

TECHNOLOGY GIANTS, THE “MOLIGOPOLY” HYPOTHESIS AND HOLISTIC COMPETITION: A PRIMER

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INTRODUCTION

This paper originates from a disconnect. On the one hand, technology pundits daily describe the information and communications technologies giants (the “*technology giants*” or the “*tech giants*”) as oligopoly firms at war with each other. In 2012, Farhad Manjoo wrote in *Fast Company* a column entitled “*The Great Tech War of 2012: Apple, Facebook, Google, and Amazon Battle for the Future of the Innovation Economy*”.¹ A year later, Manjoo inaugurated in *Slate* a fictional dialogue with Matt Yglesias entitled “*WarGames: Google vs. Apple*” with the following sub-narrative “*what would happen if the world’s two great powers went to (actual) war*”.² Their conversation closed with Microsoft Bing becoming the default search engine in the US.

On the other hand, antitrust lawyers and economists tend to classify the technology giants as entrenched monopolists, shielded from competition. In 2010, Columbia Law School Professor Tim Wu concluded an op-ed titled “*In the Grip of the New Monopolists*” in the *Wall Street Journal* with the following statement “*let’s not pretend that we live in anything but an age of monopolies*”.³ Since then, not a year has passed without a major antitrust jurisdiction levelling monopolization concerns against companies like Google, Apple, Facebook, Amazon or Microsoft (hereafter, “GAFAM”).⁴

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¹ Manjoo, Farhad, “The Great Tech War Of 2012: Apple, Facebook, Google, and Amazon battle for the future of the innovation economy” *Fast Company* [Blog], 19 Oct. 2011, available at <http://www.fastcompany.com/1784824/great-tech-war-2012>. For other examples, see, Carlson, Nicholas, “Facebook, Apple, And Microsoft Are Ganging Up On Google — And It Couldn’t Happen At A Worse Time”, *Business Insider UK*, 30 Dec. 2014, available at <http://uk.businessinsider.com/face-apple-and-microsoft-versus-google-2014-12?r=US>; Wilhelm, Alex, “Rivals: The long burning turf war between Google and Microsoft”, *The Next Web*, 17 May 2013, available at <http://thenextweb.com/insider/2013/05/17/rivals-a-short-history-of-google-and-microsoft-long-burning-turf-and-platform-war/> and Wohlsen, Marcus, “The Smartest, Richest Companies Can’t Crack Mobile. The Future Belongs to Anyone Who Can”, *Wired* [Blog] 30 Jan. 2015, available at <http://www.wired.com/2015/01/smarter-richest-companies-cant-crack-mobile-future-belongs-anyone-can/>.

² Manjoo, Farhad and Yglesias, Matthew, “WarGames: Google vs. Apple”, *Slate* [Blog] 29 July 2013, available at http://www.slate.com/articles/technology/low_concept/features/2013/wargames/what_if_google_and_apple_went_to_war_in_real_life.html

³ Wu, Tim, “In the Grip of the New Monopolists”, *Wall Street Journal*, 13 Nov. 2010, available at <http://www.wsj.com/articles/SB10001424052748704635704575604993311538482>

⁴ See the closed investigation against Microsoft in *Case United States of America v. Microsoft Corporation*, 253 F.3d 34 (D.C. Cir. 2001). See also, Case T-201/04, *Microsoft v. Commission*, ECLI:EU:T:2007:28 and Case T-167/08, *Microsoft v European Commission*, ECLI:EU:T:2012:323. See, at EU level, the on-going investigations against Google in Case COMP AT.39740 - *Google Search*, (opening of proceedings: 14 Jul. 2016); Case COMP AT.40099 - *Google Android*, (opening of proceedings: 15 Apr. 2016); Case COMP AT.40411 - *Google Search (Add Sense)*, (opening of proceedings 14 Jul. 2016). Also, the on-going investigation against Amazon, EU Commission (press release), *IP/15/5166*, “Commission opens formal investigation into Amazon’s e-book distribution arrangements”, 11 June 2015, available at http://europa.eu/rapid/press-release_IP-15-5166_en.htm. Allegations of an Amazon monopoly have also been proffered in the US, see *Brief Petition for a Writ of Certiorari to the United States Court of Appeals for the Second Circuit, The Authors Guild, Inc., Authors United*,

This article explores this schism. To date, there has been no short supply of scholarly attempts to stylize the perceived idiosyncrasies of competition amongst technology giants.⁵ Several works have been prominent in the public debate. A first group of studies consider that the tech giants compete on “*big data*”, and fret over whether this upsets the revealed preference framework of prices and quantities used in mainstream economics.⁶ Other scholars focus on tech giants’ propensity to offer “*free*” goods and services, and discuss whether this renders moot concerns for consumer welfare as we understand it to date.⁷ An alternative narrative is the “*long tail*”. It stresses that unlike the canonical model of the large scale, single product monopoly, today’s tech giant superiority consists in their ability to offer small quantities of a very large range of products and services thereby widening consumer choice (*e.g.*, search results, e-books, etc.).⁸ Last, but not least, an increasingly popular theory that walks into the footsteps of the economics of network effects of the 1990s proposes to apprehend the tech giants as multisided “*platforms*” or,⁹ put differently, as “*matchmakers*” that connect distinct groups of users.¹⁰ This research stems from Nobel Prize winner Jean Tirole and colleagues’ seminal showing that the allocation of prices between the various sides

American Booksellers Association, and Barnes & Noble, in Apple Inc., Petitioner, v. United States of America, et al., Respondents, at 4: “the market for retail distribution of electronic books (“e-books”) was essentially a monopoly, with Amazon.com, Inc. (“Amazon”) controlling 90% of e-book sales.” The US Federal Trade Commission has under close scrutiny Apple’s behavior in the music market, *see* Resnikoff, Paul, “Apple Remains Under Federal Investigation Over Apple Music Practices” *Digital Music News* [Blog], 30 June 2016, available at <http://www.digitalmusicnews.com/2016/06/30/apple-federal-investigation-music/> and the opening in 2016 of the Bundeskartellamt inquiry into Facebook’s terms of use policy, *see* Bundeskartellamt, (press release) “*Bundeskartellamt initiates proceeding against Facebook on suspicion of having abused its market power by infringing data protection rules*” 2 Mar. 2016, available at https://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2016/02_03_2016_Facebook.html; also Prochilo, Dan, “Facebook Can’t Shake Virtual Currency Co.’s Monopoly Suit”, *Law360*, New York, 27 Sep. 2013.

⁵ This trend in scholarship was even documented in *The Economist* See, *The Economist*, “Online Platforms – Nostrums for Rostrums”, 28 May 2016.

⁶ Geradin, Damien & Monika Kuschewsky. “Competition law and personal data: Preliminary thoughts on a complex issue.” Available at SSRN 2216088 (12 Feb. 2013); Newman, Nathan. “Search, Antitrust, and the Economics of the Control of User Data.” *Yale Journal on Regulation*, 31 (2014): 401. Sokol, D. Daniel and Roisin E. Comerford. “Does Antitrust Have a Role to Play in Regulating Big Data?” in Roger D. Blair & D. Daniel Sokol (Eds.) *Cambridge Handbook of Antitrust, Intellectual Property and High Tech*, Cambridge University Press, Forthcoming. Grunes, Allen P. and Maurice E. Stucke. “No Mistake About It: The Important Role of Antitrust in the Era of Big Data.” *Antitrust Source, University of Tennessee Legal Studies Research Paper* No. 269.

⁷ Anderson, Chris. *Free – the Future of a Radical Price*, Random House Business Books 2009. On the other hand some studies insist that freemiums have a hidden price, *see* Gal, Michal S. and Daniel L. Rubinfeld. “The Hidden Costs of Free Goods: Implications for Antitrust Enforcement.” *Antitrust Law Journal* 80.3 (2016): 521-562. Luchetta, Giacomo. “Is the Google Platform A Two-Sided Market?” *Journal of Competition Law & Economics*, 10.1 (2014): 185-207.

⁸ Anderson, Chris. *The Long Tail: The Revised and Updated Edition: Why the Future of Business is Selling Less of More*. New York: Hyperion, 2008. This narrative has predominantly been used to explain the business model of online retail firms. But it has then been expanded to other services, like search engines. Skiera, Bernd, Jochen Eckert, and Oliver Hinz. “An Analysis of the Importance of the Long Tail in Search Engine Marketing.” *Electronic Commerce Research and Applications*, 9 (2010): 488-494.

⁹ Varian, Hal R., Joseph Farrell, and Carl Shapiro. *The economics of information technology: An introduction*. Cambridge University Press, 2004.

¹⁰ Evans, David S. & Richard Schmalensee. *Matchmakers: The New Economics of Multisided Platforms*, Harvard Business Review Press, 2016; Evans, David S. & Richard Schmalensee. “The Antitrust Analysis of Multi-Sided Platform Businesses.” *National Bureau of Economic Research, Working Paper No w18783*, (2013). Evans and Schmalensee have counted more than 200 papers on multisided platforms.

of the platform,¹¹ rather than their levels, is determinative of output. Many scholars in antitrust economics today embrace the “*platform*” framework as the appropriate analytical matrix to read tech giants’ competition.¹²

However, those theories have in common to focus on one particular aspect of the competitive process, and thus do not seem to capture the full extent of the rivalrous interactions that pundits describe when they write about tech giants competition.¹³ For instance, we can instantly detect that “*big data*” is critical to describe Google’s business model, but leaves out of the picture the alleged competitive pressure exerted by the business strategy of Apple which is less big data centric.¹⁴ Along the same lines, “*free*” is a prevalent feature of Facebook’s business model, but it is much less predominant in Microsoft’s case. The “*long tail*” is the backbone of Amazon’s ambition to be “*Earth’s most customer centric company*”, but it fails to represent Apple’s focus on a few product lines. The recurrent platform model is also problematic, because it fits the organizational model of certain of tech giants – Google’s mobile operating system Android – but not that of others – Apple’s vertically integrated ecosystem. Last, none of those theories gives much currency to the breadth of market segments in which the tech giants operate.

With this paper, we ambition to contribute to this literature by advancing an alternative model of tech giants competition. We try to empirically verify if the intuition of the technology press cuts deeper than journalism, and find indeed that many expert analysts remote from the antitrust field consider that the tech giants are conglomerates that compete three-dimensionally as oligopolists *across* industries, and not *within* itemized relevant markets where they (inevitably) are monopolists. We refer to this apparent contradiction by the concept “*moligopoly*”, and proceed to describe the nature of moligopoly competition. Obsessed – perhaps mistakenly – by the risk of Christensenian disruption outside of their core markets, the moligopolists compete “*against the non-consumption*” in search of new and low end market footholds. This inevitably leads them to veer away from their core, and experiment in a varying array of fields, sectors and industries, sometimes adjacent, often peripheral. This process of conglomerate expansion follows two directions. *First*, besides their moat in the core, the moligopolists engage in entrepreneurial ventures in frontier technological areas. What seems to drive them is an ambition to discover the next transformative technology, and become the ultimate XXIth century disruptors in the footprints of the Henry Ford, Nikola Tesla and Leonardo da Vinci. *Second*, the moligopolists also attack peripheral markets with the hope of disrupting incumbent players. The strategy consists in

¹¹ Rochet, Jean-Charles, and Jean Tirole. “Platform competition in two-sided markets.” *Journal of the European Economic Association* 1.4 (2003): 990-1029. Armstrong, Mark. “Competition in two-sided markets.” *The RAND Journal of Economics* 37.3 (2006): 668-691. Rochet, Jean-Charles, and Jean Tirole. “Two-sided markets: a progress report.” *The RAND journal of economics* 37.3 (2006): 645-667.

¹² Parker, Geoffrey G., Marshall W. Van Alstyne, & Sangeet Paul Choudary. *Platform Revolution - How Networked Markets Are Transforming the Economy—and How to Make Them Work for You*, W. W. Norton & Company, 2016; Moazed, Alex, and Nicholas L. Johnson. *Modern Monopolies: What It Takes to Dominate the 21st Century Economy*. Macmillan, 2016; Evans, Peter C. and Gawer, Annabelle. “The Rise of the Platform Enterprise: A Global Survey”, *The Center for Global Enterprise*, 2016.

¹³ They are “*lacking in generality*”, see Tirole, Jean, *The Theory Of Industrial Organization*. MIT Press, 1988, noting at 3: “*At first sight, even a theorist should regret the very high ratio of theory to evidence in a field which is often lacking in generality and in which practical implications are so crucial*”.

¹⁴ Fung, Kaiser., and Gelman, Andrew., “Why Consumers Should Care About Apple’s War on Big Data, 07.04.15, STATBUSTERS, available at <http://www.thedailybeast.com/articles/2015/07/04/why-consumers-should-care-about-apple-s-war-on-big-data.html>

serving customers who are currently not served by existing players, by the provision of no-frills, low end services.

In both variants, the moligopolists mimic each other initiatives.¹⁵ This seems to mark a deliberate attempt to keep iron in the fire in case a rival tech giant would be the first to discover a viral technology application.¹⁶

Last, and most significantly, the moligopolists compete on specific assets. They focus their rivalry on entrepreneurial resources, labour and capital, which are the engine of disruption. In particular, the moligopolists compete for the production, acquisition and retention of Schumpeterian entrepreneurs. This is done through a variety of levers, including M&A, Venture Capitalism (“VC”), Corporate VC (“CVC”) and labour contracts.

The blindness of the antitrust field to moligopoly competition is prone to generate decisional errors. We therefore proceed to identify the origins of the antitrust defects. In our view, they originate in several flaws of mainstream economics. The canon of partial equilibrium analysis is one of them. In turn, these defects trickle down into applied antitrust theory to create crude tools, rules and proxies, like market definition, hypothetical monopolists tests (“HMT”), potential competition analysis, etc. The challenge for antitrust policy is thus to design tools that grasp the competition, or lack thereof, that occurs outside of antitrust relevant markets. Failure to do this will give way to the proliferation of flawed theories or the over-generalization of convenient models, like for example, multi-sided theory which, albeit a sophisticated and elegant theory, gives rise to broad exoneration claims from antitrust practitioners.¹⁷

In turn, we make a proposal for a rethink of antitrust policy in technology markets. Our proposal consists in verifying whether the firm under scrutiny can be deemed a moligopoly firm that engages into competition against the non-consumption. As long as this is the case, there should be no antitrust inquiry into its core market. In contrast, if the firm shirks on its mission to disrupt itself, and does not compete against the non consumption, antitrust agencies should proceed with scrutinizing the firm’s conduct in its core. We provide measurement points to help the antitrust assessment of competition against the non-consumption.

Our paper is timely. With the revival of the antitrust cult, the world has become Pavlovian conditioned to describe any large and profitable firm as a monopolist in might, and to expect regulatory oversight.¹⁸ The rapid proliferation of antitrust complaints against Google in the US, the EU and Russia is a case in point.¹⁹ But Google is not the sole target of demands for

¹⁵ Imitation behaviour in investments is not uncommon. See Scharfstein, David S., and Jeremy C. Stein. "Herd behavior and investment." *The American Economic Review* (1990): 465-479 (discussing plausible reasons for herd conduct, and .

¹⁶ With this, late movers can “hop” to the business segment that will take the market.

¹⁷ See, for an overview of the theory, Auer, Dirk, and Nicolas Petit. "Two-Sided Markets and the Challenge of Turning Economic Theory into Antitrust Policy." *The Antitrust Bulletin* (2015): 0003603X15607155.

¹⁸ See, for instance, Reich, Robert B., "Big Tech Has Become Way Too Powerful", *New York Times*, 18 Sep. 2015: “Big Tech — along with the drug, insurance, agriculture and financial giants — dominates both our economy and our politics”, available at http://www.nytimes.com/2015/09/20/opinion/is-big-tech-too-powerful-ask-google.html?_r=0

¹⁹ Couturier, Kelly, "How Europe Is Going After Google, Amazon and Other U.S. Tech Giants" *New York Times*, 19 May 2016, available at <http://www.nytimes.com/interactive/2015/04/13/technology/How-Europe-Is-Going-After-U.S.-Tech-Giants.html>; Scola, Nancy, "Sources: Feds taking second look at Google search"

antitrust activism. In May 2016, GOP candidate Donald Trump declared that Amazon had a “*huge antitrust problem*”.²⁰ He was rallied some weeks later by Senator Elizabeth Warren, who cited Google and Apple as potential targets for a revived antitrust agenda.²¹ Moreover, the supply of regulatory proposals that purport to rein in the tech giants is abundant, and occurs from all constituencies: consumer protection, privacy, net neutrality, tax, etc.²² Last, an emerging narrative is that the tech giants would use to new types of business practices to subdue competition. This would require antitrust to “*reinvent*” itself.²³ Almost invariably, the “*power*” narrative is the undercurrent of regulatory demands.²⁴

To maintain the discussion within reasonable limits, our paper focuses on a group of five iconic technology companies, namely Google, Apple, Facebook, Amazon and Microsoft. For ease of reference, we call them GAFAM. That said, our findings could apply by analogy to other technology firms like Dell, IBM, Intel, Netflix, Yahoo or any company which possibly denotes similar features.²⁵

This paper proceeds as follows. Section I lays down and verifies the moligopoly hypothesis. Section II explains that the nature of moligopoly competition is multi-dimensional, lays down the main elements of that model, and shows that the engine of that competition is the urge to compete against the non-consumption. Section III describes why modern antitrust theory and its applications fail to capture moligopoly competition. Section IV proposes specific measures to reroute antitrust policy in moligopoly markets towards barriers to entrepreneurial resources. Section V concludes.

I. THE “*MOLIGOPOLY*” HYPOTHESIS

A. METHODOLOGY

Politico, 5 May 2016, available at <http://www.politico.com/story/2016/05/federal-trade-commission-google-search-questions-223078>

²⁰ Beech, Eric, “Trump says Amazon.com has ‘a huge antitrust problem’”, *Reuters*, 12 May 2016, available at <http://www.reuters.com/article/us-usa-election-trump-amazon-com-idUSKCN0Y4075>

²¹ See Senator Elizabeth Warren, “Reigniting Competition in the American Economy”, Keynote Remarks at New America’s Open Markets Program Event, 29 June 2016, available at http://www.warren.senate.gov/files/documents/2016-6-29_Warren_Antitrust_Speech.pdf; Lesniewski, Niels, “Warren Takes on Comcast So You Don’t Have To”, *Roll Call*, 29 June 2016, available at <http://www.rollcall.com/news/policy/warren-calls-stronger-antitrust-enforcement>

²² Renda, Andrea, “Searching for harm or harming search? A look at the European Commission’s antitrust investigation against Google.” *CEPS Special Report No. 118*, 2015 (fearing that antitrust cases may fuel regulatory initiatives). For a recent review of regulatory initiatives, see *The Economist*, “Taming the beasts, European governments are not alone in wondering how to deal with digital giants”, 28 May 2016.

²³ *The Economist*, talking of “new ways to entrench themselves”. See *The Economist*, “A giant problem”, 17 Sep. 2016.

²⁴ On the other side, counter-argument is invariably that Government should not stand in the way of innovation, and avoid knee-jerk regulatory responses. For an example, see Strauss, Steven, “Is it time to break up the big tech companies?” *LA Times*, 30 June 2016, available at <http://www.latimes.com/opinion/op-ed/la-oe-strauss-digital-robber-barons-break-up-monopolies-20160630-snap-story.html>

²⁵ Manjoo, Farhad, “Tech’s ‘Frightful 5’ Will Dominate Digital Life for Foreseeable Future”, *New York Times*, 20 Jan. 2016, available at <http://www.nytimes.com/2016/01/21/technology/techs-frightful-5-will-dominate-digital-life-for-foreseeable-future.html>

The moligopoly hypothesis refers to the intuition that the antitrust field on the one hand, and the tech press on the other hand cast distinct perspectives on the degree and nature of competition faced by the tech giants.²⁶

This section attempts to verify if this intuition cuts deeper than journalism, and does so by mobilizing empirical data. The verification of the antitrust community perception is the easy part. Google, Amazon, Facebook, Apple, and Microsoft, have spent the past 15 years under the antitrust sword.²⁷ And no witness of competition policy can dispute that the default antitrust position is to characterize the tech giants as dominant firms. In a 2004 decision against Microsoft, the European Commission said that with a market share of over 90% in the Client PC operating system market, Microsoft approached “*a position of complete monopoly*”, a “*quasi monopoly*”, or “*near monopoly*”.²⁸ In a 2012 report, the staff of the US Federal Trade Commission (“FTC”) concluded its investigation noting that Google enjoyed “*monopoly power in the markets for search and search advertising*”.²⁹ In 2016, the EU Commission publicly characterized Google as dominant in general Internet search services, licensable smart mobile operating systems and app stores for the Android mobile operating system.³⁰ The German Bundeskartellamt has been reported to investigate Facebook’s dominance in the market for social networks.³¹ To date, Apple, Facebook and Amazon remain to arouse antitrust convictions. Yet, competition experts describe them as the “*new Google*”.³²

The common thread to antitrust agencies’ dominance showings is to focus on one industry segment – the agencies talk of a “*relevant market*” – where the investigated tech giant enjoys unassailable clout, and where substitution by actual and/or potential rivals is unlikely. With possible nuances, Google’s competitive stronghold is search, Apple’s core is its unique ecosystem, Facebook’s moat is its social networking platform, Amazon’s toehold is in online retailing and Microsoft’s anchor is its operating systems for personal computers (“PCs”).

By contrast, technology journals and websites abound with articles, blogs, tweets and news which celebrate the intense degree of competition amongst tech giants.³³ However, the problem with this prose is that it is difficult to know how much of the press perception is due

²⁶ We are certainly aware that there is not unanimity, much to the contrary, in the technology literature, to say that all firms compete in the same way.

²⁷ For a detailed account of these proceedings, see supra note 4.

²⁸ See Commission Decision Case COMP/C-3/37.792 - Microsoft C(2004)900 final (hereafter “Microsoft Commission Decision”).

