe0?text=&docid=157521&pageIndex=0&doclang=en&mode=lst&dir=&occ=first&part=1&cid=145436>.

[47] *Ibid* at para 237.

[48] *National Bancard Corp (NaBanco) v VISA USA, Inc*, 779 F Supp (2d) 592 (11th Cir 1986).

[49] *Ibid* at 602.

[50] See Evans & Schmalensee, *supra* note 30 at 12-13.

[51] See Timothy J Muris, "Payment Card Regulation and the (Mis)Application

of the Economics of Two-Sided Markets" (2005) 2005 Colum Bus L Rev 617 at 632-33.

[52] See Klein et al, *supra* note 43 at 592.

[53] *United States v American Express Co (In re Am Express Antisteering Rules Antitrust Litig)*, 10-CV-4496 (NGG) (RER) (ED NY 2015), online: U.S. DOJ <http://www.justice.gov/atr/cases/f312000/312037.pdf> [Amex]. In *Visa-MasterCard*, only MasterCard had a no-discrimination rule (which is referred to as an "antisteering rule" in the DOJ's case). However, the rule was not analyzed extensively in the decision because it was lumped in with the other merchant restraints. See *Visa-MasterCard*, *supra* note 3 at paras 43-45.

[54] *Amex*, *ibid* at 107.

[55] *State Oil Co v Khan*, 522 US 3 at 15.

[56] See *Visa-MasterCard*, *supra* note 3 at paras 276-321. For competition law literature supporting this line of argument, see e.g. Dennis W Carlton & Alan S Frankel, "The Antitrust Economics of Credit Card Networks" (1995) 63 Antitrust LJ 643; Dennis W Carlton & Alan S Frankel, "Transaction Costs, Externalities, and 'Two-Sided' Payment Markets" (2005) 2005 Colum Bus L Rev 617; and David A Balto, "The problem of interchange fees: costs without benefits?" (2000) 21 Eur Comp L Rev 215.

[57] See Klein et al, *supra* note 43 at 617.

[58] These results have been observed empirically. Australia instituted a regulatory regime that required Visa and MasterCard to set their interchange fees closer to costs. This resulted in Visa and MasterCard providing fewer rewards and imposing higher fees on their cardholders. See Howard Chang, David S Evans & Daniel D Garcia Swartz, "The Effect of Regulatory Intervention in Two-Sided Markets: An Assessment of Interchange Fee in Australia" in David S Evans, ed, *Interchange Fees: The Economics of What Merchants Pay for Cards* (2011) 57 at 68-69, online: Competition Policy International <https://www.competitionpolicyinternational.com/assets/Hot-Tubs/Interchange-Fees-web.pdf>.

[59] See Klein et al, *supra* note 43 at 626.

[60] *Visa-MasterCard*, *supra* note 3 at 398. Although the Department of Finance did not issue any new regulations in response to the *Visa-MasterCard* decision, it did nevertheless intervene by persuading Visa and MasterCard to offer voluntary commitments to reduce their interchange fees. See Department of Finance, Press Release, "Archived — Minister of Finance issues statement on voluntary Visa and MasterCard proposals" (4 November 2014), online: Department of Finance Canada <http://www.fin.gc.ca/n14/14-157-eng.asp>.

[61] MFN clauses are also sometimes referred to as "Most-Favoured-Customer" clauses.

[62] See Luca Aguzzoni et al, *Can 'Fair' Prices Be Unfair? A Review of Price Relationship Agreements* (2012) at paras 3.2-3.3, online: Lear <http://www.learlab.com/pdf/oft1438_1347291420.pdf>.

[63] See e.g. Jonathan B Baker & Judith A Chevalier, "The Competitive Consequences of Most-Favored-Nation Provisions" (2013) 27 Antitrust 20; Steven C Salop & Fiona Scott Morton, "Developing an Administrable MFN Enforcement Policy" (2013) 27 Antitrust 15; Joseph J Simons, "Fixing Price with Your Victim: Efficiency and Collusion with Competitor-Based Formula Pricing Clauses" (1989) 17 Hofstra L Rev 599; Jonathan B Baker, "Vertical

Restraints with Horizontal Consequences: Competitive Effects of "Most-Favored-Customer" Clauses" (1996) 64 Antitrust LJ 517; and Pinar Akman & Morten Hviid, "A Most-Favoured-Customer Clause with a Twist" (2006) 2 Eur Comp J 57.

[64] See generally Andrei Hagiu & Julian Wright, "Marketplace or reseller?" (2013), online: Harvard Business School <http://www.hbs.edu/faculty/Publication%20Files/Marketplace_Reseller_HBS%20WP%2001312014_138e1ae7-e457-4143-b984-249c4a9ca0aa.pdf>.

[65] See Justin P Johnson, "The Agency Model and MFN Clauses" (2014), online: SSRN <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2217849>.

[66] See Andre Boik & Kenneth S Corts, "The Effects of Platform MFNs on Competition and Entry" (2013), online: Yale University <http://economics.yale.edu/sites/default/files/corts_17-oct-2013.pdf>.

[67] See Øystein Foros, Hans Jarle Kind & Greg Shaffer, "Turning the Page on Business Formats for Digital Platforms: Does Apple's Agency Model Soften Competition?" (2013), online: SSRN <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2317715>.

[68] European Commission, Press Release, "Antitrust: Commission opens formal investigation into Amazon's e-book distribution arrangements" (11 June 2015), online: European Commission <http://europa.eu/rapid/press-release_IP-15-5166_en.htm>.

[69] Bundeskartellamt, Press Release, "Amazon abandons price parity clauses for good" (26 November 2013), online: Bundeskartellamt<http://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2013/26_11_2013_Amazon-Verfahrenseinstellung.html>; and Office of Fair Trading, Press Release, "OFT welcomes Amazon's decision to end price parity policy" (29 August 2013), online: The National Archive <http://webarchive.nationalarchives.gov.uk/20140402142426/http://www.oft.gov.uk/news-and-updates/press/2013/60-13>.

[70] Competition Commission, *Private Motor Insurance Market Investigation: Provisional findings report* (2013), online: The National Archive <http://webarchive.nationalarchives.gov.uk/20140402161338/http://www.competition-commission.org.uk/assets/competitioncommission/docs/2012/private-motor-insurance-market-investigation/131217_summary.pdf>.

[71] Bundeskartellamt, Press Release, "Online hotel portal HRS's 'best price' clause violates competition law – Proceedings also initiated against other hotel portals" (20 December 2013), online: Bundeskartellamt <http://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2013/20_12_2013_HRS.html>; Office of Fair Trading, *Investigation into the hotel online booking sector*, online: The National Archives <http://webarchive.nationalarchives.gov.uk/20140402142426/http:/www.oft.gov.uk/OFTwork/competition-act-and-cartels/ca98/closure/online-booking/>; and European Commission, Press Release, "Antitrust: Commission announces the launch of market tests in investigations in the online hotel booking sector by the French, Swedish and Italian competition authorities" (15 December 2014), online: European Commission <http://europa.eu/rapid/press-release_IP-14-2661_en.htm>.

[72] *United States v Apple Inc*, 952 F Supp (2d) 638 (SD NY 2013) [*Apple*]. The European Commission had earlier investigated Apple and four

major publishers for the same activities and found them to have engaged in coordinated behaviour to raise prices. The Commission obtained commitments from the parties to terminate the agency agreements and to not use MFN clauses for five years. See EC, Commission Decision (2012) 9288; Case COMP/AT.39847-E-BOOKS, online: European Commission <http://ec.europa.eu/competition/antitrust/cases/dec_docs/39847/39847_26804_4.pdf>.

[73] Apple is currently appealing the case. See Philip Elmer-DeWitt, "They laughed at the DOJ's e-book antitrust case against Apple" Fortune (15 December 2014), online: *Fortune* <http://fortune.com/2014/12/15/mondays-e-book-antitrust-appeal-hearing-went-well-for-apple/>.

[74] See Geoffrey Manne, "Why I think the Apple e-books antitrust decision will (or at least should) be overturned", *Truth on the Market* (22 July 2013), online: Truth on the Market <http://truthonthemarket.com/2013/07/22/why-i-think-the-apple-e-books-antitrust-decision-will-or-at-least-should-be-overturned-2/>.

[75] *Apple*, *supra* note 71 at 663.

[76] See Hagiu & Wright, *supra* note 63.

[77] *Apple*, *supra* note 71 at 658.

[78] *Amex*, *supra* note 52 at 25.

[79] Although Visa and MasterCard converted into corporations and are no longer not-for-profit platforms, there are still many platforms that exist as not-for-profits. For example, France's national payment card network, Groupement des Cartes Bancaires CB, is organized as a not-for-profit association. See "What is CB?", online: Cartes Bancaires CB <http://www.cartes-bancaires.com/spip.php?rubrique50>. Another example is the Toronto Real Estate Board. The Board consists of licensed real estate brokers and operates an online real estate listing platform, the Multiple Listing Service, on behalf of its members. See "Who We Are", online: Toronto Real Estate Board <http://www.torontorealestateboard.com/about_TREB/who_we_are/index.htm>.