²⁹ See FTC, Memorandum, August 8, 2012, Google Inc., File No. 111-01631. In 2010, the French competition agency had made a formal finding in a report that Google held a dominant position in the market for “search based ads”. See French Competition Authority, Opinion No 10-A-29 of 14 December 2010 on the competitive operation of online advertising, available at http://www.autoritedelaconurrence.fr/doc/10a29_en.pdf

³⁰ See EU Commission, “Commission sends Statement of Objections to Google on Android operating system and applications, *Press Release IP/16/1492*, 20 April 2016.

³¹ Bundeskartellamt initiates proceeding against Facebook on suspicion of having abused its market power by infringing data protection rules, 2 Mar. 2016, available at http://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2016/02_03_2016_Facebook.htm

³² See Budzinski, Oliver & Karoline H., Köhler, “Is Amazon the next Google?” *Ilmenau Economics Discussion Papers*, Vol. 20, No. 97.

³³ By technology community, we mean journalists, bloggers, or investors in the wide sense, *i.e.* business analysts, technology consultants and financial investors (e.g.: venture capitalists).

to sound competitive analysis as it is to gut feeling, technology hype or ideology.³⁴ We have thus attempted to explore a more systematic source of data, by looking into the “*market research*” produced by financial data providers, and in particular the “*company profiles*” that they release to the attention of investors. Financial data providers indeed hire experts trained in business, economics and technology schools, who can therefore be presumed to have been exposed to the basic tools and methods of competitive analysis (B). In addition, we have consulted the filings of the tech giants before the US Securities and Exchange Commission (“SEC”). As publicly traded corporations, the tech giants fall within the SEC scrutiny, and are therefore subject to reporting duties at each fiscal year end (10-K). Those reports, too, contain insights on the nature of technology competition (C).³⁵

B. FINANCIAL DATA PROVIDERS

The University of Florida “*Best Business Library Databases*” website aggregates sources of public information on businesses.³⁶ Amongst them, several sources published by financial data providers were freely available: Hoovers’, Yahoo! Finance and Fortune 500 (1).³⁷ We then proceeded to expand our inquiry to other similar sources, through discrete Internet searches (2).

1. Initial Research

Hoovers’ is a market research interface that offers a free access to basic information on companies, including a feature called “*Top 3 competitors*”.³⁸ Hoovers’ publicly available company profiles for each GAFAM returns the following results.

COMPANY PROFILE, TOP 3 COMPETITORS HOOVERS INDUSTRY ANALYZIS (30 DECEMBER 2015)				
Google ³⁹	Apple Inc. ⁴⁰	Facebook Inc. ⁴¹	Amazon.com ⁴²	Microsoft ⁴³
Yahoo! Inc.	HP Inc.	Microsoft Corporation	Wal-Mart Stores, Inc.	Apple Inc.
MSN	Google Inc.	Google Inc.	Apple Inc.	Oracle Corporation
Facebook., Inc.	Blackberry Limited	Twitter, Inc.	Alibaba Group Holding Limited	Google Inc.

As is apparent, each tech giant is described as having at least another GAFAM as one of its top 3 competitors (see green cells in table above).

³⁴ See Morozov, Evgeny. *The net delusion: The dark side of Internet freedom*. Public Affairs, 2012, at xiii: talking of “cyber utopianism” as “a naive belief in the emancipatory nature of online communication that rests on a stubborn refusal to acknowledge its downside”.

³⁵ For each firm, we have consulted the document titled “Report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934, for the fiscal year ended June 30, 2015”, with the code “10-K” on the SEC website, using the EDGAR search tool. See <http://www.sec.gov/Archives/edgar/data>

³⁶ <http://businesslibrary.uflib.ufl.edu/bestdatabases>

³⁷ <http://businesslibrary.uflib.ufl.edu/bestdatabases>

³⁸ Hoovers’ offers proprietary business information through an online platform and integrated workflow solutions.

³⁹ http://www.hoovers.com/company-information/cs/company-profile.Google_Inc.fb3f79c4d1791506.html

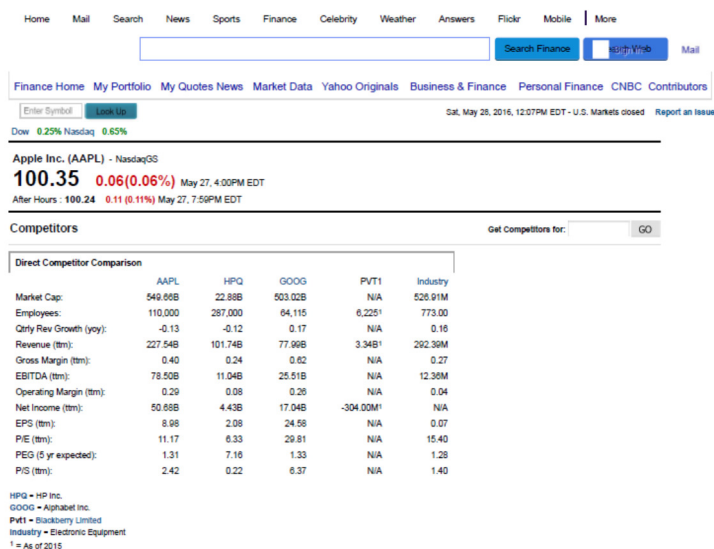
⁴⁰ http://www.hoovers.com/company-information/cs/company-profile.APPLE_INC.4c9baa063908dbd8.html

⁴¹ http://www.hoovers.com/company-information/cs/company-profile.Facebook_Inc.f1fe73cc6a208e18.html

⁴² http://www.hoovers.com/company-information/cs/company-profile.AMAZONCOM_INC.ef53c3d095de033c.html

⁴³ http://www.hoovers.com/company-information/cs/company-profile.MICROSOFT_CORPORATION.c86cc6059119a54b.html

Yahoo! Finance is an Internet platform that provides free financial news, data and commentary including stock quotes, press releases, financial reports, and original programming.⁴⁴ Yahoo! Finance offers a tool called “*Get competitors for*”, where upon entry of a publicly traded corporation “*ticker*”, it is possible to retrieve a “*Direct Competitor Comparison*” of the selected reference (see caption below).



We have questioned the Yahoo! Finance interface for each of the GAFAM, namely Google (GOOG), Apple (AAPL), Facebook (FB), Amazon (AMZN) and Microsoft (MSFT). In addition to this, we have interrogated the Yahoo! Finance tool called “*Get industry for*”. The results are aggregated in the table below.

YAHOO! FINANCE: “GET COMPETITOR FOR” (28 MAY 2016)				
GOOG	AAPL	FB	AMZN	MSFT
YHOO	HP	GOOG	AAPL	ORCL
PVT1	GOOG	MSFT	WMT	GOOG
FB	PVT1 (Blackberry)	TWTR	BABA	AAPL
YAHOO! FINANCE: “GET INDUSTRY FOR” (28 MAY 2016)				
“Internet Information Providers”	“Electronic Equipment”	“Internet Information Providers”	“Catalog & Mail Order Houses”	“Business Software & Services”

Each of the tech giants seems to have at least another GAFAM as a “*Direct*” competitor (see green cells in table above). At the same time, however, only two of the tech giants – namely Google and Facebook – are presented as members of the same industry – namely “*Internet Information Providers*”. Moreover, Yahoo! Finance lists Google and Apple as Microsoft’s direct competitors, in spite of the fact that Microsoft does not belong to the same industry, i.e. “*Business Software and Services*”.

⁴⁴ Yahoo! Finance seeks to help users make informed financial decisions. The content is a mix of Yahoo! original editorial and syndicated news via relationships with several third-party partners.

To conclude our review of company profiles, we have looked at the Fortune500 2015 ranking.⁴⁵ Here too, Fortune500 hints that each tech giant lives under the competitive “*threat*” of one or more other GAFAMs.

FORTUNE 500 2015 RANKING, QUALITATIVE ANALYSIS			
Firm	Competitors	Business	Source
Google ⁴⁶	Apple	Application store	“Google has also paid out \$7 billion over the last year to developers who distribute their apps in the store, rivaling competitor Apple”
Apple ⁴⁷	Google Android	Operating system	“Threat”
Amazon ⁴⁸	Microsoft and Google	Public cloud	“Threat”: “Microsoft and Google want a piece of the lucrative public cloud pie and are aggressively pricing their competitive products accordingly”
Microsoft ⁴⁹	Apple, Amazon and Google	Tablets, cloud computing, mobile platform	“competition from Apple’s iPad”; “rival Amazon’s AWS service”; “effort to compete with Google Android and Apple iOS as a dominant mobile platform”

2. Extension

To enrich our sample, we retrieved other publicly available company profiles. Google Finance and MSN Money are also open providers of financial data.⁵⁰ Neither interface offers a “*direct competitor comparison*” tool like Yahoo! Finance, but both offer a list of “*related companies*”. The concept of related companies seems to embrace firms that belong to a same industry and sector (see below caption extracted from Google Finance, in relation to GOOG). Google Finance sources information from FactSet, a prominent financial data vendor. There is no information of the source of the information found on MSN Money.

Related companies

Show: [Add or remove columns](#)

Most Recent Annual

		Valuation			
Company name	Price	Change	Chg %	d m y	Mkt Cap
GOOGL Alphabet Inc	747.60	+10.67	1.45%		508.00B
BIDU Baidu Inc (ADR)	185.01	+7.34	4.13%		67.07B
YNDX Yandex NV	19.91	+0.06	0.30%		6.34B
YHOO Yahoo! Inc.	37.82	+1.06	2.88%		38.18B
MSFT Microsoft Corpora...	52.32	+0.43	0.83%		409.44B
GOOAV Google Inc. - Com...	568.67				
IAC IAC/InterActiveCorp	56.27	+0.90	1.63%		4.46B
FB Facebook Inc	119.38	-0.09	-0.08%		346.04B
TWTR Twitter Inc	15.05	+0.75	5.24%		10.48B
AMZN Amazon.com, Inc.	712.24	-2.67	-0.37%		339.17B
LNKD LinkedIn Corp	131.27	+2.02	1.56%		17.45B

Sector: [Technology >](#) [More from FactSet >](#)
 Industry: [Search Engines](#)

ALPHABET INC
 NASDAQ: GOOG US Markets Closed

732.66 ▲ +8.54 +1.18% After Hours : 733.00 +0.34 +0.05%
 May 27, 2016 4:00 PM EDT. Delayed 15 minutes. Source: NASDAQ. Co. ⚙️

SUMMARY FINANCIALS ANALYSIS OPTIONS OWNERSHIP COMPANY HISTORY RELATE

Symbol	Name	Price	Change	Market Capital	Dividend Yield
AAPL	Apple Inc	100.33	▼ -0.08 -0.08%	549.66B	2.27%
MSFT	Microsoft Corp	52.32	▲ +0.43 +0.83%	411.26B	2.75%
FB	Facebook Inc	119.38	▼ -0.09 -0.08%	341.46B	-
AMZN	Amazon.com Inc	712.24	▼ -2.67 -0.37%	337.31B	-
BIDU	Baidu Inc	185.01	▲ +7.34 +4.13%	61.53B	-
YHOO	Yahoo! Inc	37.82	▲ +1.05 +2.84%	34.89B	-
NTES	NetEase Inc	175.79	▼ -1.04 -0.59%	23.11B	1.35%
LNKD	LinkedIn Corp	131.36	▲ +2.11 +1.63%	17.54B	-
YNDX	Yandex NV	19.91	▲ +0.06 +0.30%	6.45B	-
SINA	SINA Corp	51.12	▲ +0.63 +1.25%	3.57B	-
BCOR	Blucora Inc	8.97	▲ +0.26 +2.99%	371.01M	-

⁴⁷ <http://fortune.com/fortune500/apple-5/>

⁴⁸ <http://fortune.com/fortune500/amazon-com-29/>

⁴⁹ <http://fortune.com/fortune500/microsoft-31/>

⁵⁰ We have not further investigated the companies' profiles freely available on MarketWatch, because the interface offers no information on rivalry. See, however, <http://www.marketwatch.com/investing/stocks>

A significant degree of “*relatedness*” seems to exist amongst the GAFAM (see green cells in table below). This relatedness is clearer in the results retrieved on MSN Money than in the results of Google Finance. MSN Money seems also to suggest that the tech firms that are the more related to other GAFAMs are Google, Apple and Microsoft. By contrast, Amazon and Facebook seem less related.

TOP 3 “RETALED” COMPANIES, GOOGLE FINANCE, 28 MAY 2016				
GOOG	AAPL	FB	AMZN	MSFT
BIDU; YNDX; YAH	SNDK; MSFT; SSNF	TWT; GOOG; MEET	MAT; EBAY; TWX	ADBE; HP; YHOO
SCORE OF GAFAM PRESENCE WITHIN FULL LIST OF RELATED FIRMS (1, 2, 3, 4)				
3: MSFT; FB; AMZN	1: MSFT	2: GOOG; MSFT	2: GOOG; MSFT	1: AAPL

TOP 3 “RETALED” COMPANIES, MSN MONEY, 28 MAY 2016				
GOOG	AAPL	FB	AMZN	MSFT
AAPL; MSFT; FB	GOOG; MSFT; AMZN	GOOG; LNKD; TWTR	AAPL; MSFT; WMT	AAPL; GOOG; AMZN
SCORE OF GAFAM PRESENCE WITHIN FULL LIST OF RELATED FIRMS (1, 2, 3, 4)				
4: AAPL; MSFT; FB; AMZN	3: GOOG; MSFT; FB	1: GOOG	2: AAPL; MSFT	3: AAPL; GOOG; AMZN

We also accessed to the company profiles sections of the websites of Bloomberg and Reuters, the two major financial information vendors. Bloomberg and Reuters interfaces follow the same model: upon entry of a ticker, an exhaustive description of the company is given. Both Bloomberg and Reuters propose lists of competitors. Bloomberg’s data originates from Capital IQ, a subsidiary of Standard & Poor’s.

Both interfaces draw slightly distinct pictures of the GAFAMs. To start, Reuters provides no competitor analysis for GOOG, and does not explain why. We conjecture that this may be due to the fact that Google (now Alphabet) competes on multiple market segments, and that it may have been difficult to mention all its main competitors. Reuters considers that AAPL, FB and AMZN have another technology giant as their competitor. Moreover, Reuters competitor analysis suggests that the tech giants face competition from a variety of business segments outside of their core market. MSFT, for instance, is shown to be in competition with video games manufacturers, handset suppliers, office software developers and online retailers.

REUTERS FINANCE, STOCKS, COMPETITORS, 31 MAY 2016				
GOOG	AAPL	FB	AMZN	MSFT
NA	Samsung Electronics Co Ltd	Microsoft Corporation	Wal-Mart Stores, Inc.	Sony Corp
NA	Sony Corp	Mixi Inc	Target Corporation	Nintendo Co., Ltd
NA	ASUSTEK Computer Inc.	Tencent Holdings Ltd	Best Buy Co Inc.	Apple Inc.
NA	HP Inc.	Twitter Inc.	Alibaba Group Holding Ltd	HP Inc.

NA	Microsoft Corporation	LinkedIn Corp	Dollar General Corp.	IBM Corp.
NA	IBM Corp.	Yahoo! Inc.	eBay Inc.	Amazon.com, Inc.
NA	Cisco Systems, Inc.	Renren Inc.	Big Lots, Inc.	Cisco Systems, Inc.
NA	Nokia Corp	NA	Overstock.com, Inc.	Oracle Corporation
NA	Motorola Solutions Inc	NA	Books-A-Million, Inc.	BlackBerry Ltd
NA	NA	NA	Sears Holdings Corp	Yahoo! Inc.

Bloomberg's proposed competitor analysis draws a slightly different industry picture. The GAFAM are not prominently depicted as competing with other tech giants. Instead, Bloomberg's competitor analysis describes the GAFAM in competition with a number of firms located in industries remote from their core market. Amazon, for instance, is reported to compete with incumbent telecom carriers, a content provider, an office software vendor, a brick and mortar retailer, and an Internet service provider. At the same time, several of those firms are recurrently listed as rivals of the tech giants: Verizon Communications competes with 4 GAFAM (see blue cells); AT&T Inc., Comcast Corp. and IBM Corp. with 3 GAFAM (see red cells); Samsung and General Electric with 2 GAFAM (see yellow cells). The GAFAM thus seem to have, to a certain extent, the same competitors.

BLOOMBERG RESEARCH, STOCK, COMPETITORS, 31 MAY 2015				
GOOG	AAPL	FB	AMZN	MSFT
AT&T Inc.	Alphabet Inc.	AT&T Inc.	AT&T Inc.	Alphabet Inc.
Oracle Corp.	China Mobile	Comcast Corp.	Comcast Corp.	Comcast Corp
Tencent Holdings Ltd	General Electric Co.	IBM Corp.	IBM Corp.	General Electric Co.
Walt Disney Co	Samsung Electronics Co. Ltd	Samsung Electronics Co. Ltd	Home Depot Inc.	IBM Corp.
Verizon Communications Inc.	Verizon Communications Inc.	Verizon Communications Inc.	Verizon Communications Inc.	Wells Fargo & Co.

Another remark that can be made is that those competitors are large, sizeable firms. We provide hereafter a quick table that compare the market capitalization, employees, revenue and net income of the five tech giants with Verizon Communications Inc. (VZ), AT&T (T), IBM (IBM), and Comcast Corp (CMCSA). The green cells show the leading company for each category. The yellow cells show the last company for each category.

BENCHMARKING – TECH GIANTS AND OTHER COMPETITORS									
(YAHOO! FINANCE – 01 JUNE 2016)									
	GOOG	AAPL	FB	AMZN	MSFT	VZ	T	IBM	CMCSA
Market Cap	505.12B	546.98B	339.83B	341.03B	416.60B	207.48B	241.03B	147.58B	153.64B
Employees	64,115	110,000	13,598	230,800	118,000	173,300	280,870	377,757	153,000
Revenue	77.99B	227.54B	19.77B	113.42B	86.89B	131.81B	154.76B	80.84B	75.45B
Net Income	17.04B	50.68B	4.66B	1.17B	10.48B	17.97B	13.88B	12.96B	8.24B

3. Summation

At this stage, three preliminary conclusions can be derived from our survey of company profiles. *First*, in spite of differences, the tech giants often appear as direct competitors, even if they are not said to belong to the same industry. *Second*, we can see that the tech giants seem exposed to a degree of rivalry outside of the relevant market where antitrust experts concentrate their dominance investigations. *Third*, in addition to the competition that they exercise amongst each other, the tech giants rival with a number of very large non-GAFAM firms, and this does not seem to be anecdotic.

We concede that our inquiry into company profiles has a number of significant limitations. One of them is that we have little information on the methodology followed by financial data providers to undertake competitor analysis, though we are inclined to believe that they follow the canons taught in higher educational curriculumas, and in particular in business schools. Another is that the surveyed company profiles certainly report the existence of competition on the tech giants, yet fail to provide any measurement of rivalrous intensity. Their operational relevance for an antitrust inquiry may therefore limited, though the purpose of this section was to localize competition relationships, not to give a metric of their intensity.

C. SECURITIES AND EXCHANGE COMMISSION (SEC) 10-K FILINGS

We have followed our inquiry by trying to understand how the tech giants' perceive themselves their competitive environment. To that end, we have looked at their declarations to the US Securities and Exchange Commission ("SEC"), and in particular at their annual report for the fiscal year end (10-K).⁵¹ This source of information is particularly useful and trustworthy. Unlike in the antitrust setting when they talk under the threat of monopoly charges, reporting firms are not incentivized to downplay their market position before the SEC. On the contrary, studies suggest that firms reporting to the SEC may have incentives to paint a rosy picture of their profitability.⁵² Moreover, reporting firms are exposed to liability for false and misleading statements.⁵³

Part I of the 10-K form requires reporting firms to describe their business. Under Item 1.A, they must list and describe what they believe are "*risk factors*" for their operations. A FAQ issued by the SEC explains that reporting firms must provide "*information about the most significant risks that apply to the company or to its securities*".⁵⁴ This can include industry specific risks, but also global risks that affect the entire economy. The SEC guidance also indicates that "*companies generally list the risk factors in order of their importance*". And there is no limitation on the amount of risk factors that reporting firms can document.

We have examined each 10-K filing made by each GAFAM for the years 2012, 2013, 2014 and 2015. In the table below, we represent the top 3 risk factors, by order of appearance in the 10-Ks.

⁵¹ For each firm, we have consulted the document titled "Report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934, for the fiscal year ended June 30, 2015", with the code "10-K" on the SEC website, using the EDGAR search tool. See <http://www.sec.gov/Archives/edgar/data>

⁵² In order to reassure investors and regulators alike. See Healy, Paul M. & Krishna G. Palepu. "The fall of ENRON." *The Journal of Economic Perspectives* 17.2 (2003): 3-26.

⁵³ See Securities Exchange Act of 1934, at Sec.18.

⁵⁴ See "How to read a 10-K", available at <https://www.sec.gov/answers/reada10k.htm>

SEC 10-K FILINGS – TOP 3 RISK FACTORS – ITEM 1A				
FIRM	2012	2013	2014	2015
GOOG	1. “Intense competition” 2. Investments in new business strategies, products, services 3. Difficulties created by acquisition and integration of new businesses	1. “Intense competition” 2. Investment in new businesses and new products, services, and technologies is inherently risky 3. Transition of users from PC to other devices to access the internet and search	1. “Intense competition” 2. Investment in new businesses and new products, services, and technologies is inherently risky 3. Transition of users from PC to other devices to access the internet and search	1. “Intense competition” 2. Investment in new businesses and new products, services, and technologies is inherently risky 3. Transition of users from PC to other devices to access the internet and search
AMZN	1. “Intense competition” 2. Global expansion strains resources 3. Risky expansion in new market segments	1. “Intense competition” 2. Global expansion strains resources 3. Risky expansion in new market segments	1. “Intense competition” 2. Global expansion strains resources 3. Risky expansion in new market segments	1. “Intense competition” 2. Global expansion strains resources 3. Risky expansion in new market segments
FB	1. Failure to retain existing users or add new users 2. Loss of marketers, or reduction in spending by marketers 3. Growth in the use of FB on mobile may decrease available revenue	1. Failure to retain existing users or add new users 2. Loss of marketers, or reduction in spending by marketers 3. Growth in the use of FB on mobile may decrease available revenue	1. Failure to retain existing users or add new users 2. Loss of marketers, or reduction in spending by marketers 3. Growth in the use of FB on mobile may decrease available revenue	1. Failure to retain existing users or add new users 2. Loss of marketers, or reduction in spending by marketers 3. Growth in the use of FB on mobile may decrease available revenue
AAPL	1. “Global economic conditions” 2. “Highly competitive global markets characterized by aggressive price cutting” 3. “Manage frequent product introductions and Transitions”	1. “Global economic conditions” 2. “Highly competitive global markets characterized by aggressive price cutting” 3. “Manage frequent product introductions and Transitions”	1. “Global economic conditions” 2. “Highly competitive global markets characterized by aggressive price cutting” 3. “Manage frequent product introductions and Transitions”	1. “Global economic conditions” 2. “Highly competitive global markets characterized by aggressive price cutting” 3. “Manage frequent product introductions and Transitions”
MSFT	1. “Intense competition across all markets” 2. Risks and costs of focus on cloud based services 3. “Investments in new technology are speculative”	1. “Intense competition across all markets” 2. Risks and costs of focus on cloud based services 3. “Investments in new technology are speculative”	1. “Intense competition across all markets” 2. Risks and costs of focus on cloud based services 3. “Investments in new technology are speculative”	1. “Intense competition across all markets” 2. Risks and costs of focus on cloud based services 3. “Investments in new technology are speculative”

Google,⁵⁵ Amazon,⁵⁶ and Microsoft,⁵⁷ mention “*intense competition*” as the first risk factor faced by their businesses, and give colorful descriptions of fierce industry rivalry.⁵⁸ Other

⁵⁵ In 2014, Google declared: “*We face intense competition. If we do not continue to innovate and provide products and services that are useful to users, we may not remain competitive, and our revenues and operating results could be adversely affected*”. See, Google 2014 10-K form.

concerns like cyber security, global macro-economic conditions, regulatory constraints etc. seem more distant.

Apple consistently ranks competition (in particular “*aggressive price cutting*”) as the second risk factor.

Facebook does not mention competition within the three main risk factors, yet it appears in fifth position in all its 10-Ks.

In short, all GAFAM companies single out “*competition*” as a risk factor. And three of them place it above all other risk factors.⁵⁹ Several reporting firms give additional qualification on the degree of competition they face such as “*intense*” or “*aggressive*”. And several GAFAM tend to insist on the competitive risk created by expansion in new market segments (Amazon), the integration of new businesses (Google), investments in new technology (Microsoft) and frequent product introductions (Apple).

C. PRELIMINARY FINDINGS

The above findings are certainly crude. Yet, they lend credence to the moligopoly hypothesis, namely that of a misalignment between antitrust experts and other communities which goes beyond press clips and headlines. Whilst antitrust agencies routinely reach findings of dominance against the tech giants, the non-antitrust field tends to describe the tech giants as oligopolistic firms engaged in competitive rivalry. To make the point even clearer, the analysis of the non-antitrust experts seems more holistic. It tends to (i) characterize each technology firm as a conglomeral organization that offers a mix of products and services; (ii) recognize the distinctly superior position held by each of them in one or more core businesses; and (iii) balance it with a variety of competitive pressures exerted “*across industries*” by other technology and non-technology firms in actual or future, non core markets.

This moligopoly diagnosis plausibly owes to methodological issues. Let us recall how conventional antitrust methodology operates. A standard investigation consists in (i) identifying a list of relevant product markets on which a firm operates; (ii) circumscribing the investigation to those relevant markets –and *only* those– where the firm occupies a significant position; (iii) assessing whether it can be deemed dominant (i.e., whether it holds substantial market power); and (iv) initiating full scrutiny of its business strategy on the dominated relevant markets or on proximate market segments. We call this “*itemized*” competition.

By contrast, the non-antitrust world seems to embrace a distinct methodological approach. It is difficult to know from the outside which research protocol underpins the various company profiles surveyed previously. That said, it is not wholly implausible to conjecture that such works draws inspiration from models of “*extended rivalry*” in the spirit of the works that

⁵⁶ In 2014, Amazon noted: “*We Face Intense Competition*”. See, Amazon 2014 10-K form.

⁵⁷ And Microsoft mentioned, in June 2015: “*We face intense competition across all markets for our products and services, which may lead to lower revenue or operating margins*”. See, Microsoft 2015 10-K form.

⁵⁸ Apple mentioned competitive markets in second position, and only Facebook places competition as a more distant preoccupation: “*Our business is highly competitive. Competition presents an ongoing threat to the success of our business*”. See, Facebook 2012 10-K form.

⁵⁹ All the more so given that the risk of liability for false and misleading statements imposed under Section 18 of the Exchange act. Section 320 of the Sarbanes Oxley Act of 2002 imposes on the reporting company’s CEO and CFO to provide personal certification of periodic reports filed with the SEC. Signing a false declaration may expose CEOs and CFOs to civil and criminal liability.

emerged after the publication of Michael Porter' 1985 best seller "*Competitive Strategy – Techniques for Analyzing Industries and Competitors*". This framework, and its offshoots, is taught in virtually all the business schools of the world.⁶⁰ Under this approach:

"[...] competition in an industry goes well beyond the established players. Customers, suppliers, substitutes, and potential entrants are all "competitors" to firms in the industry and may be more or less prominent depending on the particular circumstances. Competition in this broader sense might be termed extended rivalry".⁶¹

Porter adds in Chapter IV of his book that many firms can be deemed potential competitors, beyond the traditional understanding of antitrust policy:

"(1) firms not in the industry but who could overcome entry barriers particularly cheaply; (2) firms for whom there is obvious synergy from being in the industry; (3) firms for whom competing in the industry is an obvious extension of the corporate strategy; (4) customers or suppliers who may integrate backward or forward".⁶²

With this background, and given the amount of scholarly work vilipending the application of conventional antitrust analysis to technology markets, our initial findings invite us to further examine the extended rivalry thesis. This subject, *i.e.* the nature of moligopoly competition, is what we now propose to examine.

II. THE NATURE OF MOLIGOPOLY COMPETITION

Now that we have a stronger intuition that the tech giants compete holistically as moligopolists, we must proceed to explain the nature of their rivalry. As is well understood, this inquiry must be empirical, on pain of suffering of the same defects as those that seem to affect the conventional antitrust framework.⁶³ We therefore start with an empirical inquiry into "*how*" moligopolists compete (A). Once this is done, a more subjective inquiry consists in understanding "*why*" the moligopolists compete as shown (B). Those are the issues that we now examine, with the ambition of proposing a descriptive theory of moligopoly competition (C).

A. EMPIRICAL ANALYSIS

From an empirical perspective, moligopoly firms display five salient features: conglomeralism (1), paranoia (2), R&Dism (3), serendipitism (4) and transactionalism (5). Behind those concepts, lie significant differences amongst the five tech giants. Yet, all or most moligopolists' seem to denote most or all those features. We review them in turn.

1. Conglomeratism

Unlike the textbook model of the single product ingot monopolist, the moligopolists are conglomerates. Surely, all have a core business: Google is predominantly a "*search*" company; Apple a communication and media devices firm; Facebook a social network; Amazon an online retailer; and Microsoft an operating systems developer. But all are active

⁶⁰ Porter, Michael. *Competitive Strategy – Techniques for Analyzing Industries and Competitors*. The Free Press, 1998, p.vi.

⁶¹ *Id.*

⁶² *Id.*, at 50.

⁶³ We observe that if antitrust dislikes all monopolies, including on ideas, then we shall not pretend that it dominates the world of expert diagnosis with its current frame of reference and analytical tools.

in a variety of other areas. Often, the moligopolists have entered – or been dragged – into adjacent businesses. Since 2004, Google has developed an e-mail service, an Internet browser, an Operating System (“OS”) for mobile and a social network. And Microsoft, who was initially thought to be a software company, made significant forays into hardware with gaming devices and tablets (not to talk of the infamous Zune music player).⁶⁴ Apple, a computer-engineering firm, has morphed into a manufacturer of wearables of all sorts including, headphones, speakers and wristwatches.

To the untrained eye, Facebook and Amazon may, look like more core-centric, focused companies. However, Facebook has slowly diversified its portfolio of activities, through a series of acquisitions (notably, of Instagram, WhatsApp and Oculus Rift).⁶⁵ And Amazon can no longer be reduced to an online bookstore or an online mall: Amazon Web Services is reported to be the market leader in cloud computing services.⁶⁶

Besides those casual observations, market research data points to the same direction. The company profiles published by the MarketLine interface has a section entitled “*Major Products and Services*” which pictures each of the tech giants as a multi-product firm active on a large number of market segments.⁶⁷ The chart bellow provides a summary of the data found through MarketLine.

⁶⁴ Microsoft has for years been also a hardware company, in gaming devices (the Xbox console) and the failed attempt to launch a music player Zune.

⁶⁵ Kelly, Gordon, “Why Facebook Is Spending Billions On Companies It Doesn't Need”, *Forbes*, 3 Apr. 2014: “Instagram was about buying a rival and making it a stable mate, WhatsApp was about owning the service which reaches markets Facebook Messenger doesn't and Oculus Rift”, available at <http://www.forbes.com/sites/gordonkelly/2014/04/03/why-facebook-is-spending-billions-on-companies-it-doesnt-need/#3e81a6881bb8>

⁶⁶ Synergy Research Group, “AWS remains dominant Despite Microsoft and Google Growth Surges”, 3 Feb. 2016, available at <https://www.srgresearch.com/articles/aws-remains-dominant-despite-microsoft-and-google-growth-surges>

⁶⁷ In June 2016, we were given access to a full trial of the MarketLine research interface. MarketLine is a publisher of business information. An internal team of analysts, drawing on primary and secondary research and prepared under an established methodology, produces its content. In the table, we have decided to restrict the list of products and services of Amazon, which comprehensively mentioned all the products and services sold by Amazon as a retailer on its Internet platform.

MARKET LINE, COMPANY PROFILES, MAJOR PRODUCTS AND SERVICES, 29 JUNE 2016				
GOOG	APPL	FB	AMZN	MSFT
<ul style="list-style-type: none"> • Search • Advertising • Consumer Content and Platforms • Enterprise products • Mobile wireless devices • Wi-Fi-enabled thermostats • Smoke detectors • Security systems • Research and development on biology that controls lifespan • Fiber to the premises (FTTx) services • Venture capital funding • Investments in growth stage companies 	<ul style="list-style-type: none"> • Mobile communication and media devices • Personal computing products • Portable digital music players • Televisions • Peripheral products • Networking solutions • Third-party hardware and software products • Mobile operating systems • Desktop operating systems • Server and application software 	<ul style="list-style-type: none"> • Pages • Platform • Desktop applications • Mobile apps • News Feed • Graph Search • Mobile-to-mobile messaging • Online advertising • Measurement and insights tools • Development tools • Application programming interfaces (APIs) 	<ul style="list-style-type: none"> • Books: • Movies, music and games: • Electronics and computers: • Home, garden and tools: • Grocery, health and beauty: • Toys, kids and baby: • Clothing, shoes and jewelry: • Sports and outdoors: • Automotive and industrial: • Kindle e-readers and books: • Amazon fire TV: • Services 	<ul style="list-style-type: none"> • Windows operating system • Office productivity suite • Gaming and entertainment consoles • Surface devices and accessories • Personal computer (PC) accessories • Smartphones • Search advertising • Display advertising • Server operating systems • Embedded software • Social networking • Consulting services • Cloud solutions • Premier product support services • Training and certification services • Customer relationship management (CRM) solutions • Supply chain management solutions

The SEC 10-Ks filings convey a similar description of moligopolists as conglomerates that compete across industries. Microsoft plainly states that it competes “*across all markets*”.⁶⁸ Facebook describe conglomerate competition in motion when it says that: “*As we introduce new products, as our existing products evolve, or as other companies introduce new products and services, we may become subject to additional competition*”.⁶⁹ And Amazon says that it takes on rivalry on virtually all sectors of the digital economy.⁷⁰

⁶⁸ See, Microsoft 2015 10-K form.

⁶⁹ See, Facebook 2015 10-K form at 4.

⁷⁰ See, Amazon 201510-K form: “*Our current and potential competitors include: (1) physical-world retailers, publishers, vendors, distributors, manufacturers, and producers of our products; (2) other online e-commerce and mobile e-commerce sites, including sites that sell or distribute digital content; (3) media companies, web*

To be sure, the moligopolists are not identical conglomerates. Significant discrepancies exist in the breadth of their product and/or service diversification. Apple and Facebook are, for example, narrower conglomerates than Google, Microsoft and Amazon.⁷¹ Moreover, the moligopolists have embraced distinct business models. Apple maintains a closed ecosystem, whilst Google has embraced a more opened architecture. Facebook is the epitome of freemiums, whilst Amazon prices ancillary services and Microsoft practices product versioning.

By and large, however, the tech giants seem to be conglomerates that compete against each other.⁷² This finding, which is not spectacular in itself, is perhaps more arresting from a financial theory perspective. Financial experts distaste conglomerates. Firms organized as conglomerates are typically undervalued by financial investors compared to comparable single-product firms. The traditional explanation is that a conglomerate is subject to greater agency problems than single-product firms.⁷³ Accordingly, one shall not expect to see conglomerates as the dominant organizational structure of large publicly listed companies like the tech giants.

2. Paranoia

The moligopolists do not express much confidence in their future. Consider, for example, Google CEO Eric Schmidt statement: “*someone, somewhere in a garage is gunning for us*”.⁷⁴

The SEC 10Ks’ sections entitled “*Competition*” convey in further detail the moligopolists business prospects. Three tech giants forecast “*disruptive technologies*” as a credible outlook. Google writes: “*Our business is characterized by rapid change as well as new and disruptive technologies*”.⁷⁵ Microsoft explains that: “[...] *many of the areas in which we compete evolve rapidly with changing and disruptive technologies, shifting user needs, and frequent introductions of new products and services*”.⁷⁶ And Facebook reports that “*Our business is characterized by innovation, rapid change, and disruptive technologies*”.⁷⁷

portals, comparison shopping websites, web search engines, and social networks, either directly or in collaboration with other retailers; (4) companies that provide e-commerce services, including website development, fulfillment, customer service, and payment processing; (5) companies that provide information storage or computing services or products, including infrastructure and other web services; and (6) companies that design, manufacture, market, or sell consumer electronics, telecommunication, and electronic devices”.

⁷¹ Wingfield, Nick, “Worries That Microsoft Is Growing Too Tricky to Manage”, *New York Times*, 8 Sept. 2013, available at <http://www.nytimes.com/2013/09/09/technology/worries-that-microsoft-is-growing-too-tricky-to-manage.html>

⁷² See, in this sense, Walton, Nigel. “New Conglomerates and the Ecosystem Advantage.” *China-USA Business Review* 13.7 (2014): 431-443. See also, Schmidt, Eric “The New Gründergeist”, *Google Europe Blog*, Monday, 13 Oct. 2014: “*For one thing, these companies are each others’ biggest competitors, because in tech competition isn’t always like-for-like. Many people think our main competition is Bing or Yahoo. But, really, our biggest search competitor is Amazon. People don’t think of Amazon as search, but if you are looking for something to buy, you are more often than not looking for it on Amazon. They are obviously more focused on the commerce side of the equation, but, at their roots, they are answering users’ questions and searches, just as we are*”.

⁷³ This holding, however, has been considerably nuanced. For a review of the literature, see Maksimovic, Vojislav & Gordon Phillips, “Chapter 8 - Conglomerate Firms and Internal Capital Markets” in B. Espen Eckbo (ed.) *Handbook of Empirical Corporate Finance* Elsevier, San Diego, 2007, at 423-479,

⁷⁴ See Schmidt, Eric, *The New Gründergeist*, *supra* note 72

⁷⁵ See, Google 2015 10-K form.

⁷⁶ See, Microsoft 2015 10-K form. The firm talks as follows of technology competition in the technology sector: “*Our competitors range in size from diversified global companies with significant research and development resources to small, specialized firms whose narrower product lines may let them be more effective in deploying technical, marketing, and financial resources. Barriers to entry in many of our businesses are low and many of*

TO be sure, the tech giants are not the only companies that express fear of disruption. Many gigantic companies from other industries also mention the disruption theme in their SEC 10-K reports. Yet, those firms do not seem to talk about the same thing, and certainly not of technological disruption. Consider, for example, the 10-K filing of General Electric for 2015. The term “*disruption*” appears eight times, in relation to market disruption (currency risk or disruption of the US financial system) and supply chain disruption (deliveries, production, etc.).⁷⁸ Starbucks also talks several times about disruption in its SEC 10-K, but with reference to international trade restrictions, energy supplies or cyber theft.⁷⁹ Wal-Mart, another giant company, makes copious reference to disruption – 16 occurrences – but always in relation to information systems interruptions, cyberattacks, supply chain, financial markets and external events like natural disasters and geo-political events.⁸⁰

And indeed, none of those three non-digital firms refers talks about disruption within the “*Competition*” section of the 10-K filing.

This is relevant. The GAFAM’s concern is specifically on technological disruption, and not on any aspect of disruption. In addition, the classification of technological disruption as a competition matter denotes that disruption is not merely an operational concern, but an existential one. Put differently, it is tempting to read in the moligopolists’ statements a paranoid fear of exit. Business history provides some context here. Technology markets abound with examples of firms wiped away by technological disruption. Think of the demise of Kodak, a well-known monopolist of the 20th century; of famous web portals such as AOL, Lycos, Altavista, Yahoo! and MySpace; or of the predicaments of once-mighty mobile handset makers such as Motorola, Nokia or RIM (the maker of the Blackberry).⁸¹ Those case studies stories are those taught in business schools, and thus form part of the educational background of many technology executives in the world.

Disruption is also part of the GAFAM’s own business history. Google is a case in point. Search engine competition started in 1994 around a handful of firms, namely Yahoo and Lycos, soon followed by Excite, Infoseek and Altavista.⁸² It is not until 1997 that Google launched operations as a search engine.⁸³ Google understood the potential of technology to unseat incumbent search engines, which often returned poor quality results.⁸⁴ Until that date, established firms like Yahoo! had compiled databases of keywords found on webpages, so

the areas in which we compete evolve rapidly with changing and disruptive technologies, shifting user needs, and frequent introductions of new products and services. Our ability to remain competitive depends on our success in making innovative products, devices, and services that appeal to businesses and consumers”.

⁷⁷ See, Apple 2015 10-K. This filing insists less, though this language is present in its reply: “*These markets are characterized by frequent product introductions and rapid technological advances*”.

⁷⁸ See, General Electric 2015 10-K form.

⁷⁹ See, Starbucks 2015 10-K form.

⁸⁰ See, Walmart 2015 10-K form.

⁸¹ Whitacre, Edward. *American Turnaround – Reinventing AT&T and GM and the Way We Do Business in the USA*. Hachette UK, 2013, at chapter 9.

⁸² Gandall, Neil. “The dynamics of competition in the internet search engine market.” *International Journal of Industrial Organization*, 19 (2001): 1103–1117.

⁸³ Its founders Sergey Brin and Larry Page had started to work on a search engine called BackRub (named after its ability to analyse backlinks pointing to a given website) in 1996.

⁸⁴ Research shows that the quality of search results is the predominant driver of usage, not the offering of additional functionalities. See, Telang Rahul & Tridas Mukhopadhyay. “Drivers of Web portal use.” *Electronic Commerce Research and Applications* 4 (2005) 49–65. Telang, Rahul, Tridas Mukhopadhyay & Ronald T. Wilcox. “An empirical analysis of Internet search engine choice.” *Darden School of Business Working Paper* 03-05 (2001).

they could be matched with search queries. Those directories were not only costly to build, develop and improve, but also subjective and error prone.⁸⁵ Brin and Page introduced an alternative technology not exclusively based on “information retrieval”. Their idea was to make heavy use of information found in hyperlinks (link structure and link text) to produce better search results.⁸⁶ The rest is well-known business history. By 2000, Google was the number 1 search engine worldwide. In 2016, Verizon purchased Yahoo!, after a half dozen helpless attempts to remain relevant,⁸⁷ including poaching key Google executives.

The same can be said of Microsoft. In the early 1980s, Microsoft was not a dominant force in the PC market. It was not even a public corporation. Microsoft was a small software company, to which IBM, one of the main players in the nascent computing industry, had outsourced the development of a PC Disk Operating System (PC/DOS).⁸⁸ As the PC market kept growing, Microsoft realized that its commercial position would stall, so long as it would not provide a user-friendly Graphical User Interface (“GUI”).⁸⁹ The GUI is the front end of an operating system. Apple, in contrast, was already a leading player on the hardware segment with its flagship Macintosh computer, which included MacOS and its user friendly GUI.⁹⁰ In June 1985, Microsoft’s CEO Bill Gates and his colleague Jeff Raikes wrote a letter to Apple’s senior management, requesting them to open up their Macintosh architecture.⁹¹ Gates was seeking to convince Apple to license its proprietary OS and GUI to a handful of personal computer manufacturers, so as to create a scalable compatible industry standard. The letter warned Apple of possible marginalization in large overseas markets, including Europe. Gates ended his missive with an open hand to help Apple implement this strategy. Again, the sequel is common knowledge. Apple snubbed Gates’ memorandum. And Bill Gates went along, launching its own operating system (MS/DOS) Windows 1.0 in November 1985 on the basis of a GUI copied from both Apple’s and another OS maker named Visi.⁹² Windows 1.0 was

⁸⁵ This explains that at the time, most web users were using multiple search engines, and there was little overlap among search results.