[80] See David S Evans & Richard Schmalensee, "The Industrial Organization of Markets with Two-Sided Platforms" (2007) 3 Comp Pol'y Int'l 151 at 174.

[81] This is not to argue, however, that platforms should be allowed to collude on one side of a market merely because they may compete away the monopoly profits, since the monopoly profits may not be competed away entirely, but merely that a collusive agreement would be more difficult to maintain in the case of a two-sided market.

[82] The fear that the iBookstore would not have a sufficient amount of customers because of the publishers raising prices through their cartel was the reason that Apple included price caps in its agreements with the publishers. If it did not have to be concerned about the effect on the other side of the market, Apple would have had an incentive to let the publishers raise prices as high as they wanted since it was receiving a part of the monopoly profits. See *Apple*, *supra* note 72 at 659.

[83] For example, since readers place little value in ads, a newspaper could extract monopoly profits from advertisers and not have to worry about the effect this would have on the value of the platform.

[84] In *Apple*, the existence of the agency agreements made the U.S. DOJ's theory

of harm more plausible because they provide an explanation for how Apple could profit from an upstream cartel.

[85] See Andrew I Gavil, William E Kovacic & Jonathan B Baker, *Antitrust Law in Perspective: Cases, Concepts and Problems in Competition Policy*, 2d ed (St. Paul, MN: Thomson/West, 2002) at 235-36.

BEWARE BUSINESS FADS: DISRUPTIVE INNOVATIONS AND COMPETITION POLICY

Joshua Gans[1]
University of Toronto

Business has its fads. Most of the time these involve changes in management practices — re-engineering the corporation, total quality management and the like. But occasionally they move beyond firm boundaries. A couple of decades ago, it was all about outsourcing and supply chain management. But since the late 1990s, and especially alongside the evolution of the commercial internet, the fad de jour has been disruption.

Disruption is seemingly everywhere and happening to everything. And like all such things it is a coin with two sides. On one side is a notion that would warm a competition regulator's heart: disruptive entrepreneurs are all about unleashing new technologies to bring down sleepy incumbents. On the other side, are the incumbents themselves. Disruption holds that they have never been more vulnerable; just a few ounces of complacency away from doom.

Combine these two sides and competition regulators and the laws that house them are themselves argued to be disrupted. When entry is free, often and strong and incumbents are petrified, those promoting competition through regulation can go home. There is simply no more than they can do. At least, that is what the direct implication of the disruption notion would imply.

However, like all fads, while there is a grain of truth at their heart, I will argue here that, fundamentally, little has changed. Indeed, once we unpack what we know about disruption and combine it with some hard-headed economics, we see that the role for competition regulators is as strong as ever and, surprisingly, how they go about their business is as traditional as it has ever been. The plan for this paper is as follows. First, I outline the main theory of disruption as provided by Clay Christensen. Next, I relate it to what is traditionally known from economic theory before turning to look at the evidence for disruption. I then explain how the evidence suggests that not much has changed for competition authorities and they still have an important role. I conclude by mentioning some issues in relation to the nascent sharing economy.

Le monde des affaires n'échappe pas aux modes. Le plus souvent, elles prennent la forme d'un changement de style de gestion : réingénierie de l'entreprise, qualité totale, etc. Parfois, ces modes dépassent les frontières des entreprises. Il y a deux ou trois décennies, l'externalisation et la gestion de la chaîne d'approvisionnement étaient sur toutes les lèvres. Depuis la fin des années 1990, et particulièrement depuis l'arrivée de l'Internet marchand, c'est la théorie des innovations perturbatrices qui retient toute l'attention.

Il existe deux côtés à cette théorie, qui semble s'appliquer à tous les secteurs. Le premier est celui des entrepreneurs créatifs et des autorités de réglementation de la concurrence : les innovations perturbatrices permettent de remplacer des entreprises établies devenues nonchalantes. Le second est celui de ces mêmes entreprises. En théorie, ces victimes sont responsables de leur malheur, leur absence d'innovation les ayant rendues particulièrement vulnérables au changement.

Résultat : les autorités de réglementation et les lois qu'elles appliquent auraient elles aussi besoin d'innovation. Selon la théorie, on pourrait même croire qu'étant donné la facilité d'accès au marché et l'immobilisme des entreprises établies, les autorités chargées d'encourager la concurrence au moyen de règlements sont totalement dépassées et n'auraient qu'à aller se rhabiller.

Comme toutes les modes, celle-ci est partiellement fondée. Toutefois, dans cet article, je vais tenter de démontrer que bien peu de choses ont véritablement changé. En effet, en comparant ce que l'on sait des innovations perturbatrices à des données économiques, on constate que le rôle des autorités de réglementation est aussi important que jamais et, étonnamment, que leur façon de procéder est aussi traditionnelle que jamais. Dans cet article, j'aborde les points suivants. Je commence par un aperçu de la théorie des innovations perturbatrices de Clay Christensen, puis la compare à la théorie économique traditionnelle. J'examine ensuite les effets des innovations perturbatrices et explique pourquoi tout indique que les choses ont très peu changé pour les autorités de réglementation, et pourquoi leur rôle demeure important. Pour conclure, j'évoque certains points relatifs à l'économie du partage naissante.

I. The Original Christensen View

The disruption movement, if it can be called that, began with the work of Clay Christensen. The Harvard Business School professor wrote a book titled *The Innovator's Dilemma*, which tried to look at why great firms failed.[2] Of course, it was well known that firms that had been great could see their glory days over and then succumb to competitive pressures. But Christensen argued that instead what could cause great firms to fail was when they followed precisely the principles of good management that MBA professors would argue they should follow. Take, for instance, the notion that you should listen to your customers when deciding which new products to pursue and launch. Christensen argued that this was a good idea if the new product innovations built on or sustained what your customers' valued.[3] But what if this was not the case? When Blackberry's customers saw the iPhone in 2007, they did not push the company to produce a similar product. Why? Because it had no keyboard and if there was one thing that Blackberry users loved, at least at the time, was the Blackberry's keyboards. As it turned out, that never changed

but, in the process, Blackberry's maker, Research In Motion ("RIM") failed to move quickly enough on the real opportunity from iPhones and then Android smart phones—an operating system and ecosystem that generated large numbers of apps.[4]

In many ways the story of Blackberry is a poster child for the disruption movement—now worth less than a tenth of its market value from its peak in 2010. But there were others including Encyclopedia Britannica ("Britannica") and Blockbuster Video ("Blockbuster"). What was important was the message: even well-managed companies were not safe. There existed innovations that were disruptive in that they came at established firms seemingly out of nowhere. To be sure, RIM, Britannica and Blockbuster all knew, investigated, and considered the innovations that were later held to be their demise. Britannica, for instance, was a leader in online digital encyclopedias as early as 1996 while Blockbuster launched video-on-demand over the Internet as early as 2000. In each case, these moves undermined their existing business models and were quickly discarded. In the meantime, new entrants took the charge absent these internal conflicts. The end result was history.

The notion that incumbent firms might face weaknesses in the face of innovative entrants had been considered before Christensen. Joseph Schumpeter had famously identified the waves of creative destruction that drove capitalism although he was ultimately pessimistic and believed that powerful large firms would end up stifling that process and along with it, innovation.[5] What Christensen brought to the table was a more nuanced approach.[6] Not all innovations would be the death knell of incumbents—only ones that were disruptive. And those innovations had two characteristics. First, they tended to make design trade-offs that offered lower performance on key metrics incumbents and their customers valued. Thus, they appealed to niche or underserved consumers initially. Incumbents chose to ignore those because they tended to be at a lower end of the market.