⁸⁶ Brin, Sergey & Lawrence Page. “Reprint of: The anatomy of a large-scale hypertextual web search engine.” *Computer networks* 56.18 (2012): 3825-3833. See also presentation by Singhal, Amit “Challenges in Running a Commercial Search Engine”, available at <https://www.research.ibm.com/haifa/Workshops/searchandcollaboration2004/papers/haifa.pdf>

⁸⁷ Following Google’s success, Yahoo! sought to move away from brute force directories’ building, through a series of acquisition of search engines companies.

⁸⁸ See O’Regan, Gerard. *Pillars of Computing, A Compendium of Select, Pivotal Technology Firms*. Springer, 2015 at Chapter 22.

⁸⁹ It is well known that Microsoft had drafted a favourable contract with IBM that allowed Microsoft to keep the rights to MS-DOS, including the right to use, manufacture and distribute its own OS. See Bagley, Constance E. “What’s Law Got to Do With It?: Integrating Law and Strategy.” *American Business Law Journal* 47.4 (2010): 587-639.

⁹⁰ In reality, Apple copied GUI that had been developed by Xerox. In the early 1980s, a deal had been signed whereby Apple (who would soon IPO) would give stocks to Xerox, in exchange for Xerox disclosing the research projects and applications carried out in its research arm PARC. During a visit of PARC, Steve Jobs encountered Xerox GUI and its mouse, and found it promising for its upcoming computer Lisa. Apple thus retargeted its development programme, and copied the Xerox interface. See Anthony, Sebastian, “How Steve Jobs acquired the mouse and GUI (video)”, *ExtremeTech* [Blog], 11 Nov. 2011, available at <http://www.extremetech.com/computing/104661-how-steve-jobs-stole-the-mouse-and-gui-video>

⁹¹ See Bruun, Erik, *Forbes Book of Great Business Letters*, Black Doll & Leventhal, New York, 2001.

⁹² This led to a copyright infringement dispute with Apple. See, in particular, *Apple Computer, Inc. v. Microsoft Corp.*, 717 F. Supp. 1428, 1430-32 (N.D. Cal. 1989), discussed in Bagley, Constance E. *supra* note 89, at 612-613.

not instantly a commercial success, and the technological world largely derided the software.⁹³ Yet, the platform embedded all the features that would subsequently disrupt Apple’s entrenched position: open architecture, cheap software (\$99) and a user-friendly GUI (with mouse). Microsoft incrementally improved its platform. In 1989, Microsoft introduced the Office suite. And in 1990, Windows 3.0 eventually included a user friendly GUI that would dominate the industry for the rest of times. Lost in monopolistic isolation,⁹⁴ Apple did not foresee that software, rather than hardware would drive the industry forward.⁹⁵

3. R&Dism

The moligopolists channel sizeable amounts of resources into research and development (“R&D”). The below table shows that all the moligopolists incur R&D expenses in excess of \$1 billion. And those expenses denote a constant increase.

R&D EXPENSES ; REVENUE (SOURCE: GAFAM 10-K FILINGS TO THE SEC, 2015)			
	2012	2013	2014
Google	\$6,083b ; \$46,039	\$7,137b ; \$55,519	\$9,382b ; \$66,001
Microsoft	\$9,8b ; \$73,723	\$ 10,411b ; \$77,849	\$ 11,381b ; \$86,833
Facebook	\$1,40b ; \$5,089 (revenue)	\$1,42b ; \$7,872	\$2,67b ; \$12,466
Apple	\$3,381b ; \$156,508 (net sales)	\$4,475b ; \$170,910	\$6,041b ; \$182,795
Amazon ⁹⁶	\$4,564b ; \$61,093 (net sales)	\$6,565b ; \$74,452	\$9,275b ; \$88,988

The true significance of this data can be best understood by looking at R&D intensity, which measures the ratio of R&D expenses to revenue. In the following table, we observe that Facebook is the most R&D intensive company, whilst Apple is the least R&D intensive one.

⁹³ See, Hollister, Sean, “Revisiting Windows 1.0: how Microsoft’s first desktop gracefully failed”, *The Verge* [Blog], 20 Nov. 2012, available at <http://www.theverge.com/2012/11/20/3671922/windows-1-0-microsoft-history-desktop-gracefully-failed>

⁹⁴ Hazlett, Thomas, Robert Litan & Edwin Rockefeller. "Legal and Economic Aspects of the Microsoft Case", *Business Economics* 35.2 (2000): 45-53: “It makes you cry to read the Apple corporate history—having a wonderful product and absolutely mismanaging it into a ridiculously low market share, given its quality. In fact, Apple acted like a monopolist. They overpriced their product and 'monopolized' the market they had. Microsoft did exactly the opposite. With low margins, it spread the software everywhere and became the standard”.

⁹⁵ Former Apple CEO Wozniak said: “Apple saw itself as a hardware company. ... That was a mistake”. See, Letters of Note, "Apple must make Macintosh a standard", 23 Feb. 2012, available at <http://www.lettersofnote.com/2012/02/apple-must-make-macintosh-standard.html>

⁹⁶ See, Amazon 2015 10-K form. In its report, Amazon defines those expenses not as R&D, but as technology and content, and defines them as follows: *Technology costs consist principally of research and development activities including payroll and related expenses for employees involved in application, production, maintenance, operation, and platform development for new and existing products and services, as well as AWS and other technology infrastructure expenses. Content costs consist principally of payroll and related expenses for employees involved in category expansion, editorial content, buying, and merchandising selection. Technology and content costs are expensed as incurred, except for certain costs relating to the development of internal-use software and website development, including software used to upgrade and enhance our websites and applications supporting our business, which are capitalized and amortized over two years'.*

RATE OF R&D/REVENUE (SOURCE: GAFAM 10-K FILINGS TO THE SEC, 2015)			
	2012	2013	2014
Google	13,212%	12,855%	14,214%
Microsoft	13,293%	13,373%	13,10%
Facebook	27,510%	18,038%	21,418%
Apple	2,160%	2,6%	3.304%
Amazon ⁹⁷	7,470%	8.939%	10,422%

When benchmarked with other industrial sectors, the data reveals the sheer importance of moligopoly R&D. At the aggregate level, Google, Microsoft and Facebook’s R&D intensity is equivalent to the average R&D intensity of the Pharmaceuticals & Biotechnology sector (see EU industrial R&D scorecard, table 3.2 below).⁹⁸ This is significant, because Pharmaceuticals & Biotechnology is the leader sector in terms of R&D intensity. Moreover, their R&D expenses outrank by more than twice the average Aerospace and Defence sector. Last, we note that both pharmaceutical and defence are heavily subsidized R&D sectors, as compared to software and computer services.

Table 3.2 - Ranking of the top 11 industrial sectors by overall R&D in the 2015 Scoreboard.

Sector	Global R&D intensity (%)	EU-608 R&D intensity (%)	US-829 R&D intensity (%)	Japan-360 R&D intensity (%)	RoW-703 R&D intensity (%)
Pharmaceuticals & Biotechnology	14.4	13.3	17.1	13.3	12.0
Software & Computer Services	10.1	10.6	13.2	2.1	6.8
Technology Hardware & Equipment	8.0	15.1	9.9	5.2	4.2
Leisure Goods	5.8	3.0	5.8	5.8	6.2
Aerospace & Defence	4.5	6.0	3.2	1.4	6.0
Electronic & Electrical Equipment	4.5	5.2	4.0	4.4	4.3
Automobiles & Parts	4.4	5.5	4.0	4.1	2.7
Health Care Equipment & Services	3.8	5.0	3.1	6.9	9.9
Industrial Engineering	2.9	3.2	2.9	2.8	2.6
Chemicals	2.6	2.1	3.4	3.6	1.7
General Industrials	2.5	4.2	2.7	2.9	1.1
Top 11 industries	5.7	6.2	7.2	4.3	4.1
Rest of 30	1.0	0.8	1.3	1.1	1.0
All 41 industries	3.4	2.8	5.2	3.3	2.4

Source: *The 2015 EU Industrial R&D Investment Scoreboard*, European Commission, JRC/DG RTD.

⁹⁷ See, Amazon 2015 10-K form. In its report, Amazon defines those expenses not as R&D, but as technology and content, and defines them as follows: “*Technology costs consist principally of research and development activities including payroll and related expenses for employees involved in application, production, maintenance, operation, and platform development for new and existing products and services, as well as AWS and other technology infrastructure expenses. Content costs consist principally of payroll and related expenses for employees involved in category expansion, editorial content, buying, and merchandising selection. Technology and content costs are expensed as incurred, except for certain costs relating to the development of internal-use software and website development, including software used to upgrade and enhance our websites and applications supporting our business, which are capitalized and amortized over two years*”.

⁹⁸ Interestingly, the EU industrial R&D Scorecard, 2015 provides certain benchmarks that help put the above numbers in perspective.

The moligopolists' R&D intensity can also be benchmarked with individual firms from other industries. In the table below, we can see that Microsoft and Google (in yellow shading) funnel amounts of resources to R&D that exceed those of the world's largest pharmaceutical companies (namely, Novartis, Roche, Pfizer and Merck, with green shading).⁹⁹

Rank in 2015	Company	Country	R&D in 2014 (€m)	R&D intensity (%)	Rank change 2004-2015
1	VOLKSWAGEN	Germany	13120.0	6.5	up 7
2	SAMSUNG	South Korea	12187.0	7.9	up 31
3	MICROSOFT	US	9921.7	12.9	up 10
4	INTEL	US	9502.5	20.6	up 10
5	NOVARTIS	Switzerland	8217.6	16.7	up 15
6	GOOGLE	US	8098.2	14.9	up > 200
7	ROCHE	Switzerland	7422.1	18.8	up 11
8	JOHNSON & JOHNSON	US	6996.1	11.4	up 4
9	TOYOTA MOTOR	Japan	6858.4	3.7	down 4
10	PFIZER	US	6844.6	16.8	down 8
11	GENERAL MOTORS	US	6095.0	4.7	down 5
12	MERCK US	US	6056.3	17.4	up 17
13	FORD MOTOR	US	5683.2	4.8	down 12
14	DAIMLER	Germany	5650.0	4.4	down 11
15	HUAWEI	China	5441.2	14.0	up > 200
16	CISCO SYSTEMS	US	5112.4	12.6	up 14
17	ROBERT BOSCH	Germany	5042.0	10.3	up 10
18	APPLE	US	4975.7	3.3	up 86
19	SANOFI-AVENTIS	France	4812.0	14.2	down 3
20	HONDA MOTOR	Japan	4576.6	5.0	down 9

Lastly, a noteworthy feature of the moligopolists' R&D investments is that they primarily cover human resources. The SEC 10-K filings give details on the content of their R&D expenses. The moligopolists explain that R&D spending consists *primarily* of labor costs (attraction, remuneration and compensation), or of related costs like those incurred to provide facilities for employees involved in R&D.

CONTENT OF R&D COSTS (SOURCE: GAFAM 10-K FILINGS TO THE SEC, 2015)				
GOOG	APPL	FB	AMZN	MSFT
"R&D expenses consist primarily of Labor and facilities-related costs for employees responsible for R&D in our existing businesses as well a new products and services; Depreciation and equipment-related	"The year-over-year growth in 2014 and 2013 R&D expense was driven primarily by an increase in headcount and related expenses, including share-based compensation costs and machinery and equipment to	"Research and development. Research and development expenses consist primarily of share-based compensation, salaries and benefits for employees on our engineering and technical teams	"Technology costs consist principally of research and development activities including payroll and related expenses for employees involved in application, production, maintenance, operation, and platform	"Research and development expenses include payroll, employee benefits, stock-based compensation expense, and other headcount-related expenses associated with product development.

⁹⁹ The qualitative comments found in the EU R&D industrial scorecard confirm this impression. Pharmaceutical companies (highlighted in green) and tech firms (highlighted in yellow) are put on almost equal footing when it comes to R&D, noting that: "There are 42 companies out of the top 100 that invested in R&D more than 10% of their net sales. These companies are mostly from Pharmaceuticals & Biotechnology (22) and ICT sectors (16). Twenty-two of them are based in the US and thirteen in the EU. It is interesting to note that 80% of these high R&D-intensive companies also have double-digit profitability. This group of companies includes US leading companies in biotechnology (Celgene, Amgen, Biogen, Gilead, and Bristol-Myers Squibb) and fast growing software/internet companies (Facebook, Google and Oracle)".

<i>expenses; and stock-based compensation expense for employees responsible for R&D”</i>	<i>support expanded R&D activities”</i>	<i>who are responsible for building new products as well as improving existing products. We expense all of our research and development costs as they are incurred”</i>	<i>development for new and existing products and services, as well as AWS and other technology infrastructure expenses. Content costs consist principally of payroll and related expenses for employees involved in category expansion, editorial content, buying, and merchandising selection”</i>	<i>Other headcount-related expenses associated with product development. Research and development expenses also include third-party development and programming costs, localization costs incurred to translate software for international markets, and the amortization of purchased software code”</i>
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4. Serendipitism

With the possible exception of Apple, the moligopolists envision innovation with a degree of organization and serendipity.¹⁰⁰ Instead of following a fully strategic approach to research, the moligopolists consider that great discoveries can be achieved unpredictably.¹⁰¹ To be sure, we use here the concept of serendipity in a broad sense, to cover not only entirely accidental innovation but more generally a process of experimental research.¹⁰² Popular historical references are Columbus or Pasteur, who did not find what they were looking for, but whose discoveries (respectively, the Americas and bacteria) were hardly accidents, and were all based on a structured innovation process.¹⁰³

On closer analysis, the moligopolists do not share a similarly serendipitous vision of research. For instance, at Google, a traditional research facility called “*Google Research*” focuses on computer science and Internet technologies, while at another division called “*Google X*” research is more open-ended and serendipity plays a key role.¹⁰⁴ In its 2015 SEC 10-K filing, Google explains under a section titled “*Moonshots*”:

¹⁰⁰ Rasmus, Daniel W., “How IT Professionals Can Embrace the Serendipity Economy”, *Harvard Business Review*, 19 Aug. 2013. In recent years, scientists have tended to show that whilst innovation must remain to a certain extent out of control, a certain degree of management and organization can assist this process. Austin, Robert D., Lee Devin, & Erin E. Sullivan. “Accidental Innovation: Supporting Valuable Unpredictability in the Creative Process Organization.” *Organization Science* 23.5 (2012): 1505-1522.

¹⁰¹ *Science The Endless Frontier*, Report to the President by Vannevar Bush, Director of the Office of Scientific Research and Development, July 1945. In 1945, Vaneeva Bush noted: “We must remove the rigid controls which we have had to impose, and recover freedom of inquiry and that healthy competitive scientific spirit so necessary for expansion of the frontiers of scientific knowledge”

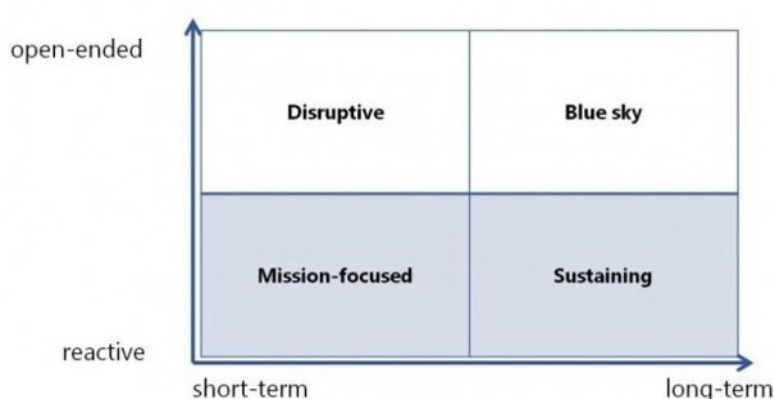
¹⁰² Stipp, Susan. “Strategic or Blue Sky Research?” *Elements* 6.3 (2010): 139-140: “with goal-directed research, there is little room for serendipity and few resources to follow a flash of inspiration”.

¹⁰³ Stephan, Paula E. “The Economics of Science.” *Journal of Economic Literature* 34.3 (1996): 1199-235.

¹⁰⁴ A journalist advances bluntly that: “if there's a master plan behind [Google] X, it's that a frictional arrangement of ragtag intellects is the best hope for creating products that can solve the world's most intractable issues”. See Gertner, Jon, “The Truth About Google X: An Exclusive Look Behind The Secretive Lab's Closed Doors”, *Fastcompany* [Blog] 15 Apr. 2014 available at <http://www.fastcompany.com/3028156/united-states-of-innovation/the-google-x-factor>.

*“The idea of trying new things is reflected in some of our new, ambitious projects. Everything might not fit into a neat little box. We believe that is exactly how to stay relevant. Many companies get comfortable doing what they have always done, making a few incremental changes. This incrementalism leads to irrelevance over time, especially in technology, where change tends to be revolutionary, not evolutionary”.*¹⁰⁵

Though it also embraces a serendipitous approach, Microsoft diverges. Its Special Projects division seeks to advance “*disruptive ideas*”, and to place less emphasis on the “*blue sky research*” that Google seems to pursue. This distinction can be well understood with the below “*investment map*”.¹⁰⁶ Microsoft focuses more on the upper left quadrant, than on the upper right quadrant where Google seems to place more emphasis. In brief, research must come from the product lines, and it must lead to applications that “*ship*”.¹⁰⁷



Investment Map - Digital Trends - 2014

Serendipity seems also second nature for other moligopolists. Amazon has institutionalized experimentation across all layers of its corporate structure.¹⁰⁸ Jeff Bezos, Amazon’s CEO, said to Harvard Business School researchers: “*I encourage our employees to go down blind alleys*

¹⁰⁵ See, Google 2015 10-K form.

¹⁰⁶ See, Kaplan, Jeremy “Microsoft’s head of research opens up about Google X, Windows 9, and the future”, *Digital Trends* [Blog], 6 May 2014, available at <http://www.digitaltrends.com/features/peter-lee-head-microsoft-research-google-x-windows-9-future-computing/> (though the article reports also that research at Microsoft must in principle cover all four quadrants).

¹⁰⁷ See, Leber, Jessica, “The Chief Of Microsoft Research On Big Ideas, Failure, And Its New Skunkworks Group” *Fastcoexist* [Blog] 7 May 2014 available at <http://www.fastcoexist.com/3030164/the-chief-of-microsoft-research-on-big-ideas-failure-and-its-new-skunkworks-group> In particular: “*We invest in research that is reactive—the product team comes to us with a hard problem it doesn’t know how to solve, and we’ll work with them to solve those problems*”. Microsoft seems conscious that the demise of Henry Ford – the first modern economy disrupter – was caused by a failure to test his vision against reality, and in particular the needs of its customers. Vlaskovits, Patrick, “Henry Ford, Innovation, and That ‘Faster Horse’ Quote”, *Harvard Business Review*, 29 Aug. 2011.

¹⁰⁸ See, Jeffrey H., Dyer, Hal B., Gregersen, & Clayton M. Christensen, “The Innovator’s DNA: Mastering the five skills of disruptive innovators.” *Harvard Business Press*, 2011, at 135: “*Bezos isn’t done experimenting with business models*”. Recently, Bezos conceded in an interview that Amazon had “*made billions of dollars of failures*” on experimentation. He said “*And if they’re experiments you don’t know ahead of time if they’re going to work. Experiments are by their very nature prone to failure. But a few big successes compensate for dozens and dozens of things that didn’t work*.” See Gibbs, Samuel, “Jeff Bezos: I’ve made billions of dollars of failures at Amazon”, *The Guardian*, 3 Dec. 2014, available at <https://www.theguardian.com/technology/2014/dec/03/jeff-bezos-billions-dollars-failures-amazon>

and experiment. We've tried to reduce the cost of doing experiments so that we can do more of them. If you can increase the number of experiments you try from a hundred to a thousand, you dramatically increase the number of innovations you produce".¹⁰⁹ Amazon's history itself displays a degree of experimentation. The company started as an online bookstore and has now morphed into an online discount retailer and a maker of electronic devices.¹¹⁰ It is reported to work on technology frontier projects like an unmanned aerial drone delivery service and fully robotized warehouses.¹¹¹ And Amazon's CEO has funded other "moonshot" ventures including a spaceflight company called Blue Origin.¹¹²

Facebook also displays a degree of experimentalism.¹¹³ It has embraced an open-ended, long-term approach to R&D with work in frontier technology areas, including Artificial Intelligence ("AI"), Virtual Reality ("VR") and Aerial wireless connectivity.¹¹⁴ Perhaps more significantly, Facebook has followed Google and Microsoft by setting up a breakthrough R&D group called "Building 8"¹¹⁵ with the stated ambition "to accomplish bold things".¹¹⁶ Facebook has also invested in a research facility called "area 404" which is supposed to fail test inventions and scale them up.¹¹⁷

¹⁰⁹ *Id.* at 136.

¹¹⁰ *Id.*, at 135 noting that this is "far cry from Bezos's original business idea". Amazon has also put together a partnership programme with universities called Amazon Catalyst, which purports to "identify, fund, and support bold, risky, globally impactful projects". See <https://catalyst.amazon.com/uw/faq/>

¹¹¹ See, Koslosky, John-Erik, "Here's Why Google and Amazon Should Continue Taking Moon Shots, and Why Investors Should Embrace It", *The Motley Fool* [Blog], 14 Apr. 2014 available at <http://www.fool.com/investing/general/2014/04/14/why-google-and-amazon-should-continue-taking-moon.aspx>

¹¹² Blue Origin works on space vehicles, including launch systems, booster and capsules. For more, see *Reddit* conversation:

https://www.reddit.com/r/IAMa/comments/4wb6up/we_are_blue_origin_software_engineers_we_build/?sort=old It ambitions to develop a fully reusable vertical take-off and landing rocket that can be used for affordable spaceflights. See <https://www.blueorigin.com/technology>; It ought to be noted here that other moligopolists have made forays into space transportation. In January 2015, Google invested \$900 million in SpaceX, a space exploration and space transport company, to support continued innovation in the areas of space transport, reusability, and satellite manufacturing. See Weber, Harrison, "Google confirms it put \$900M into SpaceX's \$1B round", *Venture Beat* [Blog], 10 Feb. 2015, available at <http://venturebeat.com/2015/02/10/google-confirms-it-put-900m-into-spacexs-1b-round/>

¹¹³ Taulli, Tom. *How to Create the Next Facebook: Seeing Your Startup Through, from Idea to IPO*. Apress, 2012, at 125.