But this was only the first element of a disruptive innovation. The second was that the innovations had a trajectory of improvement on precisely the metrics that mainstream customers valued. According to Christensen, incumbent firms who sensibly ignored those innovations when they first appeared found themselves facing entrants with more competitive products after just a short time. In his book, he argued that, by the time all that happened, it was too late for the incumbent firms. They would be disrupted.[7]

To support this theory, Christensen offered up numerous cases, the most famous of which was the hard disk drive industry. That industry

had its origins in the 1960s with pioneering efforts by IBM for its mainframe computers before smaller disk drives took off for mini-computers in the 1970s. Christensen's study began when Control Data Corporation ("CDC") was the largest independent maker of 14-inch drives for mini-computers. However, throughout the 1970s and 1980s there were several successive step changes in hard disk architecture. In each case, the physical size of the disks fell (to 8 inch, 5.25 inch, 3.5 inch, 2.5 inch, 1.8 inch, etc.) but at the cost of capacity. Not surprisingly, for incumbents at each stage, when they explored a smaller drive with their customers, those customers claimed they were not interested. However, as ultimate consumers moved from mini-computers to personal computers and then to laptops, smaller size had some obvious benefits. Christensen showed that, in most cases, newer sized disk drives were brought to market by new entrants rather than existing incumbent market leaders.[8]

Christensen then went further and argued that those market leaders themselves failed as a result of this competitive pressure. However, while that certainly did happen on one occasion as Seagate Technology ("Seagate") managed to win against CDC, as we will see, the pattern of creative destruction did not appear as strong as Christensen had maintained. This is important because what made Christensen's book "scary" to people such as Intel's Andy Grove was the notion that incumbents were more vulnerable than they thought. Even with good management, Christensen had argued that they could be felled by disruptive innovation.[9] Moreover, from an antitrust perspective, innovation dynamics were spurring a high degree of competition in such industries and hence, antitrust authorities, so it was argued, should leave those industries be. However, if, instead, it was the case that all the innovation-based entry did not lead to a rapid change in market leadership of incumbents, the role of antitrust regulators could be much more important.

II. What Does Economic Theory Say?

At its essence, disruption theory involves a simple set of relationships. First, a disruptive event occurs—which is usually the emergence of an innovation or technology that is, for want of a better term, a bad fit with what incumbents in the industry are doing. Second, incumbents pass on developing that new technology due to internal conflicts while entrants, who do not face such conflicts, take the charge. Third, the entrants do so well that they end up being a competitive threat to incumbents. Fourth, the incumbents fail to catch the entrants and so lose leadership and, ultimately, much more. From the perspective of the role of competition theory, it is this last stage where all of the action

is. If it is true that entrants can outpace incumbents to the latter's doom, then competition is working well without a regulatory hand. If that is not true, then we cannot presume that competition—which might translate technological leadership into market leadership—is working as it should.

It is worth noting that the first three stages of disruption theory have a long-standing basis in economics. Beginning with the work of Kenneth Arrow,[10] economists have long tried to understand the differing incentives of incumbents and entrants to innovate. Arrow noted something interesting in this regard. If a new entrant were to enter a market on the basis of a new innovative product, what it would receive as a reward were the profits from that product. By contrast, suppose an incumbent, already in the market, were to think of launching a new product. What it would receive would be the profits from that product but it would also lose profits from the previous generation of the product. Thus, what fundamentally distinguishes an incumbent and an entrant in thinking about whether to put forward effort to generate new and better products is a difference in their (net) rewards from that activity. For the exact same product, the incumbent's reward is lower than that of the entrant precisely because the product will replace what the incumbent already is earning. This replacement effect suggests that, to some extent, all new innovations do not "fit" with incumbents in the same way they do for new entrants. Thus, in the absence of other frictions, we may see entrants being more likely to bring innovations to market than incumbents.

This example presumes quite a bit of symmetry in the opportunities facing the incumbents and entrants. In reality, if you want to improve a product rather than, say, launch a new product completely, an incumbent has an advantage. This is because in order to get the new improvement to market, the incumbent already has an existing product to work with. By contrast, an entrant, to be an effective competitor, has to supply a product and in addition, improvements and all. Thus, we could presume that for many innovations, the costs to the incumbent of developing that product are lower than those of entrants.

Disruption theory emphasizes this type of thing by focusing on the notion that only certain types of innovations will be disruptive—in short, of the type that entrants do not have a big cost advantage relative to incumbents. To Christensen, coming up with an entirely new disk drive with a distinct physical size was an example of this. Similarly, coming up with a touch-based phone, a digital encyclopedia or streamed video would be something neither RIM, Britannica nor Blockbuster had a particular "technical" advantage in. Therefore, a more nuanced

approach to whether competition is working as it should, would be to consider whether the industry under study was more or less prone to the types of innovations that were disruptive as opposed to being merely sustaining. Importantly, two industries could see high levels of innovation but may be very different in terms of whether practices might be of concern to antitrust authorities.

Which brings us to step 4—the final step. Suppose that, in fact, a new disruptive innovation had emerged and it was brought to market by an entrant who then found itself able to compete with incumbents. Would that be the end for the incumbents? The picture painted by Christensen and the business leaders who subsequently carried the disruption movement was that the answer was yes. Incumbents would be unable to catch the entrants and would subsequently lose their market position. However, economic theory by contrast suggested that was not inevitable and, indeed, that incumbents had tools and incentives to prevent such outcomes.

Faced with existential threat, incumbents have two broad options. The first is, in fact, to meet the threat. One of the features of the disruption theory is that entrants enter but take some time to improve new products to be competitive with incumbents and compete for their primary customers. In other words, built into the theory is time. Moreover, this is not just simply a matter of waiting it out. Entrants have to invest to make their products better but incumbents can similarly divert resources to meet a competitive threat. No better example of this exists than when, in the mid-1990s, having ignored web browsers in a manner consistent with disruption theory, Microsoft realized the threat Netscape posed to its operating system dominance. Bill Gates penned an eight-page e-mail that announced a new division staffed with thousands of engineers that would be devoted to catching up and subsequently outperforming Netscape. It did just that becoming the dominant in browsers with Internet Explorer—at least for a time. Netscape, by contrast, fell out of the market entirely, albeit having led the way.

Why did Microsoft double up its investment in such way? Of course, one reason is that it could. An advantage incumbents have is the ability to marshall resources. But another reason is that it had a preservation incentive. While prior to something like Netscape coming along, Microsoft's incentives may have been muted due to the replacement effect, when such entry becomes inevitable and, by doubling up, the incumbent cannot just meet but neutralize a competitive threat, its incentives switch. In this situation, while Netscape's reward from continual innovation was a foothold in competition with Microsoft;

Microsoft's reward was to continue to hold on to its monopoly rather than face permanent competition. In this case, the difference in profits between monopoly and competition is greater than the profits in competition itself and so Microsoft's reward from innovation is relatively higher. The end result was that when a threat became existential while an entrant's entry is not permanent, incumbents had a stronger incentive to devote more resources to innovation to preserve their market dominance.

Doubling up in this way is not only a highly competitive response but is also a costly one to incumbent firms. That leads to the second option they may have—to acquire the entrant. To an antitrust lawyer that seems like a fairly obvious response. It is also obvious to an economist. After all, so long as it is permitted, a merger that can diminish competitive pressure is in the interest of both the incumbent and the entrant concerned.

Then why was it not given weight by the disruption movement? Christensen emphasized that by the time the incumbent realised that acquiring the entrant was a good move, it would be too late. The entrant would already have market leadership in its sights and so acquisition may be too costly for the incumbent—indeed, it may be unaffordable. In addition, Christensen argued that integration of the two firms would not get rid of the issues the incumbent had in promoting and developing the new disruptive technology. He argued something similar in relation to the incumbent's ability to catch up by doubling up investment.[11]

Thus, the question regarding the relevance of competition policy in the face of disruption can move up one level. It hinges not only on the incumbent's incentive and ability to respond to the entrant but also on whether it can do so either by doubling up on investment in response, or by undertaking an acquisition. If these are too costly or too late, as Christensen suggests, then the new entry will be successful in overturning incumbent leadership and competition authorities can relax. On the other hand, if they are neither costly nor late, and are viable options to protect incumbent leadership, competition authorities have a role to play. What role? That needs to be discussed. However, before considering that let me turn to the evidence on whether disruption really does leave incumbents flatfooted.

III. What Does the Evidence Say?

While there are certainly examples where firms that seemed to have an unassailable market position, fell from grace, the question is whether an industry can be prone to disruption over the long-term

so that we can relax about competitive forces operating in a socially beneficial way. As already noted, Christensen identified that hard disk drive industry as an example of an industry prone to disruption. For that reason, it has received much attention from economic researchers over the last couple of decades. As I will highlight here, the picture painted is somewhat different from that of Christensen although it is consistent with the incumbent response to incumbent as highlighted by economic theory.

As a starting point, it bears repeating that, for the most part, Christensen was correct when he showed that for large step-size changes in hard disk drive configurations, it was entrants rather than incumbents who brought the new innovations to market first.[12] A recent study by Mitsuru Igami highlighted why.[13] He examined the move from 5.25 inch drives to 3.5 inch drives. The 3.5 inch drives would become the most popular drives ever for personal computers and laptops. But actually this drive took some years to be introduced. For a few years, it was exclusively supplied by new entrants before being successfully promoted by Conner Peripherals, another entrant, who came to dominate the 3.5 inch segment in its early years. Igami examined why it was that the market leader in 5.25 inch drives, Seagate, took so long to enter that segment. He found that, consistent with disruption, Seagate were concerned about the replacement effect explaining about two thirds of their delay. Interestingly, he also found that Seagate had a cost advantage that translated into the new segment—something that could have accelerated its entry but also gave it something more to protect in terms of existing margins. This serves to reinforce the role of entrants in bringing new innovations to market.

That said, apart from one instance—the move from 8 inch to 5.25 inch drives—in general, the incumbents ended up catching up by investing more heavily in the new designs when they found themselves under competitive pressure. In other words, the displacement predicted by step 4 of disruption theory did not come about. Instead, both doubling up on investment and acquisition were demonstrable incumbent responses in this industry.

On doubling up, incumbents generally caught up with entrants by investing more heavily than them in new designs after they entered the market. Josh Lerner found that the late-comers to a new segment (that is, the leaders in the previous segment) ended up being the market leaders again after a short time.[14]

Similarly, acquisition played an important role in the industry. Following its successful leadership in the 3.5 inch segment, Conner Peripherals was acquired by Seagate in 1993 during the period when

Seagate had finally started to catch them in that segment. That process was part of an ongoing consolidation that had seen Seagate purchase Control Data Corporation in 1989 (the incumbent it did displace when it introduced the 5.25 inch drive) and over the next two decades, acquisition was the main form of exit for new entrants in the industry. Later Seagate bought Maxtor in 2006, Samsung's drive division in 2011 and LaCie in 2012. Maxtor itself had been an acquirer of competitors including MiniScribe in 1990 and Quantum in 2000. All told, Seagate was responsible for the exits (directly or indirectly) of nine of its rivals by acquisition.

This is well-known in antitrust circles. It is only a few years ago that the industry went from 5 to 3 players in a short period of time due to the Seagate-Samsung and Toshiba-Hitachi set of mergers. In those cases, antitrust authorities were concerned about the reduction in competition but also on a potential reduction in Research & Development ("R&D") expenditures and so placed conditions on the mergers to ensure those reductions did not take place.

But our understanding of this industry has now been aided by a 2015 study conducted by Mitsuru Igami and Kosuke Uetake.[15] They took historical data from the industry to develop a model to see if permitting those final two mergers was a good idea or not. On the static side, what they found is that compared to mergers in the past, these mergers had relatively large effects. In particular, they likely led to a large reduction in consumer welfare while at the same time also generating substantial realized efficiencies. In the past, both of these effects had been dampened by smaller scale. Nonetheless, even though the effects became large, they balanced each other out. What was more interesting was what the likely impact of a long term merger policy would have been on the industry. For instance, suppose that antitrust authorities blocked mergers that reduced the number of competitors below 5. If this had been the policy 15 years ago, it would have reduced the rate of R&D because it would actually encourage some firms to exit the industry. Specifically, firms that might otherwise have stayed in longer to find a merger partner, leave and with them goes any innovations they may have produced. The end result of this is that while the R&D rate did not vary much when the industry moved from 5 to 3, had a 5 threshold been the policy, it would have slowed R&D earlier in the industry lifecycle.

IV. How Should Competition Authorities Approach Disruption?

What has been demonstrated is that disruption theory does not imply that competition authorities can be relaxed and presume that

industries will have a natural matching of technological leadership with market leadership. In fact, the two can be divorced and, in some cases, the instrument of that divorce can be practices that are often assessed by competition authorities. That said, like all innovation, because there are dynamic issues associated with an industry, the analysis of those practices requires care.

For example, when we look at mergers we tend to consider them one case at a time. However, when dynamics and innovation play a role, the case by case approach may not be appropriate.[16] This is because the strength or tenor of the merger policy will have an impact not just on the present case at hand but also on the prospects for future mergers.[17]

To see why this matters, suppose that in an industry two firms wish to merge. Using static analysis, we can assess the likely impact on prices and hence, consumer welfare. We can also examine whether there may be any efficiencies from the merger. But the impact on innovation is more subtle. To be sure, competitive pressure to innovate will disappear between the merging parties but may also change for others from that.

That, however, is not all that will happen. This is because the prospects for future mergers being permitted or not will also have changed. That will impact on their likelihood and also have an impact on what determines innovation prizes into the future. The hard issue is: in what way?

As it turns out there are competing effects and no amount of introspection can resolve them. A more permissive merger policy will make mergers more likely. On the one hand, when mergers are more likely, that may reduce innovation competition and so cause innovation rates to fall. On the other hand, mergers may themselves be part of the prize—for instance, you are going to be a more attractive merger partner if you have innovated more and so you can expect to get more of the share of gains from mergers. This effect may mean that more permissive merger policy may spur innovation. Which effect dominates is hard to say.

These sorts of issues tax competition authorities and make analysis difficult. This is especially the case when industries are undergoing disruptive change. In that situation, regulators may be concerned that inaction today may, rightfully, lead to problems later on. Hence, increasingly, there is earlier investigation and advice to government in general coming from competition authorities.

V. Conclusion

A good example of this is in relation to what is currently termed "the sharing economy." These are the new entry into industries such as hotels and taxi/limo services that have been facilitated by digital technology that can match under-utilized resources with consumers. Indeed, this highlights a two-element definition of the sharing economy: (i) that there are individuals who own key assets (such as cars or dwellings) and (ii) that there exists a market platform to match those individuals with consumers. Element (i) isn't something that is new but element (ii) is which is what makes all this currently relevant. Basically, mobile technologies allowed temporal agglomeration issues for suppliers to be overcome so that, for instance, a supplier could signal their availability and location in real time. In many respects, this is a business fad all on its own.

Regulators, competition and beyond, are concerned about these new developments. The first concern is consumer safety. There are existing regulations concerning the ability of individuals to make available their assets due to concerns about consumer safety (at least that is how they are posited these days). Those concerns have not gone away. But the very fact that new markets have arisen without such regulations gives us pause to wonder whether they are necessary. Uber, AirBnB all should have failed if the regulations were making transactions safe. They did not fail because those platforms substituted public regulation for private regulation. Uber and AirBnB are some of the most regulated eco-systems in the world. The problem we have is compatibility between the public and private regulations not any fundamental disagreement that they should exist *for their intended purpose*.

The second concern is with respect to market power or dominance, should the private platforms emerge into a dominant platform in the future. To be sure, that is exactly what happened under the system of public regulation. Because of that only large scale entry could overturn the existing system. Like George Orwell's novel *Animal Farm* portrays, the danger is that we turn one monopoly into another. If the new platforms write the public regulatory rules, there is a concern that we could have that situation.

In this situation to foretell a danger competition authorities need the equivalent of canaries in a coal mine. One reason to be optimistic is that a certain form of competition is baked into the system. For instance, if Uber and Lyft drivers are *not* employees, they cannot be compelled to work. A feature of Uber is that drivers are free to come in and out of the system. Alongside that, they are currently free to come into and out

of the Uber platform. Their ability to "platform shop" disciplines the power of platforms.

There are also risks. Consider a situation where drivers must be licensed but that Uber, for example, takes on the costs of licensing the drivers and ensuring the cars are serviced. In return, they require exclusivity to Uber. Then we potentially have the seeds of a problem. Instead, we want to ensure that drivers can fulfill these requirements in an independent way to avoid such tying. It should not matter as, one way or another, the market will compensate them for the costs. The sharing economy is important. It could re-write how we, for instance, deal with transportation. But it needs a competitive foundation.

Endnotes

[1] Thanks to Thomas Ross and participants at the Canadian Bar Association Workshop in September 2015. All views remain my own. Correspondence: joshua.gans@gmail.com.
[2] Clayton M Christensen, *The Innovator's Dilemma* (Harper Business: New York, (1997)).
[3] *Ibid* at xv.
[4] For more information on the precise story, see *The Disruption Dilemma*, MIT PRESS [forthcoming in 2016] [Gans (2016)].
[5] Joseph A Schumpeter, *Capitalism, Socialism and Democracy* (New York: Harper, 1942).
[6] In fact, Christensen was, not the only one. Rebecca Henderson and Kim Clark posited a supply-side theory that focused on innovations that would be hard for incumbents to develop and sustain. *See ibid* for more details.
[7] Christensen, *supra* note 2 at xi.
[8] Christensen, *supra* note 2 at 23.
[9] Christensen, *supra* note 2 at xviii.
[10] Kenneth J Arrow, "Economic Welfare and the Allocation of Resources for Invention," in Harold M Groves, ed, *The Rate and Direction of Inventive Activity: Economic and Social Factors* (Cambridge: National Bureau of Economic Research, 1962) 609–26.
[11] Christensen, *supra* note 2 at 77.
[12] The exception was the 2.5 inch drive.
[13] Mitsuru Igami, "Estimating the Innovator's Dilemma: Structural Analysis of Creative Destruction in the Hard Disk Drive Industry, 1981-1988" J Pol Econ, (forthcoming, 2015).
[14] Josh Lerner, "An Empirical Exploration of a Technology Race" (1997) 28:2 The RAND J Econ 228.
[15] Mitsuru Igami & Kosuke Uetake, "Mergers, Innovation and Entry-Exit Dynamics: The Consolidation of the Hard Disk Drive Industry (1996-2005)," Yale University (SSRN), (15 October 2015) online: <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2585840>.
[16] See Ilya Segal & Michael D Whinston, "Antitrust in Innovative Industries," (2007) Am Econ Rev, 97: 1703-30; Joshua S Gans, "When is Static Analysis a Sufficient Proxy for Dynamic Considerations?: Reconsidering Innovation

and Antitrust," (2010), in J Lerner and S Stern (eds), 11 *Innovation Policy and the Economy* 1703; and Joshua S Gans & Lars Persson, "Entrepreneurial Commercialization Choices and the Interaction between IPR and Competition Policy" (2013) 22:1 Ind Corp Change, 131-151 for more discussion.