¹¹⁴ Facebook works on several projects intended to improve wireless connectivity, including "Aquila", a solar powered drone that can provide ground Internet connection.

¹¹⁵ See <https://www.facebook.com/zuck/posts/10102777889538891>. For an early description, see D'Onfro, Jillian, "Facebook's bulking up the team for its mysterious new hardware division: Building 8" *Business Insider UK*, 21 Apr. 2016, available at <http://uk.businessinsider.com/facebook-building-8-job-postings-2016-4?r=US&IR=T>. According to Zuckerberg, the idea is to promote "DARPA-style breakthrough development".

¹¹⁶ Building 8 is supposed to complement Facebook's existing R&D efforts, not overlap it. Building 8 has posted a job application that is about hiring people "willing to face down their fear of failure to accomplish bold things". For an overview, see D'Onfro, Jillian, "All the crazy-ambitious products Facebook's working on besides its social network" *Business Insider UK*, 26 Apr. 2016, available at <http://uk.businessinsider.com/facebook-most-ambitious-moonshot-projects-2016-4?r=US&IR=T>

¹¹⁷ For a description, see Constine, Josh, "Inside Facebook's new 'Area 404' hardware lab", *TechCrunch* [Blog], 3 Aug. 2016, available at <https://techcrunch.com/2016/08/03/facebook-area-404/>

Apple's approach to R&D is harder to document. The company is well known for its secretive culture, both internally and externally.¹¹⁸ It thus discloses almost no information on its innovation processes, other than that required by financial regulators and investors.

Admittedly, the main weakness of this discussion is that we cannot tell if the observed R&D behavior of the moligopolists denotes a *credible* commitment to serendipitous research. In some cases, the moligopolists' commitment to serendipitous R&D appears unambiguous. Google's corporate restructuring in October 2015 is a case in point.¹¹⁹ Under the new structure, an umbrella company called Alphabet Inc. has been entrusted with oversight over various subsidiaries.¹²⁰ Google is one segment. It concentrates all the core search and advertisement activities (Google search, YouTube, Chrome, etc.). The other segment, "*Other bets*", regroups various businesses like Google X (self-driving cars, delivery drones, etc.), Calico (longevity research), etc. The rationale behind Google's corporate reorganization is to spin out loss-making "*moonshot*" ventures from Google's core search activities which are profitable.¹²¹ By providing transparency to financial markets on its individual performance in its core business, Google prevents its search activities' stock price being dragged down by costly moonshot ventures. Moreover, the move seems designed to maintain the company's innovation potential, by giving its business units autonomy in their research policy, disconnected from Google's strategic goals in search.¹²²

In other cases, we observe less adherence to R&D experimentation. Companies like Amazon and perhaps Apple – to the extent we can observe it – seem to embrace a more core-centric, sustaining and reactive vision of R&D. Amazon's most frontier R&D projects seem predominantly geared towards the optimization of its core operations in online retailing.

¹¹⁸ Lashinsky, Adam. *Inside Apple: How America's Most Admired--and Secretive--Company Really Works*. Hachette UK, 2012, at chapter 2: "All companies have secrets, of course. The difference is that at Apple, everything is a secret".

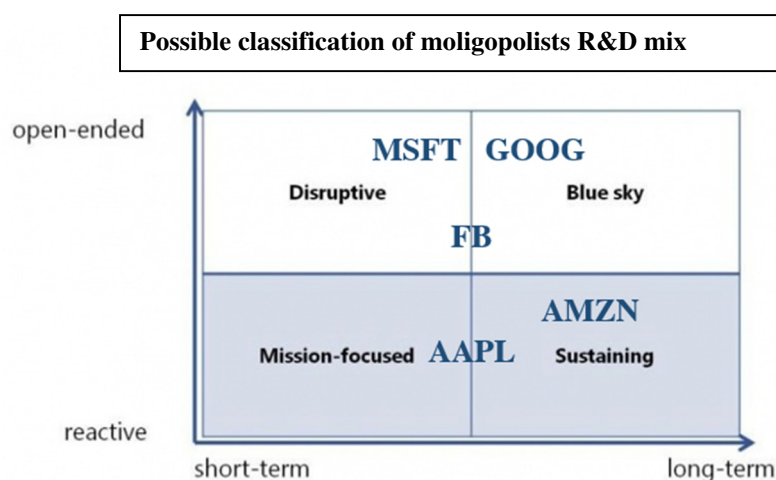
¹¹⁹ Besides this, the culture of experimentation seems institutionalized within the firm. At Google, staff is encouraged to use 20 percent of its time to work on personal projects with possible company-related implications. See Mediratta, Bharat & Bick, Julie, "The Google Way: Give Engineers Room", *New York Times*, 21 Oct. 2007, available at www.nytimes.com/2007/10/21/jobs/21pre.html. Google's low frills virtual reality solution "cardboard" is a result of a 20% project. See <https://vr.google.com/cardboard/>.

¹²⁰ This is well explained in Google's company profile, available on the Financial Times: "*Alphabet Inc. is a holding company. The Company holds interests in Google Inc. (Google). The Company's segments include Google and Other Bets. Google segment includes Internet products, such as Search, Ads, Commerce, Maps, YouTube, Apps, Cloud, Android, Chrome, Google Play, and hardware products, including Chromecast, Chromebooks and Nexus, which are sold by the Company. Its technical infrastructure and Virtual Reality are also included in Google segment. Google segment is engaged in advertising, sales of digital content, applications and cloud services, as well as sale of Google branded hardware. The Other Bets segment consists of various operating segments and includes businesses, such as Access/Google Fiber, Calico, Nest, Verily, GV, Google Capital, X and other initiatives. Other Bets segment is engaged in the sale of Nest hardware products, Internet and television services through Google Fiber, and licensing and research and development (R&D) services through Verily*", see Financial Times, Alphabet Inc. profile, available at: <http://markets.ft.com/research/Markets/Tearsheets/Business-profile?s=GOOGL:NSQ>

¹²¹ See, Barr, Alistair & Rolfe, Winkler, "Google Creates Parent Company Called Alphabet in Restructuring", *Wall Street Journal*, 10 Aug. 2015, available at www.wsj.com/articles/google-creates-new-company-alphabet-1439240645

¹²² See Dougherty, Conor, "Google to Reorganize as Alphabet to Keep Its Lead as an Innovator", *The New York Times*, 10 Aug. 2015: "*The change is an effort to keep Google innovative. As other big technology companies have gotten old, some have been felled by a desire to remain wed to their traditional core businesses. With its new structure, Google can give operating divisions more leeway in making their own decisions and keep the businesses more nimble*", available at www.nytimes.com/2015/08/11/technology/google-alphabet-restructuring.html

Apple’s innovation strategy aims at differentiated, groundbreaking consumer goods, which yield premium prices and large profit margin. In contrast with an experimental R&D trajectory, Apple “make choices about which technologies to ride based on keen market insight”.¹²³



Another challenge to our analysis is that we lack metrics to gauge the weight of the moligopolists’ serendipitous ventures within their overall R&D policy. No data has been disclosed on the R&D money apportioned to divisions like Google X, Microsoft’s Special Projects or Building 8. Google’s restructuring into Alphabet gives, however, the beginning of an idea. In early 2016, a technology analyst calculated that Other Bets expenses were equivalent to between a quarter and 40% of Alphabet’s total R&D spend in 2015 (see graph below).¹²⁴

5. Transactionalism

The moligopolists are very active on the merger and acquisitions (“M&A”) market. The following table presents data on the volume and value of M&A transactions announced and completed since 2003.

M&A ACTIVITY, GAFAM, 2003-2016, COMPANY PROSPECTOR, MARKETLINE (28 JUNE 2016)				
Company Name	Primary Industry	Country	M&A Vol.	M&A Value (\$m)
Alphabet Inc.	Business and Consumer Services	United States	181	37.485,0
Amazon.com, Inc.	Retailing	United States	52	4.167,0
Apple Inc.	Communications	United States	58	6.655,0
Facebook, Inc.	Media	United States	80	27.324,0
Microsoft Corporation	Technology and Services	United States	157	68.332,0

Google and Microsoft lead the sample, both in terms of number of deals announced (and completed) and in terms of value. Apple and Amazon are less active on the M&A market.

¹²³ Heracleous, Loizos. “Quantum Strategy at Apple Inc.” *Organizational Dynamics* 42.2 (2013): 92-99.

¹²⁴ See Dawson, Jan “Breaking Down Alphabet’s Other Bets”, *Beyond Devices* [Blog], 1 Feb. 2016, available at <http://www.beyonddevic.es/2016/02/01/breaking-down-alphabets-other-bets/> The analysis is based on Alphabet's published financial results for Q4 2015. Of course, Other Bets comprises projects like Fiber whose expenses are not fully R&D driven, hence the figure might be lower. That said, the share of total costs absorbed by Other Bets seems to rise.

For each GAFAM, the largest acquisitions are respectively: Microsoft (on-going) purchase of LinkedIn for \$26 billion, Facebook’s purchase of WhatsApp for \$19 billion, Google’s buyout of Motorola Mobility for \$12,5 billion, Apple’s \$3 billion takeover of Beats Electronics, and Amazon’s \$1,2 billion bid for Zappos.

M&A DEALS/YEAR, MARKETLINE (28 JUNE 2016)					
Year	GOOG	AAPL	FB	AMZN	MSFT
2016	5	3	1	4	6
2015	15	11	4	8	18
2014	30	9	9	5	11
2013	21	13	10	6	10
2012	20	4	19	2	9
TOP 5 LARGEST ACQUISITION TO DATE IN VALUE					
1	Motorola Mobility \$12,5 billion	Beats Electronics \$3 billion	WhatsApp \$19 billion	Zappos \$1,2 billion	LinkedIn \$26 billion
2	Nestlabs, \$3,2 billion	NeXt, \$404 million	Oculus VR, \$2 billion	Twitch, \$842 million	Skype, \$8,5 billion
3	DoubleClick, \$3,1 billion	Anobit, \$390 million	Instagram, \$1 billion	Kiva Systems, \$678 million	Nokia (phone), \$7,6 billion
4	YouTube, \$1,65 billion	AuthenTec, \$356 million	LiveRail, \$400-500 million	Exchange.com, \$645 million,	Aquantive, \$6 billion
5	Waze, \$966 million	PrimeSense, \$340 million	Face.com, \$100 million	Quidsi, \$545 million	Mojang, \$2,5 billion

Those numbers, again, can be put into perspective with the largest M&A transactions in the pharmaceutical industry (see table below).¹²⁵ To date, no transaction in the technology world exceeds the value of the largest pharmaceutical mergers.

TOP 5 M&A TRANSACTIONS, PHARMACEUTICAL INDUSTRY				
Rank	Year	Purchaser	Target	Value
1	1999	Pfizer	Warner-Lambert	\$90.0 billion
2	2000	Glaxo Wellcome Plc	SmithKline Beecham Plc.	\$76.0 billion
3	2004	Sanofi	Aventis	\$73.5 billion
4	2015	Actavis	Allergan, Inc	\$70.5 billion
5	2009	Pfizer	Wyeth	\$68.0 billion

Besides billion dollars M&A transactions, the moligopolists also generate a large number of smaller deals. Those transactions are not notified to the SEC.¹²⁶ It is thus uneasy to track them exhaustively.

¹²⁵ Wikipedia contributors, “List of largest pharmaceutical mergers and acquisitions.” *Wikipedia, The Free Encyclopedia*, 15 June 2016, available at https://en.wikipedia.org/wiki/List_of_largest_pharmaceutical_mergers_and_acquisitions

¹²⁶ Only “significant business combinations” must be notified to the SEC. Significant acquisitions are those that represent more than 20% of the acquirers’ assets, pursuant to S-X Rules 3-05 and 1-02(w). *See*, Division of Corporation Finance, Financial Reporting Manual, available at <https://www.sec.gov/divisions/corpfina/cffinancialreportingmanual.pdf>

What we know is that those deals target grown-up startups. Their strategic importance shall not be understated. Google's purchase of Android was the stepping-stone of what is today the dominant OS for smartphones.

Moreover, and broadly speaking, the moligopolists' acquisitions target a wide array of sectors, including web analytics, social networking, gaming, artificial intelligence technologies (visual recognition, natural language processing, facial tracking, etc.), manufacturing, robotics, virtual reality, digital payments and so on.

The moligopolists' transactional activity also covers corporate venturing. The purpose of corporate venture capital ("CVC") is to fund startups and assist their growth.¹²⁷ CVC is less expensive than M&A, and leaves entrepreneurial freedom to target startups. Well-known examples include Google ventures \$258 million and Microsoft venture \$1 billion investments in Uber; Microsoft's \$240 million investment in Facebook in 2007; Google-led \$524 million investment in MagicLeap.

The trajectory of moligopolists CVC investments is uneasy to systematize. Their portfolio of investments in startups covers various areas. For example, Google's venture capital firm reportedly focuses on Consumer; Life Science & Health; Data & AI; Enterprise and Robotics.¹²⁸

Most GAFAM seem to have a dedicated corporate venture capital ("CVC") arm (Google Ventures for Alphabet, Microsoft Ventures and Microsoft Accelerator, Facebook Inc. Investment Arm, Amazon.com Inc., Investment Arm).¹²⁹ Apple is the exception that confirms the rule. It does not have a dedicated arm for CVC. Yet, this does not mean that Apple does not engage in CVC. For example, in 2015, it invested \$1 billion in Didi Xuching, a Chinese ride hailing startup that competes with Uber (and that has since then outcompeted it). Apple's lack of institutionalized CVC vehicle may be a by-product of the firm's well-known culture of secrecy. Apple is strategically reluctant to disclose the trajectory of its investments to the market place.¹³⁰

To close, we note that for both types of transactional activity, the moligopolists are on par with several other large firms. In the M&A market, IBM and Cisco are also ranked as prominent players. In CVC, Intel and Qualcomm are also mentioned as large startups funders.

6. Summation

Let us restate what are observable features of the technology giants: conglomeralism, paranoia, R&Dism, serendipitism and transactionalism. That said, the moligopolists denote

¹²⁷ A startup is essentially a new company.

¹²⁸ "Google Ventures CEO Bill Maris to step down" *Computer Business Review*, 11 Aug. 2016, available at <http://www.cbronline.com/news/verticals/ebanking/google-ventures-ceo-bill-maris-to-step-down-4976998/>

¹²⁹ For example, at Alphabet, there are two investment companies. On the one hand, Google Ventures provides venture capital funding to new companies (Uber, Nest, Slack, Foundation Medicine, Flatiron Health, One Medical Group, etc.). On the other hand, Google Capital invests in growth stage companies with focus on emerging, long-term technology trends.

¹³⁰ Apple is reported to be unwilling to have such an instrument, because it would reveal its interests and strategy to others. Moreover, to have a VC arm implies admission that innovation takes place outside of the investor, which may alter the image of Apple as a true innovator. See, C. Huston, "Why Apple doesn't have a venture-capital arm", *MarketWatch*, 18 June 2016, available at <http://www.marketwatch.com/story/why-apple-doesnt-have-a-venture-capital-arm-2016-06-15>

those traits to a varying degree. Consider conglomeratism. Google and Microsoft display much diversification, while Facebook and Amazon are more core-centric. The same applies to the fear of exit. The ethos of disruption is a story commonly heard from Google's senior management. But it is much less explicit with older firms like Apple and Microsoft with a history of resilience to disruption. R&D intensity reaches extreme values with Facebook and trails at comparably much lower levels with Apple. Serendipitism is also an area with many shades. Blue sky research is clearly institutionalized with Google. Amazon shares the same culture. Other firms like Facebook and Microsoft insist marginally more on mission focused, sustaining R&D.¹³¹ Last, Google and Microsoft are very active players on the transactional market, while Amazon and Apple are less M&A hungry.

Those industry characteristics are not novel. The fascination surrounding the digital economy shall not detract us from seeing that large firms with similar features have existed for decades, with examples like AT&T Bell LABS, Xerox PARC, IBM's Yorktown Heights, etc.¹³² R&Dism and transactionalism is also a feature observed in the pharmaceutical sector.¹³³ And the tech giants are not all young firms from the Silicon Valley. Apple and Microsoft are relatively old technology companies, while Amazon, Google and Facebook are comparably much younger. Firms like Microsoft or Amazon are not Silicon Valley players.¹³⁴

Keeping all those precautions in mind, the point of our inquiry shall therefore focus on understanding if there is a specific model that characterizes the competition that exists between the moligopolists, and that distinguishes them from other past or contemporary industry histories. For example, it is sometimes said that the tech giants R&D cannot be analogized to pure blue sky research, because it is much more driven by shareholders' demand.¹³⁵ At the same time, moligopoly R&D may be comparably costlier than

¹³¹ Facebook essentially promotes experiments to upgrade its social network platform. Widget and applications developers receive significant assistance through Open Application Protocol Interfaces ("APIs"), free tools and test facilities,¹³¹ and beta testing support. See Moore, Todd, "Beta test your apps on Facebook", *TechRepublic*, 26 Sep. 2016 <http://www.techrepublic.com/blog/software-engineer/beta-test-your-apps-on-facebook/>. Facebook has faced significant failures in this context, like Beacon (where Facebook republished users' purchasing activity on other sites). See Cashmore, Pete, "RIP Facebook Beacon" *Mashable* [Blog], 19 Sep. 2009, available at <http://mashable.com/2009/09/19/facebook-beacon-rip/#eZnXhMhBrPqw>

¹³² H. Anderson, "Why Big Companies Can't Invent", *Technology Review*, 2004, available at <https://www.technologyreview.com/s/402693/why-big-companies-cant-invent/> But contra, J. Stokes, "AT&T Labs vs. Google Labs: not your grand father's R&D", <http://arstechnica.com/uncategorized/2006/07/7340/> ("today's short-term corporate focus on maximizing shareholder value by inflating the stock price at all costs". And "the pressure to innovate comes from the boardroom and the marketing department. Hence all the men and women in R&D have to be able to make a case for the eventual marketability of what they're working on or risk being downsized").

¹³³ Gans and Stern note that the pharmaceutical sector obeys to the license or merge phenomenon. Gans, Joshua S., and Scott Stern, "Incumbency and R&D incentives: Licensing the gale of creative destruction." *Journal of Economics & Management Strategy* 9.4 (2000): 485–511. Yet, the motivations behind the moligopolists are not entirely similar to those of pharmaceutical companies. Like pharmaceutical firms whose patents expire, they use the M&A market to acquire blockbuster technologies. However, M&A deals in pharmaceuticals also find other rationales like tax optimization or scale economies which seem less clearly prevalent in the technology world.

¹³⁴ Thought this may change with Microsoft's acquisition of LinkedIn.

¹³⁵ See Fates, Matt, "How outsourced R&D drives Enterprise IT", *Boston.com*, 21 Nov. 2013: "The demand for growth and innovation creates tremendous pressure for IT incumbents, which aim to achieve both mandates though the acquisitions of smaller, emerging companies." available at http://archive.boston.com/business/blogs/global-business-hub/2013/11/how_outsourced.html.

pharmaceutical R&D, which is heavily subsidized.¹³⁶ We offer an analysis of this question in the next section.

B. INTERPRETATION

At this stage of our inquiry, the question before us consists in describing how the moligopolists compete. More particularly, we attempt to stylize the the extended rivalry that the antitrust field fails to see when it makes findings of dominance in itemized relevant markets. The analysis is inevitably interpretative, and shall not be taken by the reader as authoritative.

I. *What Moligopolists Fear? Disruption*

Let us start with a question: what is it that brings the moligopolists to stray from their core, and transform into conglomerates? And let us add to this question a conservative assumption: like any and all firms (perhaps with the exception of startups), the tech giants' ambition is to stay durably in market.

There are some reasons to think that the tech giants are obsessed by the prospect that they will not transition to the next generation. Unlike other monopolists from the past, the moligopolists have – perhaps mistakenly – no confidence that scale in the core will provide a competitive moat.

This fear cuts deep. It is a safe bet that it is rooted in education. In business schools, theories of disruption have become the alpha and omega of curriculums. Clayton Christensen's best seller *The Innovators' Dilemma* provides the foundational basis.¹³⁷ It explains that managers from large firms all too often follow two erroneous precepts: listen to the needs of their best customers and focus investments on projects that promise the best returns. Those principles are in fact paradoxically "*the wrong thing*" to do, because established firms fail to notice disruptive innovation that arise either in the low ends of their core or in new market footholds.¹³⁸

Since Christensen's book, related theories of competitive strategy have mushroomed, and they have often been rationalized on disruption grounds.¹³⁹ "*Judo economics*" is one of them.¹⁴⁰ It describes how innovators can turn an incumbent strength's into a weakness. A large scale, a strong image, or sunk investments may represent a formidable competitive advantage for an incumbent. However, they may also represent a threat because they trap the incumbent behind significant barriers to change. Yoffie and Kwak use judo to explain how Sega defeated Nintendo's dominance in the US home video game market. Sega "*leveraged Nintendo's brand equity by targeting an older, hipper audience with game titles containing generous*

¹³⁶ Sampat, Bhaven N., and Frank R. Lichtenberg. "What are the respective roles of the public and private sectors in pharmaceutical innovation?" *Health Affairs* 30.2 (2011): 332-339.