[17] For an interesting perspective on disruption and competition policy enforcement see Alexandre de Streel & Pierre Larouche, "Disruptive Innovation and Competition Policy Enforcement", Note, Organisation for Economic Cooperation and Development (OECD), DAF/COMP/GF(2015)7 (20 October 2015), online: <http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP/GF(2015)7&docLanguage=En>. Their paper views mergers as a potential hindrance to disruptive processes and argues that competition authorities need to be vigilant. As will be argued here, the dynamic trade-offs are somewhat more subtle.

THE INNOVATION DEFENCE

Mihkel Tombak, Ph.D.[1]

HATCH Professor of Technology Management and Strategy; Chair, Department of Management, University of Toronto-Mississauga, Institute for Innovation and Management University of Toronto

Innovation effects of alleged anticompetitive behaviour are being considered in a significant number of cases. The process should involve competition regulators assessing a tradeoff between allocative and dynamic efficiency. Those innovation effects can be used both in defence of firms' actions and in challenging anti-competitive activities. Such effects need to be carefully examined on a case by case basis as they depend on: the type of antitrust behaviour; the history of the industry; the nature of innovation; and, the economics of innovation in that market. With disruptive technologies a "natural" dominance may evolve and this implies that restrictive trade practises deserve greater scrutiny. In merger reviews, a history of accumulated incremental innovation with long term projects and substantial scale economies in R&D should lessen competition concerns but regulators should be wary of alleged efficiencies that lower R&D budgets. This involves looking beyond measures of concentration to the roles different sized firms play in bringing innovations to market.

Plusieurs affaires portant sur des allégations de pratiques anticoncurrentielles font état de conséquences négatives sur l'innovation. Dans le cadre de telles causes, les autorités de réglementation de la concurrence doivent trouver un équilibre entre une allocation optimale des ressources et un progrès dynamique. Ces conséquences sur l'innovation peuvent être utilisées par les entreprises pour défendre leurs actions et pour combattre des accusations de pratiques anticoncurrentielles. Ces conséquences doivent toutefois être examinées de très près, au cas par cas, car elles dépendent du type de mesures antitrust, de l'historique du secteur, de la nature de l'innovation et des principes économiques régissant l'innovation dans le secteur. La présence d'innovations technologiques perturbatrices peut placer certaines entreprises en situation de domination « naturelle » nécessitant un examen approfondi des pratiques commerciales restrictives. En matière d'étude des fusions, un historique d'accumulation d'innovations cumulatives associé à des projets à long terme et à des économies d'échelle en recherche et développement devrait diminuer la pression de la concurrence. Toutefois, les autorités de réglementation devraient se méfier des diminutions de budget de R et D attribuables à de prétendus gains d'efficacité. Il faut donc aller au-delà des mesures de concentration et considérer les rôles joués par des entreprises de différentes tailles dans l'introduction des innovations sur le marché.

I. Introduction

The importance of innovation to economic growth has grown prominent in the consciousness of the political leadership of most of the developed nations in the past few decades leading to policies encouraging an innovation eco-system. This innovation fostering political agenda has not gone unnoticed by those facing antitrust action. Some antitrust remedies have been countered by what can be described as the "innovation defence" — that the enforcement of antitrust laws would be detrimental to the process of innovation and thereby impede economic growth. Antitrust authorities are also more sensitive to innovation effects in justifying challenges to mergers. Gilbert and Weinschel report that in challenges to mergers by the U.S. Department of Justice (DOJ) and the Federal Trade Commission (FTC) in the United States citations of innovation effects had risen from about 3% of cases in the early 1990s to 38% of cases in the early few years of this century.[2] It is these innovation effects that we will examine in this Study — when, and under what conditions, such an Innovation Defence (or Challenge) might have merit.

There are at least two economic features of innovation which suggest that the defence has merit. First, radical innovation creates fast changing environments creating new markets and destroying the boundaries of old markets — rendering antitrust action moot. There are many examples of this, such as the example of the MS Media player decision of 2003 and the rapid ascendancy of iTunes in 2004/2005. More recently, examples may be found in the Google case and the ongoing case in hotel booking websites. The fundamental question that this feature of innovation creates for antitrust economics is: should the economic basis for competition policy shift from enlarging allocative efficiency to ensuring dynamic efficiency?

The second feature of innovation, and perhaps the economically more important one, is incremental research and development ("R&D")'s slow and steady march improving the quality, features, cost effectiveness of existing products and services. An example of this is the automobile industry's prodigious investments in improving the fuel efficiency of the cars produced. For more than a decade the industry has improved fuel efficiency of its automotive products at an average rate of just over 2% per annum.[3] This form of innovation was material in the 1982 case of *United States v AT&T Co.*,[4] the 2000 ruling by Judge Thomas Penfield Jackson against Microsoft[5] and, the changes in antitrust legislation allowing for research joint ventures. This feature of innovation requires a re-examination on the basis of new studies of

a decades old debate on market power and firm size and its effect on R&D.

Those studying the economics of innovation and antitrust economics have often posed this as a deep rooted problem pitting Schumpeter (1942) (who is accredited with the term "creative destruction")[6] against Arrow (1962).[7] While their analyses came to two different conclusions as to which market structure fostered innovation to a greater extent — Arrow on the side of more competitive markets, Schumpeter on the side of less aggressive competition — one has to keep in mind the different situations they were modelling. Arrow posed the question of an inventor (who could be external to the industry) who has developed a cost reducing technology, licensing it to firms in an industry, and whether that inventor would prefer that industry to be more or less competitive.[8] In other words, the invention came from outside the industry as an exogenous shock. Schumpeter's starting point was that the innovation comes from within the industry, requiring R&D investment and (assuming that the likelihood of innovation was positively correlated with R&D investment size) examining under what market conditions would one see greater R&D investment.[9] So here again, the answer and the type of analysis conducted depends on the source and the type of innovation.

In what follows we will examine each of these types of innovation in greater detail with a particular focus on the economic aspects that relate to competition policy. We survey the literature in the economics of innovation to glean from it the knowledge that could provide some guidance to competition authorities and those advising firms on competition issues.

II. Disruptive Innovation — The Creation of New Markets and the Destruction of Old

In this type of innovation described by Schumpeter as "creative destruction" new products are introduced which replace old products. Clearly, consumers must perceive some advantages in the new product which creates the incentive to switch buying patterns. New consumers may enter the market as they find value in these new products. Furthermore, existing consumers find new uses for the product through additional features that the new products may offer. Thus additional consumer surplus can be generated.

How do we recognize such technologies? There are detailed case studies which describe how superseding technologies are often introduced to the marketplace by newer players rather than the existing dominant firms in the old market.[10] Thus an economic feature of this

type of innovation is "churning" in the industry. Foster finds that early indicators are that: prototypes technically outperform the early versions of the existing technology; the new technologies have higher R&D productivity rates; and the practical limits to their technical performance exceeds that of the older technology. For later stage technologies, disruptive technologies are getting some consumers to switch and appeal to most of the new consumers. Figure 1 below illustrates some of the basic economics of the introduction of new technologies.