¹³⁷ Christensen, Clayton M. *The innovator's dilemma: when new technologies cause great firms to fail*, Boston, Massachusetts, USA: Harvard Business School Press, 1997.

¹³⁸ Christensen, Clayton M., Michael E. Raynor, & Rory McDonald. "What Is Disruptive Innovation?" *Harvard Business Review*, December 2015 Issue.

¹³⁹ See also, Tushman, Michael L., & Philip Anderson. "Technological discontinuities and organizational environments." *Administrative science quarterly*, 31.3 (1986): 439-465. Veryzer, Robert W. "Discontinuous innovation and the new product development process." *Journal of Product Innovation Management*, 15.4 (1998): 304-321.

¹⁴⁰ Gelman, Judith R., and Steven C. Salop. "Judo economics: capacity limitation and coupon competition." *The Bell Journal of Economics* 14.2 (1983): 315-325.

doses of sex and gore". The move trapped Nintendo. By following "into the teen and adult market, Nintendo would undercut its image as a trustworthy, family-entertainment brand".¹⁴¹

Or consider "platform envelopment".¹⁴² Eisenmann, Parker and Van Alstyne explain how aspiring platform providers can use overlapping user bases to disrupt established players. The entrant platform bundles "its own platform's functionality with that of the target's so as to leverage shared user relationships and common components". Possible examples are Microsoft envelopment attack against RealNetworks or Google envelopment of Yahoo! by linking new products like Gmail to its search platform.

A variant can also be found in "ecosystems" theory.¹⁴³ Hazzlett, Teece and Waverman define an ecosystem as "a number of firms, competitors and complementors that work together to create a new market and produce goods and services of value to customers". They explain how mobile carriers were progressively induced to cease control over ecosystems to handset application providers ("HAPs") like Apple, Google, Blackberry and Nokia. In the model, carriers and HAPs are both "complementors" and competitors "for rents".¹⁴⁴ And HAPs are the disruptors.

Like most powerful ideas, Christensen's disruption theory and its offshoots are often used to provide *ex post* rationalizations for observed market facts.¹⁴⁵ In our view, the theory's more important – yet often overlooked – contribution is not descriptive, but decisional: disruption is what *ex ante* influences the decisions made by business managers, regardless of its actual market impact.¹⁴⁶

Of course, the tech giants cassandresque forecasts could be derided as "lies".¹⁴⁷ Admittedly, the claim may hold when moligopolists describe their competitive environment before regulators (like, for example, in the 10-K filings). Yet, it is considerably less convincing that moligopolists seek to manage regulatory outcomes when their senior executives talk to journalists, essayists and academics about their education. Recall, in this regard, that Steve Jobs often referred to Christensen's book as a source of inspiration for Apple's strategy.¹⁴⁸

¹⁴¹ Yoffie, David B. & Mary Kwak. "Judo Strategy: 10 Techniques for Beating a Stronger Opponent." *Business Strategy Review*, 13.1 (2002): 20-30.

¹⁴² Eisenmann, Thomas, Parker, Geoffrey & Van Alstyne, Marshall, "Platform Envelopment." *Strategic Management Journal* 32 (2011): 1270-1285.

¹⁴³ Hazlett, Thomas W., David Teece & Leonard Waverman. "Walled Garden Rivalry: The Creation of Mobile Network Ecosystems." *George Mason Law & Economics Research Paper* 11-50 (2011).

¹⁴⁴ *Id.* p.13.

¹⁴⁵ Lepore, Jill, "The Disruption Machine – What the gospel of innovation gets wrong", *The New Yorker*, 23 June 2014, who notes "Ever since "The Innovator's Dilemma," everyone is either disrupting or being disrupted", available at <http://www.newyorker.com/magazine/2014/06/23/the-disruption-machine>. Christensen has himself trenchantly critiqued the use of his theory to explain the success of peer-to-peer platforms like Uber. See, Christensen & McDonald, *supra* note 138.

¹⁴⁶ As FT blog Alphaville reports, entrepreneurs groomed in 21st century business schools dream of "becoming a growth obsessed winner takes all unicorn" and of "replac[ing] the old guard by a new guard". Kaminska, Izabella, "It's not a game of thrones, it's a game of monopoly", *FT Alphaville*, 17 May 2016.

¹⁴⁷ In another bestseller, the venture capitalist and PayPal founder Peter Thiel writes that the technology firms lie. See, Thiel, Peter & Masters, Blake, *Zero to One*. Crown Business, New York, 2012 ("Monopolists lie to protect themselves. [...] they tend to do whatever they can to conceal their monopoly—usually by exaggerating the power of their (nonexistent) competition").

¹⁴⁸ Isaacson, Walter, *Steve Jobs*, Simon & Schuster, New York, 2011, at 690: Jobs was reported to explain the necessary transition of Apple to the cloud as follows: "It's important that we make this transformation, because of what Clayton Christensen calls "the innovator's dilemma," where people who invent something are usually the last ones to see past it, and we certainly don't want to be left behind".

And note that in *The Everything Store: Jeff Bezos and the Age of Amazon*, Brad Stone explains that Christensen's *Innovator Dilemma* was central to Jeff Bezos' decision to venture into new areas with the Kindle introduction and the launch of Amazon Web Services.¹⁴⁹

Moreover, the moligopolists' fears are backed by industry history. As said before, technology markets abound with examples of also-ran. Think of the demise of Kodak, a well-known monopolist of the twentieth century, of famous web portals such as AOL, Yahoo! and MySpace, or of Nokia, BlackBerry and now Yahoo!. Even deeper than this, great innovative prowess is not synonymous of market clout, as evidenced by the poor competitive performance of IBM's gigantic R&D programme or Xerox's Palo Alto Research Center (PARC).¹⁵⁰

2. What Moligopolists Do? Compete Against the Non-Consumption

A 2015 *Harvard Business Review* article by Dobbs, Koller and Ramaswamy describes the driver of tech giants competition: "*In this era of tech disruption, companies need to be willing to disrupt themselves before others do it to them. That requires overcoming the fear that a new product or channel will cannibalize an existing business*".¹⁵¹ Self-disruption may be the root of the advent of technology conglomerates. In subsequent books and papers, Christensen expressed a similar idea, and introduced a powerful concept which is little mentioned in mainstream commentary. Firms engaged in self-disruption "*compete against the non-consumption*".¹⁵² They try to serve potential purchases that are not made by customers because existing products or services are "*too expensive or too complicated*" or "*new market applications for entirely new customers*".¹⁵³ As we are about to see, the notion of "*competition against the non-consumption*" is very apt to capture the competitive dynamics at play in moligopoly markets.

2.1. New market footholds

The moligopolists seem involved in a process of constant tinkering with ideas, in the hope of discovering killer inventions that will create novel needs, and safeguard lasting presence in markets. This competition is about new products and services that will make it to market tomorrow. Consider Apple's iPhone example, which disrupted the mobile phone industry by providing an entirely novel experience to users, with hundreds of applications.¹⁵⁴

¹⁴⁹ Stone, Brad. *The everything store: Jeff Bezos and the age of Amazon*. Random House, 2013. Blogs also report that Bill Gates reading list makes good mention of Christensen's books. See "What Does Bill Gates Read for Fun?" *Farnam Street* [Blog], 30 July 2011, available at <https://www.farnamstreetblog.com/2011/07/what-does-bill-gates-read-for-fun/>

¹⁵⁰ See Anderson, Howard., "Why Big Companies can't Invent", *Technology Review*, May 2004, 56.

¹⁵¹ Dobbs, Richard, Tim Koller & Sree Ramaswamy. "The Future and How to Survive It." *Harvard Business Review*, October 2015 Issue.

¹⁵² See Christensen, Clayton M. & Michael Raynor. *The innovator's solution: Creating and sustaining successful growth*. Harvard Business Review Press, 2013. Christensen, Clayton M., Mark W Johnson & Darrell K Rigby, "Foundations for Growth: How to Identify and Build Disruptive New Businesses", *MIT Sloan Management Review* 43.3 (2002): 22.

¹⁵³ *Id.*

¹⁵⁴ See Denning, Steve, "The New Yorker: The Battle of the Strategy Titans", *Forbes*, 29 June 2014. This is Amazon's Prime air concept, which holds the potential to disrupt the package delivery industry, available at <http://www.forbes.com/sites/stevedenning/2014/06/19/the-new-yorker-battle-of-the-strategy-titans/#5ca2e45473ef>

But it is also about greater ambitions.¹⁵⁵ Peter Thiel coined the expression: “*going from 0 to 1*”, to talk of “*doing something nobody else has ever done*”.¹⁵⁶ Scholars use other concepts like “*general purpose technologies*”,¹⁵⁷ “*generative technologies*”¹⁵⁸ or “*empowering innovations*”.¹⁵⁹ Their common denominator is to refer to technological platforms which hold potential to transform society through a wide array of applications. Textbook examples include the steam engine, radio transmission, electrification, semiconductors, computers, the Internet and wireless technologies.

A clear instantiation of this ambition can be seen at play in the tech giants’ competitive race in the field of intelligent artefacts that purport to technically improve human life:¹⁶⁰ personal assistants,¹⁶¹ non-physical applications (“*bots*”) which leapfrog the brain,¹⁶² self-driving cars, semi-autonomous drones, exoskeletons and Augmented Reality (“*AR*”) devices, etc.¹⁶³

And indeed, at the time of writing of this article, the moligopolists are engaged in a real war to build on artificial intelligence (“*AI*”) capabilities. First, several moligopolists have set up a dedicated organisation that works on AI: Google’s Deepmind, Facebook Artificial Intelligence Research (FAIR), Microsoft Cognitive Services.

Second, an acquisition spree is taking place, with firms like Microsoft (Swiftkey) Facebook (Wit.ai), Apple (Perceptio), Google (Deepmind) and Amazon (Orbeus) ramping up their acquisitions of AI startups in the past four years. We reproduce, hereafter, a list Microsoft’s

¹⁵⁵ Google, Apple, Facebook, Amazon or Microsoft grandiose mission statements seem testimony to their ambition to build a new future. Google’s mission statement is to “*Organize the World’s information*”, see <https://www.google.com/about/company/>

¹⁵⁶ See Thiel and Masters, *supra* note 147, at chapter 1.

¹⁵⁷ Bresnahan, Timothy F., & Manuel Trajtenberg. “General purpose technologies ‘Engines of growth’?” *Journal of Econometrics* 65.1 (1995): 83-108.

¹⁵⁸ Zittrain, Jonathan. *The Future Of The Internet - And How To Stop It*. Yale University Press & Penguin UK, 2008.

¹⁵⁹ Christensen, Clayton M. “A Capitalist’s Dilemma, Whoever Wins on Tuesday”, *New York Times*, 3 Nov. 2012, available at <http://www.nytimes.com/2012/11/04/business/a-capitalists-dilemma-whoever-becomes-president.html>

¹⁶⁰ The subject of improving human life by technical efficiency is not new. Keynes wrote that this could ultimately lead to technological unemployment. Keynes, John Maynard. “Economic possibilities for our grandchildren” in *Essays in Persuasion*. Palgrave Macmillan UK, 2010: 321-332.

¹⁶¹ Like, for instance, Apple’s Siri, Google Now, Amazon’s Alexa, Facebook M or Microsoft Cortana. Less headline grabbing applications are, for instance, Google search autocomplete or spam folding softbots. For a good overview, see Rodriguez, Jesus “The race to monetize artificial intelligence is on”, *CIO* [Blog], 30 May 2016, available at <http://www.cio.com/article/3076154/internet-of-things/the-race-to-monetize-artificial-intelligence-is-on.html>

¹⁶² For instance, by giving answers before the user asks. One such example, in search engines, is a platform that would be able to address complex questions like: “*show me flights under €300 for places where it’s hot in December and I can snorkel*”. E. Schmidt once took this example to explain the complexity of such queries. He explained: “*Google needs to know about flights under €300; hot destinations in winter; and what places are near the water, with cool fish to see. That’s basically three separate searches that have to be cross-referenced to get to the right answer*”. See, “Google defends flight search – it’s hard to do it well and industry doesn’t appreciate us”, *BD Travel Solution* [Blog], 24 Oct. 2014, available at <http://blog.bdtravelsolution.com/google-defends-flight-search-hard-well-industry-doesnt-appreciate-us/> Facebook, Microsoft, Apple and Google all are looking into gateway applications which can be branched on messenger, apps, search engines, etc. See “AI, Apple and Google”, *Benedict Evans* [Blog], 23 June 2016, available at <http://ben-evans.com/benedictevans/2016/6/23/ai-apple-and-google>; Microsoft, for instance, believes a lot in the concept of “*conversation as a platform*”, whereby “*chat-based interfaces will overtake apps as our primary way of using the internet: for finding information, for shopping, and for accessing a range of services*”. See Newton, Casey, “Why Microsoft is Betting its Future on AI”, *The Verge*, July 7, 2016, available at <http://www.theverge.com/2016/7/7/12111028/microsoft-bot-framework-artificial-intelligence-satya-nadella-interview>

¹⁶³ See Klein, Ezra, “Pokemon Go isn’t a fad. It’s a beginning”, *VOX*, July 12, 2016 available at <http://www.vox.com/2016/7/12/12152776/pokemon-go-augmented-reality-beginning>

acquisitions since 2010.¹⁶⁴ We note that this consolidation wave is not confined to the moligopolists, but that it also involves other large technology firms like IBM, Intel and Salesforce.¹⁶⁵

Calendar Year	Press Release	Company
2016	February 24, 2016	Xamarin
2016	February 3, 2016	SwiftKey
2015	December 12, 2015	Metanautix
2015	November 9, 2015	Secure Islands
2015	November 5, 2015	Mobile Data Labs
2015	October 2, 2015	Havok
2015	September 28, 2015	Adistudio Inc
2015	September 8, 2015	Adallom
2015	September 3, 2015	VoloMetrix
2015	August 3, 2015	Incent Games Inc
2015	July 16, 2015	FieldOne Systems LLC
2015	June 10, 2015	BlueStripe
2015	June 2, 2015	6Wunderkinder
2015	April 14, 2015	Datazen Software
2015	February 11, 2015	Sunrise
2015	January 23, 2015	Revolution Analytics
2015	January 20, 2015	Equivio
2014	December 11, 2014	HockeyApp
2014	December 1, 2014	Acompil
2014	November 13, 2014	Aorato
2014	September 15, 2014	Mojang
2014	July 11, 2014	InMage
2014	July 2, 2014	SyntaxTree
2014	May 28, 2014	Capptain
2014	May 1, 2014	GreenButton
2014	January 7, 2014	Parature
2013	October 23, 2013	Apiphany
2013	June 3, 2013	InRelease
2013	March 7, 2013	NetBreeze
2013	March 4, 2013	MetricsHub
2013	February 2, 2013	Pando Networks
2012	December 28, 2012	R2 Studios
2012	October 16, 2012	StorSimple Inc.
2012	October 15, 2012	MarketingPilot
2012	October 4, 2012	PhoneFactor Inc.
2012	July 9, 2012	Perceptive Pixel Inc.
2012	June 25, 2012	Yammer Inc.
2011	November 22, 2011	VideoSurf Inc.
2011	June 7, 2011	Prodiance
2011	May 10, 2011	Skype
2010	November 26, 2010	Canesta, Inc.
2010	October 6, 2010	AVicode
2010	February 2, 2010	Sentillion

Figure 1 - MSFT Acquisitions 2010-2016 (Source: Investor Relations, MSFT website)

Third, the moligopolists are obsessed with the control of “big” data.¹⁶⁶ Data is seen as the main input of super-computational machines.¹⁶⁷ When it is “big”, data makes AI applications be more accurate. Microsoft’s purchase of LinkedIn helps understand this. With access to LinkedIn trove of personal data, Microsoft digital assistant Cortana hopes to become more predictive, including in helping users in the most mundane aspects of their professional lives like small talk.¹⁶⁸

¹⁶⁴ “The Race For AI: Google, Facebook, Amazon, Apple In A Rush To Grab Artificial Intelligence Startups”, *CB Insights* [Blog], 10 April 2016, available at <https://www.cbinsights.com/blog/top-acquirers-ai-startups-ma-timeline/>; Tam, Pui-Wing, “Silicon Valley’s Artificial Intelligence Marathon Is On Bits”, *New York Times*, 19 May 2016, available at <http://www.nytimes.com/2016/05/20/technology/silicon-valleys-artificial-intelligence-marathon-is-on.html>

¹⁶⁵ *Id.*

¹⁶⁶ Calo, Ryan. “Digital Market Manipulation.” *The George Washington Law Review*, 82.4 (2014): 995-1051. Newman, Nathan, “Search, Antitrust and the Economics of the Control of User Data.” *Yale Journal on Regulation* 31.2 (2014): 401-454 and Gal & Rubinfeld, *supra* note 7. Note that in the early literature, big data was essentially understood as a formidable marketing instrument, which enabled perfect price discrimination and the exploitation of network effects.

¹⁶⁷ Anja Lambrecht and Catherine E. Tucker, “Can Big Data Protect a Firm from Competition?” available at SSRN 2705530 (18 Dec. 2015) : “in order to extract value from big data, firms must have the right managerial toolkit”.

¹⁶⁸ In the investors’ ppt. in support of the transaction, Microsoft explains that the tie up will help users “connect dots on your behalf so that you stay one step ahead”. The presentation offers the example of a professional meeting between two individuals. With LinkedIn, Cortana can spot that the two attendees are alumni of the

At this stage, it is still unclear which AI application will truly be transformative.¹⁶⁹ Yet, the AI field is useful because it serves to illustrate the point of intense competition in areas with no contemporary consumption. But AI is just one direction in which moligopolists seek new market footholds. The moligopolists have launched entrepreneurial ventures in many other frontier areas. Consider, for example, Amazon's Blue Origin space rocket travels,¹⁷⁰ Google's Calico longevity research,¹⁷¹ Facebook's Aquila's airborne wireless connectivity,¹⁷² etc.

2.2. Low-end footholds

In parallel to the search for new markets foothold, the moligopolists also attempt to disrupt entrenched incumbents in low-end footholds. In this variant, the strategy starts as a small scale experiment. The disruptor targets the fringe of a market – customers not served or with low profitability – and progressively moves upmarket to erode the profitability of the incumbent.

Christensen is not the sole who understood that disruption could kick start from the low-end of markets. In a paper called “*What's your Google Strategy?*” Andrei Hagiu and David B. Yoffie warn the “*average company*” against the power of intermediaries.¹⁷³ With numerous case studies, they explain how multi-sided platform manage to go all the way up and commoditize other players.¹⁷⁴

Though this strategy has attracted less media coverage, it has been equally, and quite fruitfully, followed by several moligopolists. Let us look at possible instantiations. Amazon is a case in point. Once an online mall that relied on third party express mail operators for the last mile between the warehouse and customer's premises, Amazon has progressively converted into a delivery operator, upsetting the positions of firms like Fedex, UPS and TNT.¹⁷⁵ The announcement that Amazon would lease 20 Boeing 767 jets to build its own cargo operations is just another step in that direction.¹⁷⁶

same university. And it can then provide topics for ice-breaking discussion, like commenting on the results of the sports team of the university or of common contacts. See https://ncmedia.azureedge.net/ncmedia/2016/06/msft_announce_160613.pdf

¹⁶⁹ The moligopolists seem however to believe that the firm that will control the main intelligent platform will be in place for some time. See *New York Times*, “The Race Is On to Control Artificial Intelligence, and Tech's Future”, John Markoff and Steve Lohr, March 25, 2016: “*Whoever wins this race will dominate the next stage of the information age*” said Pedro Domingos, a machine learning specialist and the author of “*The Master Algorithm*”. This can be further seen through several initiatives, including those of Google and Facebook who have started to openly share their AI technology with the world, arguably in the hope to promote convergence around their early technology. Metz, Cade, “Google just open sourced Tensorflow, its artificial intelligence engine”, *Wired* [Blog], 9 Nov. 2015, available at <http://www.wired.com/2015/11/google-open-sources-its-artificial-intelligence-engine/> and Metz, Cade, “Facebook open sources its AI hardware as it races Google” *Wired* [Blog] 10 Dec. 2015, available at <http://www.wired.com/2015/12/facebook-open-source-ai-big-sur/>

¹⁷⁰ Or Amazon's CEO Jeff Bezos' Blue Origin concept, see Stockton, Nick, “The Commercial Space Industry Takes Flight”, *Wired* [Blog] 29 Dec. 2015, available at <http://www.wired.com/2015/12/the-commercial-space-industry-takes-flight/>

¹⁷¹ See <http://www.calicolabs.com/>

¹⁷² See D'Onfro, Jillian, “Everything you need to know about Facebook's audacious solar-powered internet planes”, *Business Insider UK*, 31 Jul. 2015, available at <http://uk.businessinsider.com/facebook-building-internet-planes-lasers-2015-7?r=US&IR=T>

¹⁷³ Hagiu, Andrei & David B. Yoffie. “What's your best Google Strategy.” *Harvard Business Review*, April 2009.

¹⁷⁴ One interesting case study pits Amazon and Toys “R” Us.