Figure 1
The welfare impact of the creation of new markets

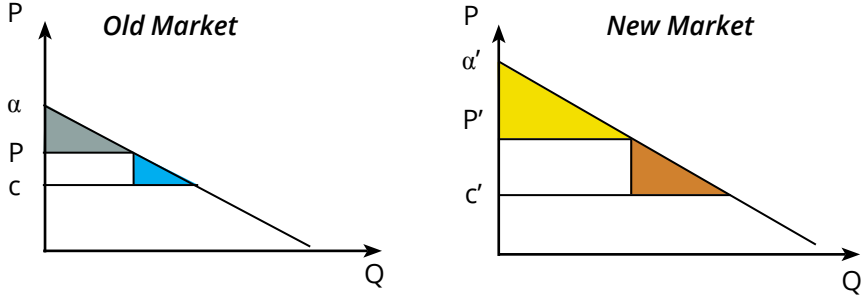

Figure 1 above shows the demand, (constant) marginal cost, prices, Consumer Surplus and Deadweight Losses for an "Old Market" and the "New Market" created by a superseding product. The innovation could involve a reduction in costs (from c to c′) and, as illustrated, it creates more value to the consumer so the demand intercept shifts from α to α′. This increase in value to the consumer may increase price (as illustrated, from P to P′) or such an increase in price could take place through a change in market structure. Cases can easily be constructed whereby the Consumer Surplus (and Total Surplus) has increased going from the Old Market to the New Market despite increases in price and increases in Deadweight loss. How do the above features affect Competition Policy? In most countries this policy has focused on restricting moves by firms that would restrict the Consumer Surplus in existing markets (the blue triangle in the above, Old Market diagram) or restricting the Total Welfare (the grey triangle together with the rectangle below it). This type of innovation suggests that the goal of Competition authorities should be to prevent actions of firms that inhibit the creation of the new market with its corresponding larger Consumer Surplus (the yellow triangle) and Total Welfare (the yellow triangle and the rectangle below it).

This suggests an interesting question — how much larger does the new market need to be to compensate for a (possible) more adverse market structure? Let us examine a worst case scenario where the old market was perfectly competitive and it is replaced by a new market which is monopolized. To make the situation even worse, let us say that there are no efficiency gains (C = C′). With the above linear demands for the new market to generate greater Consumer Surplus α′ would have to be greater than 2α — C. In other words, the new market would have to be about double the size of the old market or more. Using a Total Welfare standard α′ would have to be greater than $(2/\sqrt{3})\alpha - (2/\sqrt{3} - 1)c$ which implies that the new market need be more than about 15% larger than the old market. Both conditions are conceivable with the Consumer Surplus standard being more stringent.

This puts competition authorities in a rather difficult position. With the old competition analysis framework, data on costs, prices and quantities are available and Consumer Surpluses and Deadweight losses are computable. Accepted models for the existing products for which the counter-factuals' prices and quantities can be computed also exist. So the machinery is in place to assess the effects on the existing market of possible anticompetitive acts by firms. With this type of innovation we are asking the competition authorities to consider the impact on a hypothetical situation — the product which is unknown or at least loosely specified, the firms involved may be nascent and the benefit to consumers and ultimate market size being difficult to assess. Quantitative analyses of counterfactual cases have their precedents in competition cases. Estimates of the R&D production function would be more reliable for incremental innovation examined below. As we shall see in the section on dynamics and positive feedbacks, below, the models appropriate for disruptive technologies are relatively nascent. The want of quantitative models of disruptive innovation is not to say that Competition authorities have little to do in such a situation. On the contrary, for the new market to come about, market access for the new firms becomes paramount. Regulations concerning market restrictions then deserve greater study. The new technologies being primarily championed by different players need access to the market. If they were blocked or inhibited by not appearing in searches by potential buyers or, retailers restricted to the sale of certain suppliers' products then the sales growth of even a dominant technology can be slowed resulting in a lack of dynamic efficiency.

An example of such a case is that of *Microsoft Corp. v Commission of the European Communities*[11] where the Commission was concerned about abuse of dominant position in particular with respect to Microsoft (MS)' Windows Media Player product and the interoperability

of similar products with the Windows operating system. In 2003, the Commission reached a preliminary decision, and in March of 2004 ordered MS to, in addition to other penalties, divulge server information necessary for competing networking software to interact fully with Windows desktops and servers within 120 days and to produce a version of Windows without Windows Media Player within 90 days.[12] In April, 2004 MS released a commentary on the ruling which included the statement, "The commission is seeking to make new law that will have an adverse impact on intellectual property rights and the ability of dominant firms to innovate."[13] In October of 2003 Apple introduced version 4.1 of iTunes which included support for MS Windows 2000 and Windows XP. By 2012 iTunes matched the market share in streaming media players of Windows Media Player (iTunes Store has now an approximately 80% market share of music downloads). So it appears that the opening of the market facilitated the penetration of the market by a new technology.

In summary, disruptive technologies are ones where new products supersede old ones and there are clear performance benefits to consumers so that many switch to the new technology and new consumers enter the market opting for the new technology. These new disruptive technologies are often introduced by new suppliers. In this situation, competition authorities need to focus on restrictive trade practices to ensure that these new technologies have access to the market.

III. Incremental Innovation — the Steady Improvement of Existing Products

In this type of R&D existing firms have a clear advantage — a proven track record for commercialization, experience with production and marketing, and access to financial resources as well as (arguably) an incentive to conduct such R&D. A basis to the innovation defence lies in the question of whether there are economies of scale in research and development. This question is not as straightforward as it initially appears. A related issue, and one which concerns antitrust authorities, is the still unresolved debate on market structure and innovation — does market power foster greater investment in R&D? These two issues of firm size and innovation and market power and innovation are often intertwined and often confused.

There have been a multitude of attempts to resolve these issues both theoretically and empirically.[14] The empirical studies are plagued by a common problem in empirical IO studies — endogeneity. On this issue the causality can run in either direction — R&D can result in a firm obtaining both increased size and market power, and that increased size and market power can provide a firm with greater financial

resources with which to conduct R&D. Another problem with the empirical studies in this area are the measures used for innovation — either measures of R&D outputs, such as patents or measures of R&D inputs, such as R&D expenditures. A third issue is how to measure market power. There are many other econometric issues that plague these studies but in at least one well cited empirical study there is the finding that R&D intensity is maximized in a market structure that lies between the two poles of monopoly and perfect competition.[15]

The empirical literature on market structure and innovation is not conclusive but the details of those studies are informative. Again, the difficulties in conducting such empirical work should not be underestimated. Both market structure and innovation variables are endogenously determined with interactions with many other variables. There are industry-specific features which are correlated with both concentration and innovation, for example, technological opportunity or appropriability. The early work in this area — which had mixed results — is surveyed by Kamien and Schwartz.[16] One confounding issue discovered by Lunn (1986) was the different effects of the different types of R&D.[17] His work made a distinction between process and product technologies and he found that there was a positive relationship between process R&D outcomes and a negative but less significant relationship when it came to product innovation.[18]

On the matter of firm size and innovation, some theoretical and empirical justification seems to exist. Theoretically, it appears quite plausible that R&D inputs, both financial and personnel, represent large upfront costs that the institution incurs often well before revenues from the R&D output accrue. The research personnel, being highly qualified and highly specialized, are not readily available on the spot market. The competing alternatives offering tenure make this form of labour a fixed cost. Furthermore, the nature of the activity with longer term projects makes it an activity which is difficult to speed up or slow down. There are theoretical arguments for firm size increasing the technological opportunities available to firms.[19]

An example of this is the testing required for pharmaceutical products. The personnel required are highly-educated medical personnel trained in the treatment of a certain ailment. The health regulators would mandate a certain protocol for the experiment that would require the monitoring of a minimum number of treated individuals of certain characteristics for a minimum amount of time. The average expenditure on research to bring a pharmaceutical product to the market is now in the order of hundreds of millions of dollars.[20] While it is conceivable that capital markets might be able to provide the financial

resources required by smaller firms, the highly specialized nature of the information makes this an investment difficult to assess for the average investor. Consequently, in this industry, an active market in licensing technology between large pharmaceutical firms and smaller biotechnology companies has evolved. While small biotechs still go to the capital markets, the signal given to investors of a licensing deal with a large, well-established pharmaceutical company is an important determinant of the value of the share offering. Debt markets are far less likely to be a mechanism to avoid financial constraints, as Hall showed that leverage has a strong negative relationship with R&D intensity.[21] Retained earnings being a preferred mode of financing R&D gives a distinct advantage to large firms and perhaps conglomerates which may cross-subsidize across divisions.

One argument for large firms has been that with the evolution of an industry further improvement becomes more expensive to the point where only the largest firms within that industry may be able to finance the next generation. One industry where this claim has been made is in aerospace with the oft-cited example being the development of the Boeing 747. It has been contended that in the early 1960s the development of the next generation large-bodied, long-range passenger carrier involved such a large investment that Boeing, the largest airframe producer at the time, risked the company sustainability on one product, the 747. Happily for Boeing, this investment paid off handsomely but there is no doubt that the investment was substantial and required a long-term perspective.

That the size of the firm or its market power may affect the nature, quality and quantity of the research conducted is a notion for which there is some anecdotal evidence from the *United States v AT&T* case and its resulting consent decree. It is claimed that Bell Labs has never recovered from the resulting breakup and it is now largely an internal consulting division of the corporation. Similar claims — that the quality of R&D has diminished with the moderated dominance and size of their parent organizations — have been made of IBM's Watson laboratories and Xerox PARC.