¹⁷⁵ See Hook, Leslie, “Amazon's instant gratification service aims to disrupt delivery”, *Financial Times*, 11 Dec. 2015, available at <https://www.ft.com/content/4e481d36-994a-11e5-95c7-d47aa298f769>

¹⁷⁶ See, Greene, Jay & Dominic Gates, “Amazon in talks to lease Boeing jets to launch its own air-cargo business”, *The Seattle Times*, 17 Dec. 2015, available at <http://www.seattletimes.com/business/amazon/amazon-in-talks-to-lease-20-jets-to-launch-air-cargo-business/>

Google's slow entry into high speed Internet is another one. As is well known, Google has rolled out fiber in a discrete number of American cities. With this, Google aims at disrupting cable carriers.¹⁷⁷ The same can be said of Project Fi.¹⁷⁸ With this project, Google phone and Android users can, in exchange for a monthly subscription, use a Google SIM card that taps into multiple networks for the mobile service.¹⁷⁹ The users no longer need a subscription with a mobile network carrier. Apple has been rumored to work on a similar service.¹⁸⁰

Microsoft's acquisition of Skype in 2011 looks like a low end attack on Cisco. Until this acquisition, Microsoft had been a distant rival to the market leader Cisco in the enterprise communications services. With Skype, Microsoft targeted a segment of the market where Cisco – which focused on high enterprise grade functionalities – was not present. Subsequently, Microsoft launched “*Skype for Business*”, and 2016 data from IDC suggests that Microsoft's market share in that segment has tripled.¹⁸¹

Last, Facebook's \$19 acquisition of WhatsApp in 2014 can be read as the first episode of a low end disruption strategy, aimed at SMS communication, slowly exploiting network effects up to eat away mobile phone carriers' profits.

Perhaps, the sole moligopolist that does not clearly compete against the non-consumption in low-end footholds is Apple. Throughout history, Apple has steadily signaled a preference for competition in high end footholds, with the release of expensive products and services.

2.3. Discussion

Self-disruptive moligopolists tend to follow two strategies. On the one hand, they seek to introduce innovation that has drastic potential, in the hope of creating new market footholds. On the other hand, they subvert markets subject to possible rents from the low end, in the hope of incrementally refining customers' experiences.

This process often brings the moligopolists to mimic each other. When one moligopolist discovers a potential new market foothold outside of its core, other moligopolists tend to follow suit. Such dynamics can be witnessed in several non-core technology areas where moligopolists compete head to head: cloud computing (Amazon, Microsoft and Google); self-driving cars (Google and Apple), virtual reality devices (Microsoft, Facebook), wearables (Google,¹⁸² Microsoft,¹⁸³ Apple¹⁸⁴), space transportation (Google, Amazon, Facebook),¹⁸⁵ etc.

¹⁷⁷ See Kumparak, Greg, “Google announces Provo, Utah as the third Google Fiber city and acquires the local fiber provider”, *TechCrunch.com* [Blog], 17 Apr. 2013, available at <https://techcrunch.com/2013/04/17/google-announces-provo-utah-as-the-third-google-fiber-city-acquires-the-local-fiber-provider/>

¹⁷⁸ Gryta, Thomas & Ryan Knutson, “Apple Takes Aim at Wireless Phone Companies”, *The Wall Street Journal*, 9 Sep. 2015, available at <http://www.wsj.com/articles/apple-takes-aim-at-wireless-phone-companies-1441845365>

¹⁷⁹ See, Raphael, JR, “Project Fi revisited: 6 months with Google's weird wireless service”, *Computer World* [Blog], 14 Apr. 2016, available at <http://www.computerworld.com/article/3056595/mobile-wireless/project-fi.html>

¹⁸⁰ Gokey, Malarie, “Apple says it won't launch its own MVNO phone service to take on Google's Project Fi” *Digital Trends* [Blog], 4 Aug. 2015 available at <http://www.digitaltrends.com/mobile/apple-mvno-phone-service-news/#ixzz4ASH7ficK>

¹⁸¹ See “Microsoft to Compete Head-To-Head with Traditional UC&C Vendors in EMEA, Says IDC” *IDC* (Press Release), 1 Feb. 2016, available at <https://www.idc.com/getdoc.jsp?containerId=prCEMA40968216>

¹⁸² With Google glass.

¹⁸³ With Hololens.

¹⁸⁴ With the Apple watch.

By the same token, the moligopolists often level low-end disruption at each other. The development of Android can be described as a low-end attempt to take on the dominance of rival operating systems for mobile phones, like Symbian and iOS.¹⁸⁶ Similarly, Amazon's development of the Kindle Fire can be read through disruption lenses: a low feature, low priced technology with scalable technology potential, designed to challenge Apple's iPad moat.¹⁸⁷ Closer to us, Facebook has transformed its Messenger as a platform through which applications and other services can be downloaded through hyperlinks. This evolution has been interpreted as an incipient low end attack against Apple's iOS and Google's Android operating systems and applications stores for mobile phones.¹⁸⁸

More importantly, this type of head to head, disruptive competition almost never targets the core. With the exception of Microsoft Bing's challenge of Google, few disruptive attacks have been directed towards the root business of another moligopolist. The imitation game that we just described is suggestive of an urge to keep an iron in the fire, and to maintain the ability to "hop" to the next (disruptive) "dominant design".¹⁸⁹ Perhaps the most graphic industry evolution that carries this point is that all tech giants have, at some point or the other, attempted to develop a phone. Apple launched the iPhone in 2007. In 2010 and 2011, Google followed, by launching a suite of Nexus phones and the acquisition of Motorola Mobility. In 2012 Microsoft purchased the handset manufacturer Nokia. And Facebook and Amazon both attempted to enter, with the HTC First and the Fire phone.¹⁹⁰

The general take away from the above discussion is that entrenched market positions in the core are just one slice, one layer or one facet, of the various dimensions of competitive interactions amongst moligopolists. The moligopolists compete *across* many markets *against* the non-consumption.

¹⁸⁵ Sparks, Daniel, "Why Did Google Invest \$1 Billion in SpaceX?" *The Motley Fool*, Feb. 2016 available at: <http://www.fool.com/investing/general/2016/02/14/why-did-google-invest-1-billion-in-spacex.aspx>

¹⁸⁶ Readers will remember that following the success of Android, S. Jobs declared: "I will spend my last dying breath if I need to, and I will spend every penny of Apple's \$40 billion in the bank, to right this wrong. I'm going to destroy Android, because it's a stolen product. I'm willing to go thermonuclear war on this". See Weintraub, Seth, "Steve Jobs: 'I'm going to destroy Android, because it's a stolen product. I'm willing to go thermonuclear war on this.'" *9to5Mac*, 20 Oct. 2011, available at <https://9to5mac.com/2011/10/20/steve-jobs-im-going-to-destroy-android-because-its-a-stolen-product-im-willing-to-go-thermonuclear-war-on-this/>

¹⁸⁷ Wheeler, Rob, "Amazon's Kindle Fire Is a Disruptive Innovation", *Harvard Business Review*, 29 Sep. 2011.

¹⁸⁸ "The Message is the Medium" *The Economist*, 28 Mar. 2015.

¹⁸⁹ Abernathy, William J. & James M. Utterback. "Patterns of industrial innovation." *Technology Review* 64.7 (1978): 254-228. The dominant design model shows that many product innovations compete at the initial stage of an industry, until a dominant design prevails. See Akiike, Atsushi. "Where is Abernathy and Utterback Model?" *Annals of Business Administrative Science* 12.5 (2013): 225-236. For a critique, which explains that dominant design is just a special case, see, Windrum, Paul & Chris Birchenhall. "Is product life cycle theory a special case? Dominant designs and the emergence of market niches through coevolutionary-learning." *Structural Change and Economic Dynamics* 9.1 (1998): 109-134.

¹⁹⁰ Finley, Klint, "The Smartest Thing a Tech Company can do? Don't Make a Phone", *Wired* [Blog], 26 May 2016, available at <http://www.wired.com/2016/05/microsofts-smartest-move-yet-letting-go-smartphones/>: "Maybe the idea started in 2011 when Google acquired Motorola Mobile. Or maybe it was earlier, when Google launched its line of Nexus-brand phones and tablets in 2010. Or maybe it started in 2007 when Apple announced the iPhone. After all, Apple's strategy of controlling every layer of the mobile experience, from the hardware to the operating system to the app store, seemed to inspire the notion that success in the mobile market meant building your own phone"

We concede that the disruption narrative has limitations.¹⁹¹ One of them is that its transposition in public policy is unclear. Short of clear metrics of successful or unsuccessful disruption, the theory has little predictive power.¹⁹² That said, our discussion of disruption theory was not meant to be normative. Instead, it pursued a modest descriptive ambition: that of explaining why moligopolists veer away from their core, and turn into conglomerates.

3. *How Moligopolists Compete? Entrepreneurship*

The last outstanding question before us consists in understanding how the moligopolists compete against the non consumption. Amongst all other variables, one seems to cut across business models: “*entrepreneurship*” is the source of competitive advantage in moligopoly markets. In our reading, the moligopolists are Schumpeterian social institutions which nurture, spur and structure the efforts of entrepreneurs through which disruption occurs. After an introduction of the theory (3.1), we explain how moligopoly competition takes place on entrepreneurial assets (3.2.) and we offer a discussion (3.3).

3.1. Schumpeterian entrepreneurship

No one better than Schumpeter underscores the role of “*entrepreneurs*” in bringing disruption to markets:

*“the function of entrepreneurs is to reform or revolutionize the pattern of production by exploiting an invention or, more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way, by opening up a new source of supply of materials or a new outlet for products, by reorganizing an industry and so on”.*¹⁹³

With this background, Schumpeter invites us to think of the entrepreneur in terms of the person that brings “*new things*”.¹⁹⁴

Schumpeterian theory also insists on two overlooked aspects relevant for our discussion of moligopoly competition. First, Schumpeter considers that entrepreneurs are not only those who achieve “*spectacular*” advances or improvements of “*historical importance*”.¹⁹⁵ The entrepreneur is more generally someone who “*get[s] things done*”.¹⁹⁶ In engineering jargon, an entrepreneur may be someone that brings solutions that “*scale*”.¹⁹⁷ In strategy terms, an entrepreneur is a visionary leader. And from an organizational perspective, an entrepreneur is a good manager. This last aspect ought not to be underestimated: as is well trodden in the literature, certain types of organizations, like conglomerates, are hard to manage. Due to their

¹⁹¹ For a good review of the critiques, see “Disruption, Disrupted’: A Round Up”, *Andreessen Horowitz*, 2 July 2014, available at <http://a16z.com/2014/07/02/disruption-roundup/>

¹⁹² Denning, *supra* note 154.

¹⁹³ See Schumpeter, Joseph A., *Capitalism, Socialism and Democracy*, Routledge, UK [1942] 2013, at 132. See also, Schumpeter, Joseph A., “The Creative Response in Economic History”, *The Journal of Economic History* 7.2 (1947): 149-159 (noting at 151: “*the defining characteristic is simply the doing of new things or the doing of things that are already being done in a new way (innovation)*”).

¹⁹⁴ *Id.* at 151.

¹⁹⁵ *Id.*

¹⁹⁶ See, Schumpeter ([1943] 2013), *op. cit. supra* note 193 at 132.

¹⁹⁷ See Brooke, Lindsay “Elon, Henry, and the mastery of manufacturing”, *SAE International*, 26 May 2016, available at <http://articles.sae.org/14846/>

very structure, they create multiple agency problems and misallocation of resources between good and bad subsidiaries.¹⁹⁸

Second, Schumpeter views entrepreneurship as a function that can also be performed by teams, thereby explaining the rise of firms as receptacles of entrepreneurial abilities. In the late editions of *Capitalism, Socialism and Democracy*, Schumpeter argues that the concept of entrepreneur can equally refer to an organization, “*stressing entrepreneurial behavior more than the entrepreneur as individual actor*”.¹⁹⁹ One of such organizations can be a corporation, where several individuals “*co-operatively*” fulfill the entrepreneurial function.²⁰⁰ In Schumpeter’s view, the firm as aggregator of entrepreneur is not necessarily small-sized:

“*Again, the entrepreneurial function may be fulfilled co-operatively. With the development of the largest scale corporations this has evidently become of major importance: aptitude that no single individual combines can thus be built into a corporate personality; [...]. In many cases, therefore, it is difficult or even impossible to name an individual that acts as “the entrepreneur” in a concern*”.²⁰¹

Schumpeter’s theory of the entrepreneur has been critiqued for its gaps.²⁰² However, a possibly unforeseen contribution of Schumpeter’s theory of the firm as aggregator is to hint at the possibility of competition over the creation, cultivation and appropriation of units or groups of entrepreneurs. In the next section, we explore if this descriptive power of Schumpeterian theory can likely apply to moligopoly competition.

3.2. Competition over Entrepreneurial Resources

The technology press covers human resources in terms similar to superstar athletes.²⁰³ Dozens of papers are penned on the leadership of iconic CEOs and how this turns into competitive advantage.²⁰⁴ Similarly, the ruthless hiring market is an unquenchable source of business commentary.²⁰⁵

¹⁹⁸ Goel, Anand M., Vikram K. Nanda & M. P. Narayanan. “Resource allocation in conglomerates under moral hazard.” *AFA* (2001) New Orleans, available at SSRN 249977.

¹⁹⁹ See, Arena, Richard & Paul-Marie Romani. “Schumpeter on Entrepreneurship”, in Arena, Richard, and Cécile Dangel-Hagnauer, (eds.) *The Contribution of Joseph A. Schumpeter to Economics*, Vol. 43 Routledge, 2002, at 173.

²⁰⁰ See, Schumpeter, Joseph A. *Essays: On entrepreneurs, innovations, business cycles, and the evolution of capitalism*. [1951] Richard V. Clemence (ed.) New Brunswick, N.J.: Transaction Publishers, 2009, Introduction at xxvii.

²⁰¹ See Schumpeter, Joseph A. “Economic Theory and Entrepreneurial History, Change and the Entrepreneur”, (1949), reprinted in *op. cit.* 200 *supra* note 207, at 253.

²⁰² See Arena & Romani, *supra* note 199, at 180. And in particular for its obsessive focus on major innovations.

²⁰³ Lee, Timothy B., “Verizon’s purchase of Yahoo explained” *VOX*, 25 July 2016, available at <http://www.vox.com/2016/7/25/12267540/verizon-yahoo-purchase-explained>: (“*The most successful companies in Silicon Valley — including Google, Facebook, and Apple — have an intensely technology-focused culture. These companies are obsessive about hiring the most talented engineers (and in Apple’s case, designers) so they can build the best technology products. And this culture tends to be self-perpetuating — very skilled, highly motivated people like to work with other very skilled, highly motivated people. Once you have a critical mass of such people, it becomes easy to recruit more of them*”).

²⁰⁴ For instance, Steve Jobs, Jeff Bezos or Bill Gates are close to superstars in the tech press. The press also rejoices with stories on legendary teams of individuals, and their contribution to technology firms’ success: Microsoft is Bill Gates plus Paul Allen; Google is Larry Page and Sergey Brin; Apple is Steve Jobs and Steve Wozniak.

²⁰⁵ Think of the recruitment of senior technology officers like Astro Teller by Google or Yann LeCun by Facebook, of the lateral hire of Google’s Vice-President Marissa Mayer to become Yahoo! CEO, or of the recent poaching of several AI researchers from Google by Musk and Altman’s OpenAI. See Metz, Cade, “Inside

Again, that entrepreneurs are the source of competitive edge can be observed from sources other than technology journals.²⁰⁶ In their SEC filings, the moligopolists point to human resources as the engine of technology competition. *First*, their submissions stress (with the possible exception of Apple) the intense degree of competition to retain key personnel. Facebook is perhaps the company that gives the most salience to this aspect. In the general description of its business, under the heading “*competition*”, it writes: “*We compete to attract, engage, and retain people, to attract and retain marketers, to attract and retain developers to build compelling mobile and web applications that integrate with Facebook, and to attract and retain highly talented individuals, especially software engineers, designers, and product managers*”.²⁰⁷

Google,²⁰⁸ Microsoft²⁰⁹ and Amazon²¹⁰ make similar declarations. Their 10-K filings repeatedly come back on the issue of employee competition.²¹¹ In essence, all report that the

OpenAI, Elon’s Musk Wide Plan to Set Artificial Intelligence Free”, *Wired*, 27 Apr. 2016, available at <https://www.wired.com/2016/04/openai-elon-musk-sam-altman-plan-to-set-artificial-intelligence-free/>

²⁰⁶ In 2015, *Wired* devoted a long paper to the 25 talents that will change the future of business. See “25 geniuses who are creating the future of business”, *Wired*, 26 April 2016, available at <https://www.wired.com/2016/04/wired-nextlist-2016/>

²⁰⁷ See, Facebook 2015 10-K form.

²⁰⁸ Google writes in Part I, Item I, under “Culture and Employees”: that “*Competition for qualified personnel in our industry is intense, particularly for software engineers, computer scientists, and other technical staff*”. It then mentions this issue in the risk factors section: “*If we were to lose the services of Larry, Sergey, Eric, or other key personnel, we may not be able to execute our business strategy. Our future success depends in a large part upon the continued service of key members of our senior management team. In particular, Larry Page and Sergey Brin are critical to the overall management of Google and the development of our technology. Along with our Executive Chairman Eric E. Schmidt, they also play a key role in maintaining our culture and setting our strategic direction. All of our executive officers and key employees are at-will employees, and we do not maintain any key-person life insurance policies. The loss of key personnel could seriously harm our business. We rely on highly skilled personnel and, if we are unable to retain or motivate key personnel, hire qualified personnel, or maintain our corporate culture, we may not be able to grow effectively. Our performance largely depends on the talents and efforts of highly skilled individuals. Our future success depends on our continuing ability to identify, hire, develop, motivate, and retain highly skilled personnel for all areas of our organization. Competition in our industry for qualified employees is intense, and certain of our competitors have directly targeted our employees. In addition, our compensation arrangements, such as our equity award programs, may not always be successful in attracting new employees and retaining and motivating our existing employees. Last, a discussion of this problem is also found in Part II, Item 7: “Our employees are critical to our success and we expect to continue investing in them. Our employees are among our best assets and are critical for our continued success. Their energy and talent drive Google and create our success. We expect to continue hiring talented employees and to provide competitive compensation programs to our employees”.*

²⁰⁹ Microsoft 2015 10-K form, explains that in Part I, Item 1, under the risk factors section that: “*Our business depends on our ability to attract and retain talented employees. Our business is based on successfully attracting and retaining talented employees. The market for highly skilled workers and leaders in our industry is extremely competitive. We are limited in our ability to recruit internationally by restrictive domestic immigration laws. If we are less successful in our recruiting efforts, or if we cannot retain key employees, our ability to develop and deliver successful products and services may be adversely affected. Effective succession planning is also important to our long-term success*”. In Part II, Item 7, the issue is again discussed: “*The investments we are making in devices and infrastructure will increase our operating costs and may decrease our operating margins. Our success is highly dependent on our ability to attract and retain qualified employees. We hire a mix of university and industry talent worldwide. Microsoft competes for talented individuals globally by offering an exceptional working environment, broad customer reach, scale in resources, the ability to grow one’s career across many different products and businesses, and competitive compensation and benefits*”.

²¹⁰ Amazon 2015 10-K form, mentions the issue in risk factors: “*We depend on our senior management and other key personnel, particularly Jeffrey P. Bezos, our President, CEO, and Chairman. We do not have “key person” life insurance policies. The loss of any of our executive officers or other key employees could harm our business*”. And in Part II, Item VII it mentions again a possible rise in importance of human resources: “*We*

market for highly skilled workers is extremely competitive. We note that this competition is not reduced to the recruitment of skilled engineers. Google, Amazon and Apple²¹² insist in particular on the key role played by their senior management.

Second, the “*proxy statements*” filed with the SEC ahead of shareholders meetings document inventories of competitive “*peers*” with whom reporting firms compete for the compensation of senior executive talent.²¹³ Those lists reflect the degree of competition in skills markets. What we can see is that each moligopolist seems to consider that it faces competition from a large crowd of companies – between 1 and 18. This competition originates from firms with whom the moligopolists do not necessarily compete head on in a relevant product or service market in the antitrust sense. For example, the five tech moligopolists identify content providers (The Walt Disney Company, TimeWarner, Netflix), network communications providers (Viacom, Verizon), upstream technology developers (Qualcomm) or coffee retailers (Starbucks) as their competitors. Moreover, the moligopolists competitors are heterogeneous. They differ in size (compare Facebook with LinkedIn and Twitter.), age (compare AT&T with Netflix), business models (compare Amazon with Target and BestBuy).

COMPETITIVE PEERS, GAFAM, 2014 OR 2015				
Microsoft Technology Peer Group, 2015²¹⁴	Google Peer Companies for 2014²¹⁵	Facebook Peer Group, 2015²¹⁶	Apple Primary Peer Group 2014²¹⁷	Amazon²¹⁸

expect spending in technology and content will increase over time as we add computer scientists, designers, software and hardware engineers, and merchandising employees”.

²¹¹ *Id.*, not only in Part I, Item 1A, risk factors section, but also within a section of the 10-K report titled Part II Item 7. “*Management’s Discussion and Analysis of Financial Condition and Results of Operations*”.

²¹² Apple, 2015 10-K form: “*Much of the Company’s future success depends on the continued availability and service of key personnel, including its Chief Executive Officer, executive team and other highly skilled employees. Experienced personnel in the technology industry are in high demand and competition for their talents is intense, especially in Silicon Valley, where most of the Company’s key personnel are located*”.

²¹³ This information is called a “*proxy statement*”, and can be found in a document called SEC Form DEF 14A.