Empirically, the literature on firm size and R&D intensity is mixed (albeit much of it suffering from the econometric problems described above). What follows is an extremely brief survey of this literature. Soete found that R&D as a percentage of sales increased with firm size in some sectors and decreased in other industries.[22] Subsequently, Pavitt, Robinson and Townsend, using employment as the measure of firm size, found that R&D output increased with an increase in firm size.[23] Examining relatively large firms, Bound et al found that

smaller firms among the dataset of large firms and large firms were more research intensive (as measured by patenting) than the medium sized firms.[24] Cohen and Klepper, drilling down to the business units of firms, found a positive relationship between R&D intensity and business unit size due to the larger entity being able to spread the costs of R&D.[25] To summarize this vast literature, there are clearly industry effects, there are the effects of the nature of the R&D activity, there are consequences of R&D appropriability (*e.g.*, patenting) as well as the effects of the details of the organization — all impacting on innovation. To determine the direction and significance of an innovation effect and possible remedies, the details of the case are material.

The area of competition law where the above issues have their greatest impact is in merger regulations and in cases where the proposed remedy involves the breakup of a large corporation. The aforementioned breakup of AT&T, and the proposed breakup of Microsoft by Judge Jackson in *United States v Microsoft Corp*.[26] are examples of such cases. In the *Microsoft DC Appeal* case, the United States was concerned with the abuse of dominant position consisting of predatory behaviour and creating barriers to entry and one of the remedies proposed by Judge Jackson was a breakup of Microsoft.

With respect to merger regulations, the problem is succinctly described by Katz and Shelanski:

> Merger policy's problem: if antitrust enforcement is to promote and not disrupt the benefits of innovation, and if antitrust is properly to account for innovation's effects on market performance over time, to what extent should it adhere to its conventional presumptions regarding concentration in markets characterized by technological change?[27]

As we have shown in the above Figure 1, one can readily generate cases where the "Old Market" may be perfectly competitive while the "New Market" is serviced by a monopoly and yet the welfare — both Consumer Surplus and Total Surplus — is higher under the "New Market". This implies that a simple change in concentration measures may not suffice to challenge a merger. For example, Hall found, after controlling for propensity to merge, that the merger event resulted in increased R&D intensity.[28]

As an example, let us say there is an industry consisting of eight firms — four firms each with 20% market share and four firms each with 5% market share. Such an industry would have a Hershman-Herfindahl Index (HHI) of 1,700. If two of the larger firms were to merge and there is no business "stealing" effect the industry becomes one of three firms with market shares of: 40%, 20%, 20% and four firms with 5% resulting in a HHI of 2,500. Are we really better off in the former market

configuration? A recent study by Agrawal et al is informative for answering this question.[29] This inquiry shows that different sized firms play different roles in bringing innovations to market similar to our Pharmaceutical industry example above. They find that metropolitan areas that have a greater diversity of firm sizes have a greater number of patents registered. The later market configuration in our example has a greater diversity of firm sizes but this is something that the HHI measure is inclined to depict negatively.

In summary, large firms in oligopolistic industries tend to invest large sums in R&D. Consequently, they are capable of taking on large scale projects. They tend to invest more in the R&D process. Competition authorities need to examine the extent to which these factors affect Consumers Surplus and Total Surplus and weigh those against possible new product developments (and their enhancements of Consumer Surplus and Total Surplus) from smaller rivals that may be adversely affected by the presence of a larger competitor. Competition regulators should also take into consideration related licensing markets as evidence that large firms may facilitate smaller firms' access to markets.

IV. Introducing Dynamics into the Analysis — Positive Feedbacks

An early study of the effect of market concentration on innovation was conducted via a detailed case study of the U.S. commercial aircraft industry, thus controlling for industry effects, appropriability and types of innovation by Phillips.[30] He found that a series of innovations exogenous to the industry resulted in a rise in market concentration which, in turn, led to an increase in R&D investment. This success leading to success was a pattern replicated (for more than a decade) by Nortel. Nortel, being a beneficiary of the AT&T consent decree while simultaneously being successful in developing an electronic digital telecommunications switch, became (by a far margin) the largest private investor in R&D in Canada for many years. Success leading to success is an indication of the presence of positive feedbacks in the economics of innovation.

"Positive feedbacks" is an idea championed by Brian Arthur[31] among others. Positive feedbacks occur when there is a closed causal loop where an increase in an input is positively reinforced. In an example of negative feedbacks, with a downward sloping demand function and upward sloping supply functions, greater consumption leads to higher cost supply which negatively feeds back on the demand through higher prices. Many examples of disruptive technologies, however, exhibit positive feedbacks. Network effects are one example of positive feedbacks. Websites which create markets require both large numbers of

buyers and large numbers of sellers. Increases in the number of buyers increase the value of listing an item for sale on that site, which increases the number of sellers and items for sale which, in turn, increases the value to buyers visiting the site. Another example is one where the value to consumers of an operating system on a laptop computer depends positively on the base of consumers who have already purchased such an operating system. In this case, instead of the negative feedback of a downward sloping demand function, previous purchases positively feed back into greater demand. Arthur cites many examples of positive feedbacks with the introduction of new technologies.[32]

The lessons from the economics of positive feedbacks that are relevant for competition policy are: (a) history matters, the systems exhibit path dependence; (b) market dominance is a natural (and can be a welfare superior) outcome of such economic systems; (c) technology lock-in (into possibly inferior technologies); and (d) the models are not good predictors of which technologies/firms will attain dominance. For example, in the aforementioned Microsoft DC Appeals case positive feedbacks help explain why and how MS attained market dominance in operating systems. In fact, Bill Gates has stated that he was cognizant of positive feedbacks and recognized how this would affect the evolution of the product, and he designed firm strategies accordingly.[33] Whether this market dominance comes about through a conscious firm strategy or by simply firms muddling through, positive feedbacks suggest that this is a natural feature of such a market. For competition enforcers such a natural dominant position *per se* should be less of a cause for alarm but does suggest that vigilance for abuse of dominant position should be more significant in such markets.

In Judge Jackson's Statement of Facts at the district court level, he stated the following:

> Microsoft's refusal to offer a version of Windows 98 in which its Web browser is either absent or removable, however, had no such purpose. Rather, it had the purpose and effect of quashing innovation that exhibited the potential to facilitate the emergence of competition in the market for Intel-compatible PC operating systems.[34]
>
> […]
>
> Microsoft threatened to terminate the Windows license of any OEM that removed Microsoft's chosen icons and program entries from the Windows desktop or the "Start" menu. It threatened similar punishment for OEMs who added programs that promoted third-party software to the Windows "boot" sequence. These inhibitions soured Microsoft's relations with OEMs and stymied innovation that might have made Windows PC systems more satisfying to users.[35]

Furthermore, Judge Jackson noted that "by pressuring Intel to drop the development of platform-level NSP software, and otherwise to cut back on its software development efforts, Microsoft deprived consumers of software innovation that they very well may have found valuable".[36] Bill Gates protested Judge Jackson's interpretation of software innovation this point in a television interview: "[t]he ruling says to creators of intellectual property that the government can take away what you've created if it proves too popular."[37] He also contended that many of the other remedies proposed would be "very damaging to consumers".[38]

The proposed breakup remedy was overturned on appeal. Positive feedbacks may well explain the dominant position of the Windows operating system. What was lacking in Judge Jackson's Statement of Facts and also from MS's response, was an explanation for, or any proof of, how the linkage between the application software and the operating system benefited or did not benefit consumers.

In summary, the models of positive feedbacks illustrate methods by which dynamics can be incorporated into antitrust analyses of innovation effects. Such models demonstrate market features which can fundamentally change antitrust decisions and proposed remedies.

V. Discussion and Conclusions

Innovation is an important part of economic growth and the private sector's investment in R&D is essential for innovation to contribute to economic growth. Disruptive technologies disrupt industries and markets and in the process, while there are winners and losers, on net they create surplus. The vast literature on the economics of innovation, only a small subset of which is discussed here, shows that this process of creating wealth through innovation is not straightforward. The innovation process is a complicated brew of firms of different sizes and types and in possibly different industries conducting different types of innovation. Firms may have incentives to encourage and conduct some types of innovation while having the motivation to harm other types of innovation. Competition is clearly a driver of innovation but depending on the type of innovation, product market competition in the existing market may enhance or hamper it.

In McGowan's assessment, courts will need to consider the following for innovation cases:

> [I]nnovation cases will require courts to take into account the interests of particular firms or institutions whose innovative work is alleged to have been harmed through anticompetitive acts. Without particular

> innovators to provide concrete evidence of the alleged harm, innovation cases are likely to be unmanageable. Courts must therefore take such interests into account without returning to a version of antitrust policy that seeks to protect particular firms.[39]

He recommends that:

> In all but exceptional cases courts should require evidence of harm to innovation generally, rather than only to particular firms. In considering the question of causation in monopoly maintenance cases, courts should take into account the structure of the market, the type of claim advanced, and the feasibility of tailored remedies. The degree to which technology facilitates transitions among products and product generations is also relevant to such claims. Last, remedies in antitrust innovation cases should be tailored to reflect market structure and the strength of the evidence on causation.[40]

McGowan is suggesting here that evidence be garnered from innovating firms but that the remedies should not necessarily be geared to protecting those same particular firms. The question is, how should this be achieved?

The fundamental issue that innovation presents competition authorities is a trade-off between allocative efficiency and dynamic efficiency. The familiar tools for calculating the static Consumer Surplus and/or Total Surplus need to be extended into a dynamic framework where new products and features and their resulting surpluses are considered. The ongoing work in the economics of innovation is already yielding some guidance for competition regulators. A distinction needs to be made with respect to which type of innovation is involved. When disruptive technologies are concerned restrictive trade practices deserve greater scrutiny. In a merger review, competition authorities should consider the history and nature of R&D in that industry. If there is a history of accumulated incremental innovation with long-term projects and substantial scale economies in R&D then that should lessen competition concerns, but regulators should be wary of alleged efficiencies that lower R&D budgets. Mergers between large established firms and small start-ups with the rationale being access to technology should be tested as to why research joint ventures and/or licensing do not suffice.

The work in positive feedbacks does provide descriptive dynamic models which are informative for antitrust. They show that technology adoption processes can be path-dependent, and that history matters. Such models also show a tendency towards market dominance which can be welfare enhancing using both Consumer surplus and Total surplus metrics. These models also indicate that effective remedies for increased concentration may be difficult to engineer.

While the work in the economics of innovation does not always provide definitive answers to many of the issues above, sufficient progress has been made to start addressing innovation effects in some competition cases where those effects can be decisive. No doubt there will be many more cases in the future which will have significant impacts on innovation.

Endnotes

[1] Mihkel M Tombak is the Hatch Professor of Technology Management and Strategy and Chair of the Department of Management at the University of Toronto Mississauga. He also holds an appointment at the Rotman School of Management, and is Associate Fellow, CIRANO. Correspondence: mihkel.tombak@rotman.utoronto.ca.

[2] Richard J Gilbert & Alan J Weinschel (2005), "Competition Policy for Intellectual Property: Balancing Competition and Reward," University of California at Berkeley Working Paper, online: <http://eml.berkeley.edu/~gilbert/wp/Antitrust_and_IP.pdf>.

[3] U.S. Dep't of Transportation, "Domestic Passenger Car CAFE" in "Summary of Fuel Performance" 15 December 2014, online: <www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/Performance-summary-report-12152014-v2.pdf>.

[4] 552 F Supp 131 (DDC 1982) [*AT&T 1982 Case*].

[5] *United States v Microsoft Corp*, 97 F Supp 2d 59 (DDC 2000) (direct appeal denied, pet cert denied, 530 US 1301 (2000)).

[6] Joseph A Shumpeter, *Capitalism, Socialism and Democracy* (London, UK: Routledge, 1942, reprinted 1994) at ch 3.

[7] Kenneth J Arrow (1962), "Economic Welfare and the Allocation of Resources to Invention" in Richard R Nelson,ed *The Rate and Direction of Inventive Activity: Economic and Social Factors* (New York: Princeton University Press, 1962) at 609.

[8] *Ibid* at 619-22.

[9] Joseph A Schumpeter, *Capitalism, Socialism and Democracy* (London, UK: Routledge, 1942 reprinted 1994) at ch 3.

[10] See Richard N Foster, "The timing of technological transitions" in *Innovation: The Attacker's Advantage* (New York: Summit Books, 1986); Clayton M Christensen, *The Innovators Dilemma: When New Technologies Cause Great Firms to Fail* (Cambridge, Harvard Business School Press, 1997); and Joshua S Gans, "Beware of Business Fads: Disruptive Innovations and Competition Policy" in this Issue.

[11] **CFI** *Microsoft v Commission*, T-201/04, [2007] ECR II — 3619.

[12] **EC** *Micrsoft v Commission*, COMP/C-3/37.792, [2004] online: <http://ec.europa.eu/competition/antitrust/cases/dec_docs/37792/37792_4177_1.pdf>.

[13] Ina Fried, "Microsoft commentary slams EU ruling", *CNet News* (21 April 2004), online: <http://www.cn-c114.net/582/a303449.html>.

[14] For a very good survey of the empirical literature, see George Symeonides, "Innovation, Firm Size and Market Structure: Schumpeterian Hypotheses and Some New Themes" in *OECD Economics Studies No. 27 1996/II* (Paris, OECD

Publication, 1996) at 35-70, although the literature has developed rapidly since.
[15] See Philippe Aghion et al, "Competition And Innovation: An Inverted-U Relationship", 120:2 Q J Econ at 701-28.
[16] Morten I Kamien & Nancy L Schwartz, *Market Structure and Innovation* (Cambridge, UK:Cambridge University Press, 1982).
[17] John Lunn, "An Empirical Analysis of Process and Product Patenting: A Simultaneous Equation Framework" (1986) 34:March J Indus Econ 319-330.
[18] *Ibid.*
[19] Boyan Jovanovic & Rafael Rob, "Demand-Driven Innovation and Spatial Competition Over Time"(1987) 54:1 *Rev Econ Stud*, 63-72.
[20] Tufts Center for the Study of Drug Development, News, "Cost to Develop and Win Marketing Approval for a New Drug is $2.6 Million" (18 November 2014), online: Tufts CSDD <http://csdd.tufts.edu/news/complete_story_pr_tufts_csdd_2014_cost_study>.
[21] Bronwyn H Hall, "Mergers And R&D revisited" (1999) UC Berkeley Econometrics Laboratory Working Paper, online: <https://eml.berkeley.edu/~bhhall/papers/BHH99_mergers_rnd.pdf>.
[22] Luc LG Soete, "Firm Size and Inventive Activity: The Evidence Reconsidered"(1979) 12 :4 *Eur Econ Rev* at 319-40.
[23] Keith Pavitt, Michael Robson & Joe Townsend, "The Size Distribution of Innovating Firms in the UK:1945-1983" (1987) 35:3 J Indl Econ at 297-316.
[24] John Bound et al, "Who Does R & D and Who Patents?" in Zvi Griliches, ed, *R&D, Patents, and Productivity* (Chicago: University of Chicago Press, 1984).
[25] Wesley Cohen & Steven Klepper, "A Reprise of Size and R & D" (1996) 106:437 The Econ J, 925-51.
[26] 253 F 3d 34 (DC Cir 2001) [*Microsoft DC Appeal*].
[27] Michael L Katz & Howard A Shelanski, "Mergers And Innovation" (2007) 74:1 Antitrust LJ 1 at 2.
[28] Hall, *supra* note 21 at 16 and Table 6.
[29] A recent study by Agrawal et al is informative for answering this question. See Ajay Agrawal et al, "Firm Size Diversity nd Regional Innovation", (2012), University of Toronto, Rotman School of Management Working Paper, online: <http://mackinstitute.wharton.upenn.edu/wp-content/uploads/2013/01/Agrawal-Ajay-Galasso-Alberto-Cockburn-Iain-Oettl-Alexander_Firm-Size-Diversity-and-Regional-Innovation.pdf>.
[30] See Almarin Phillips, *Technology and Market Structure: A Study of the Aircraft Industry*, (Lexington, U.S.: Lexington Books,1971).
[31] W Brian Arthur"Positive Feedbacks in the Economy," (1990) 262:Feb Sci Am, 92-99.
[32] *Ibid* at 80, 82, and 84.
[33] Randall E Stross, *The Microsoft Way: The Real Story of How The Company Outsmarts Its Competition* (New York:Basic Books, 1996) at 184.
[34] U.S. DOJ, *United States v Microsoft Corp*, Court's Findings of Fact, Civil Action No. 98-1232 (TPJ), online: <http://www.justice.gov/atr/us-v-microsoft-courts-findings-fact>.
[35] *Ibid* at 203.
[36] *Ibid* at 410.
[37] See Scott Ard, "Judge: Microsoft must be broken in two",

CNET News (11 July 2002), online: <http://www.cnet.com/news/judge-microsoft-must-be-broken-in-two/>.
[38] Microsoft, "Microsoft Urges Court to Dismiss Government's Breakup Proposal Immediately" (10 May 2000), online: Microsoft <http://news.microsfot.com/2000/05/10/microsfot-ureges-court-to-dismiss-governments-breakup-proposal-immediately/>.
[39] David McGowan, "Innovation, Uncertainty, and Stability in Antitrust Law" (2001) 16 Berkeley Tech LJ 729 at 730, online: <http://scholarship.law.berkeley.edu/btlj/vol16/is>.
[40] *Ibid* at 730.