²¹⁴ See, Microsoft 2015 Proxy Statement available at

https://www.sec.gov/Archives/edgar/data/789019/000120677415003229/microsoft_def14a.htm

²¹⁵ See, Google 2015 Proxy Statement, available at

https://www.sec.gov/Archives/edgar/data/1288776/000130817915000157/lgoo2015_def14a.htm

²¹⁶ See, Facebook 2015 Proxy Statement, available at

<https://www.sec.gov/Archives/edgar/data/1326801/000132680115000019/facebook2015proxystatement.htm>

²¹⁷ See, Apple, 2015, Proxy Statement, available at

<https://www.sec.gov/Archives/edgar/data/320193/000119312515017607/d774604ddef14a.htm>

²¹⁸ See, Amazon, 2015, Proxy Statement, available at

<https://www.sec.gov/Archives/edgar/data/1018724/000119312515144712/d834161ddef14a.htm>

1. Accenture	1. Amazon.com, Inc.	1. Adobe	1. Amazon.com	1. AOL
2. Adobe Systems	2. Hewlett-Packard Company	2. Microsoft	2. Disney	2. Apple
3. Amazon	3. Oracle Corporation	3. Amazon.com	3. IBM	3. Best Buy
4. Apple	4. Apple Inc.	4. Netflix	4. Twenty-First Century Fox	4. Cisco
5. Cisco Systems	5. Intel Corporation	5. Apple	5. AT&T	5. Dell
6. EMC	6. Qualcomm, Inc.	6. Qualcomm	6. eBay	6. eBay
7. Facebook	7. Cisco Systems, Inc.	7. Cisco Systems	7. Microsoft	7. Facebook
8. Google	8. International Business Machines Corporation	8. salesforce.com	8. Verizon	8. Google
9. Hewlett-Packard	9. The Walt Disney Company	9. eBay	9. CBS	9. Honeywell
10. IBM*	10. eBay, Inc.	10. SAP	10. EMC	10. IBM
11. Intel*	11. Microsoft Corporation	11. EMC	11. Oracle	11. Intel
12. Oracle	12. Yahoo! Inc.	12. The Walt Disney Company	12. Viacom	12. Microsoft
13. Qualcomm		13. Google	13. Cisco Systems	13. Oracle
14. Symantec		14. Twitter	14. Google	14. Starbucks
15. Yahoo		15. LinkedIn	15. Qualcomm	15. Target
		16. VMware	16. Comcast	16. Verizon
		17. Yahoo!	17. Hewlett-Packard	17. Yahoo
			18. TimeWarner	

Against this backdrop, the R&D scholarship reminds us of the fact that R&D competition takes place over entrepreneurs. Noting that people are an “*enormously important*” aspect of an R&D strategy, Professor Gary Pisano clarifies that “[d]espite the growing use of sophisticated instrumentation, computer simulation, and laboratory automation, R&D is still a labor intensive process”.²¹⁹ In the same vein, Avron Barr and Shirley Tessler write that “*unlike most other engineering and product development disciplines, software has remained an art: the creative output of individuals with unique skills*”.²²⁰

Bringing the moligopolists R&D expenses together with their statements on human resources shall bring us to infer that a non trivial part of their competition is rivalry to provide an attractive working environment, a stimulating work culture, rewards systems that foster creative thinking, long term career opportunities and a team-oriented work environment.²²¹ In some industries like software, R&D competition is said to be particularly fierce.²²²

But this is not all. The moligopolists M&A and CVC activity on transactional markets can also be seen as a declination of moligopoly competition for entrepreneurs. This counterintuitive idea necessitates to understand that the prospect of M&A with a moligopolist is a powerful incentive of entrepreneurial initiative.²²³ IPO is indeed a rather exceptional exit route for startups.²²⁴ Instead, many technology startups ambition exit through M&A with a

²¹⁹ Pisano, Gary, P., “Creating an R&D Strategy” *Harvard Business School*, Working Paper 12-095, (2012), at 5.

²²⁰ Barr, Avron, & Shirley Tessler. “The Globalization of Software R&D: The Search for Talent.” *Council on Foreign Relations' Study Group on the Globalization of Industrial R&D* (1996), at 11.

²²¹ Kochanski, James, Paul Mastropolo & Gerry Ledford. “The Human Side: People Solutions for R&D.” *Research-Technology Management* 46.1 (2003): 59-61.

²²² See, Barr & Tessler, *supra* note 220.

²²³ Victor Luckerson, “How Google Perfected the Silicon Valley Acquisition” *Time Magazine*, 15 April 2015, available at <http://time.com/3815612/silicon-valley-acquisition/>. This is so not only because M&A exit is a lottery win – in many cases it is not – but also because the moligopolists can offer efficient research environments, in furtherance of the startup’s initial ambition.

²²⁴ This is the path followed by Facebook, Google and before them by Microsoft and Apple. For a complete picture of firms exit routes, see DeTienne, Dawn R., Alexander McKelvie & Gaylen N. Chandle. “Making sense of entrepreneurial exit strategies: A typology and test.” *Journal of Business Venturing* 30 (2015) 255–272; DeTienne, Dawn R., “Entrepreneurial exit as a critical component of the entrepreneurial process: Theoretical development.” *Journal of Business Venturing* 25 (2010) 203–215.

larger firm.²²⁵ This is the path followed by Android, Skype, Huffington Post, WhatsApp, Instagram, Oculus, Minecraft, Beats, Twitch, Waze, LinkedIn and others.

In a book on Google, George Geish labels the M&A exit route as “*acqui-hiring*”. He explains that *acqui-hiring* is “*the process of acquiring a company to recruit its talent, with or without being interested in the target’s technology, products, and services*”.²²⁶ The concept of *acqui-hiring* is particularly interesting, because it helps picture that the moligopolists also compete on the market for entrepreneurial assets through their M&A strategy. In this context, some moligopolists like Google seem intensely active (YouTube, Waze, Deepmind, etc.) whilst other like Apple have only sparingly used M&A to acquire talents.²²⁷ But it is also helpful, because it brings us to the intuition that competition over entrepreneurial assets can take many forms, from labour contract to transactional activity on capital markets.

By the same token, the financial funding provided through CVC and VC activities may constitute the capital seeds that enable modern Schumpeterian entrepreneurs. Early investments in startups through CVC, minority shareholdings acquisitions and other passive banking strategies (for example, Microsoft and Google’s respective investments in Facebook and Uber) promote the rise of entrepreneurial skills.

3.3. Discussion

Besides competition against the non-consumption, the moligopolists also compete over entrepreneurial assets. This competition focuses on the attraction of skills and on the provision of capital to entrepreneurs. Many firms seem active in that space (>10), and it can be safely assumed that this competition too, is oligopolistic in nature.

That said, the finding that competition takes place over the acquisition, retention and combination of entrepreneurial skills is not specific to digital economy industries: sports clubs compete for athletes, hospitals for specialists, music labels for artists, universities for best students and law firms for rainmakers.

What is perhaps less well understood is that in all those industries – perhaps with the exception of universities – competition over skills gives rise to an increase in the price of labour. In the technology world, a Microsoft senior researcher remarked that the cost of a top AI researcher had surpassed that of a NFL top quarterback prospect.²²⁸

From a theoretical perspective, the moligopoly competition over entrepreneurial skills can thus be characterized as a market where technology firms on the demand side face an upward slopping supply curve of entrepreneurial assets. The more money in wages, the more units of labour. The more capital channeled to M&A and CVC markets, the more wannabee start-up founders. In turn, any concept of market power detained by the moligopolists shall thus be

²²⁵ Generally following a process of (i) VC funding; (ii) consolidation with possible non-VC investment; (iii) M&A with a larger technology firm.

²²⁶ Geis, George T. *Semi-Organic Growth: Tactics and Strategies Behind Google's Success*. John Wiley & Sons, 2015, at 184.

²²⁷ *Id.* “Apple engaged in M&A only sparingly, believing that innovation should essentially originate from within. In contrast, Google was acquiring companies at a rapid clip and using technology and talent from the purchases as a major part of its innovation efforts”, preface, at x.

²²⁸ See, Metz, *supra* note 205.

understood as their ability to decrease the remuneration rate and funding levels of entrepreneurial resources.²²⁹

C. SUMMATION: THREE-DIMENSIONAL COMPETITION

Our descriptive theory of competition is simple. Technology firms are involved in a three dimensional competitive process (see figure below). Technology firms compete as rival sellers of substitute products or services in one or more itemized product or service markets. Besides, technology firms compete against the non-consumption, to serve market segments that do not exist or to unearth new market footholds. And technology firms jockey upstream to gain control of entrepreneurial assets, skills and capital, which hold the key to disruption.

The degree of competition that exists across those dimensions is not linear. Technology firms may occupy distinct monopoly positions in one or more core product/service markets, and at the same time compete against each other in oligopoly over the non-consumption and entrepreneurial assets. Often, those firms follow each other outside of the core, to keep iron in the fire.

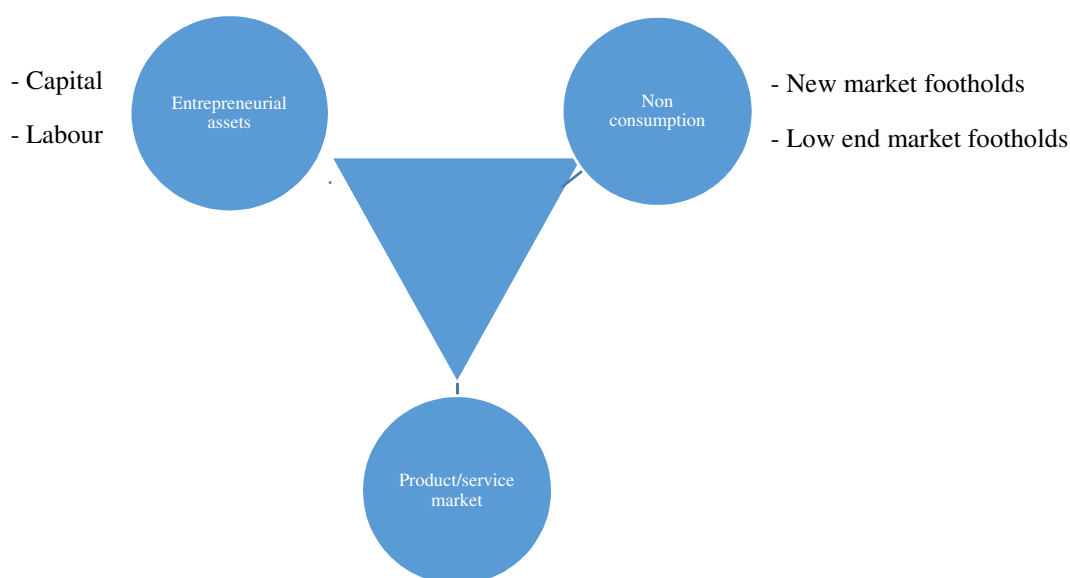
Moreover, technology firms are subject to a distinct degree of three-dimensional competitive pressure. This can be seen in their differences in R&Dism, conglomeralism, serendipitism and transactionalism. A common feature of those four variables is to grow with technology firms' fear of disruption.

Last, we have so far used the moligopoly concept to refer to five specific technology companies (GOOG, AAPL, FB, AMZN and MSFT). But there is no compelling reason to restrict the concept of moligopoly to the GAFAM. In our view, the concept can be used to other firms that compete three-dimensionally. The above mentioned lists on competitive peers found in publicly listed firms' *proxy statements* give insights on other possible moligopolists, like Cisco Systems, IBM, Intel, Qualcomm, Oracle, etc.

Those findings are important. They call into question the mainstream theory of competition which turns a blind eye over rivalry that arises outside of product or service markets. This is the question that we look at now.

Graphical representation of Moligopolists' three-dimensional competition

²²⁹ See, for buyer behavior in labor markets, Robinson, Joan, *The Economics of Imperfect Competition*, Macmillan London, 1932, at 215; Thornton, Robert J., "Retrospectives: How Joan Robinson and BL Hallward Named Monopsony." *The Journal of Economic Perspectives* 18.2 (2004): 257-261, at 257-58.



III. FAILURE OF COMPETITION ECONOMICS?

At this stage of our inquiry, we should now revolve back to the antitrust framework. It should be clear that a certain amount of (unmeasured) competitive activity is disregarded by antitrust authorities when they make findings of dominance against technology firms. In this section, we explain this situation by deficiencies both in mainstream economics (A) and applied competition theory (B).

A. THE PROBLEM WITH MAINSTREAM ECONOMICS

By “*mainstream economics*”, we refer here to (i) the intellectual foundation provided by classical price theory; (ii) the formative works of Alfred Marshall, Joan Robinson and Edward Chamberlin and subsequent scholars of the early 20th century; and (iii) its more contemporary refinements under the aegis of industrial organization (“IO”) theory. As we shall see, mainstream economics suffers of three maladies that inevitably lead to disregard the very existence of moligopoly competition.

1. *Simplification*

The first problem of mainstream economics is one of over-simplification. Due to difficulties in the application of Leon Walras general equilibrium theory,²³⁰ the entire field of microeconomics has embraced partial equilibrium analysis.²³¹ Under partial equilibrium analysis, the inquiry focuses on supply and demand/prices and quantities in a market, and holds all other things outside that market to remain constant. As a result, partial equilibrium commands “*arbitrary*” specifications,²³² including disregarding cross-market externalities

²³⁰ See Walras, Léon, *Eléments d'économie politique pure*, Œuvres économiques complètes d'Auguste et Léon Walras, VIII). Paris: Economica, ([1874] 1988).

²³¹ One influential economist who has propagated partial equilibrium analysis is A. Marshall. See Guillebaud, Charles W. “The Evolution of Marshall's Principles of Economics”, *The Economic Journal* 52.208 (1942): 330-349. There have been, however, attempts to reintroduce general equilibrium analysis. See Negishi, Takashi. “Monopolistic Competition and General Equilibrium.” *The Review of Economic Studies* 28.3 (1961): 196-201.

²³² See, for a critique of partial equilibrium as arbitrary, Duhamel, Marc. “The Optimality of Arbitrary Partial Equilibrium Welfare Analysis.” *Journal of Public Economic Theory* 8.2 (2006): 321–343.

from, and towards, other markets. The domination of partial equilibrium analysis in the field plausibly explain antitrust economics' non sensitivity to moligopoly competition.²³³

Besides, since Cournot and Bertrand, “*descriptive models*” of competition represent rivalry in mono-parametrical terms:²³⁴ firms compete *either* by setting prices *or* quantities.²³⁵ As a result, in economics, “*one can analyze the economy solely at the level of prices and quantities exchanged*”.²³⁶ The idea that firms may compete on other variables, like skills (or its proxy, *i.e.* wages) is uncharted territory to the trained antitrust economist and, most likely looks like imposture. Revealed preference theory subsequently generalized that approach.

Third, in the “*ideal models*” of competition, market structures are pigeonholed as either monopolistic, oligopolistic or atomistic (perfect competition).²³⁷ In turn, “*consumer welfare*” is deemed to increase as we move from the first category to the last, and “*producer welfare*” is deemed to decrease as we go backwards.²³⁸ The convenience of this approach explains yet another over-simplification: that mainstream economics is reluctant to embrace holistically a situation where firm that may be a monopolist on one (or some) markets and at the same time an oligopolist on one (or some other) markets.

2. Generalization

Mainstream economics also suffers from generalizing observed initial conditions across time and industries. In contrast to simplification which is often a conscious methodological choice, generalization involves an element of ignorance.

A first damaging generalization for the analyzis of technology competition consists in assuming that labour is a commodity input like wheat, steel, iron or coal. This is an old postulate inherited from early XXth century writings by socialist economists like Karl Marx²³⁹ and demand and supply economists like Arthur Pigou.²⁴⁰ This generalization is a

²³³ See, for a forceful critique, Kaldor, Nicholas. “The Irrelevance of Equilibrium Economics.” *The Economic Journal* 82.328 (1972): 1237-1255, at 1237: “*the habits of thought engendered by 'equilibrium economics' has become a major obstacle to the development of economics as a science-meaning by the term 'science' a body of theorems based on assumptions that are empirically derived (from observations) and which embody hypotheses that are capable of verification both in regard to the assumptions and the predictions*”.

²³⁴ See Gibbard, Allan & Hal R. Varian. “Economic Models.” *The Journal of Philosophy*, 75.11 (1978): 664-677, at 665 (“Descriptive models attempt to describe, in some sense, economic reality”)

²³⁵ See, Cournot, Augustin A. *Recherches sur les principes mathématiques de la théorie des richesses*, Dunod, Paris (2001); See, Bertrand, J. “Théorie des Richesses: revue de Théories mathématiques de la richesse sociale par Léon Walras et Recherches sur les principes mathématiques de la théorie des richesses par Augustin Cournot.” *Journal des Savants*, 1883.

²³⁶ Schabas, Margaret, “An Assessment of the Scientific Standing of Economics”, *Proceedings of the Biennial Meeting of the Philosophy of Science Association*, Vol. 1986, Volume One: Contributed Papers (1986), pp. 298-306.

²³⁷ Each market structure is exclusive of the other. See Gibbard & Varian, supra note 234 at 665 (“*Ideal models, on the other hand, are concerned with the description of some ideal case which is interesting either in its own right or by comparison to reality*”)

²³⁸ Despite the considerable sophistication and refinements of economic theory in the 20th and 21th century, and in particular, the progress brought by game theory, a running constant in the world's antitrust laws has been the resilience of this structural vision of competition. With distinct methods and perspectives, the Harvard, Chicago and Post-Chicago schools of antitrust all relied on such categories. Similarly, the theory of contestable markets, with its focus on entry and expansion, remains deeply rooted in a structural vision of competition. Finally, the works of celebrated Nobel-prized competition economists like John NASH, Jean TIROLE and others are all imbued with a structural understanding of the market. This vision of competition has received many labels, the most famous of which is the Structure-Conduct-Performance (“SCP”) paradigm identified by the Harvard school in the 1950-60s. To avoid epistemological controversy, we refer to this as the *Greek-antitrust* vision of competition. Even the much praised two-sided markets theory talks of monopoly and oligopoly.

²³⁹ Marx, K. 1990. *Capital*. Vol. 1. Trans. B. Fowkes. New York: Penguin. at 731 (“*The fact that this particular commodity, labour-power, possesses the peculiar use-value of supplying labour, and therefore of creating value,*

variant of the lump of labour fallacy where all workers are treated as perfectly substitutable.²⁴¹ As Williamson wrote, it has now become typical to consider that “*requisite talent is available in elastic supply*”.²⁴² Because of this view of labour as a fungible commodity, mainstream economics fails to understand that human resources can be a source of competitive advantage.²⁴³ The field in turn lacks analytical models where firms *can* and *do* compete on labour related parameters, like wages, work environment, retention plans, stock-option, compensation schemes, etc.

A second problematic generalization is the conglomerate discount.²⁴⁴ The early theory of finance finds that conglomerates are subject to a 13 to 15% discount in stock market valuation as compared to single segment firms, due to the fact that corporate diversification creates agency problems. On this basis, it has become conventional in mainstream economics to consider that conglomerates should remain rare²⁴⁵ and fragile.²⁴⁶ Economic theory has thus not built models of conglomerate competition where diversified firms beset by the risk of internal inefficiency compete *holistically* across multiple, and possibly *distinct*, market segments. Instead, the world has witnessed the production of theories where firms unilaterally leverage market positions from one product market to the other,²⁴⁷ or where firms coordinate in one product market through retaliation in other product markets.²⁴⁸

3. *Disciplinarity*

Economics philosopher Alexander Rosenberg writes that “*The trouble with economics [...] is that economists never resort to theory change, even in circumstances that seem to mandate it*”. His critique is that modern economics is a “*one theory science*” that refuses to embrace the teachings of other fields of social sciences, including neighbouring ones.²⁴⁹ Tyler Cowen – who cannot be suspect of antipathy towards mainstream economics – affirms that the

cannot affect the general law of commodity production. If, therefore, the amount of value advanced in wages is not merely found again in the product, but augmented by a surplus-value, this is not because the seller has been defrauded, for he has received the value of his commodity; it is solely due to the fact that this commodity has been used up by the buyer.”)

²⁴⁰ Kaufman, B. “Wage Theory, New Deal Labor Policy and the Great Depression: Were Government and Unions to Blame.” *Industrial and Labor Relations Review* 65.3 (2012): 501-532, at 510.

²⁴¹ The lump of labour fallacy holds that there is a fixed amount of work, so that if worker’s A hours are reduced by X%, this will be replaced by X% more hours from worker B. See Walker, Tom. “Why economists dislike a lump of labor.” *Review of Social Economy* 65:3 (2007): 279-291.

²⁴² Williamson, Oliver. “Dominant Firms and the Monopoly Problem: Market Failure Considerations.” *Harvard Law Review* 85.8 (1972): 1512-1531, at 1516.

²⁴³ Decades of massive unemployment in Western economies may have contributed to this perception that labour is a fungible commodity.

²⁴⁴ Lang, Larry & Rene M. Stulz. “Tobin’s q, corporate diversification and firm performance.” *Journal of Political Economy* 102 (1994): 1248-1280. Berger, Philip G., & Eli Ofek. “Diversification’s effect on firm value.” *Journal of Financial Economics* 37.1 (1995): 39-66. Lyandres, Evgeny. “Strategic cost of diversification”. *Review of Financial Studies* 20.6 (2007): 1901-1940.

²⁴⁵ There is nonetheless a literature that tries to explain why we observe conglomerates. This may be due to the fact that conglomerates act as efficient internal capital markets; that they offer exit routes for failing single segment firms; or that diversification benefits to managers. For a review of those reasons, see Maksimovic, Vojislav & Gordon Phillips, *supra* note ____.

²⁴⁶ Klein, Peter G. “Were the Acquisitive Conglomerates Inefficient?” *RAND Journal of Economics* 32.4 (2001): 745-761.

²⁴⁷ Bowman, Ward S. Jr. “Tying Arrangements and the Leverage Problem”, *The Yale Law Journal* 67.19 (1957): 19-36.

²⁴⁸ Bernheim, B. Douglas, & Michael D. Whinston. “Multimarket contact and collusive behaviour.” *The RAND Journal of Economics* (1990): 1-26; Scott, John T. “Multimarket contact among diversified oligopolists.” *International Journal of Industrial Organization* 9.2 (1991): 225-238.

²⁴⁹ Rosenberg, Alex. “Review of ‘The Inexact and Separate Science of Economics’ by Daniel M. Hausman.” *The Journal of Philosophy* 90.10 (1993): 533-537.

discipline is trapped in the “Walrasian box”.²⁵⁰ Both writers have in sight the mainstream, neo-classical paradigm that dominates modern economics. The main features of this paradigm are (i) reliance on mathematical (deductivist) method of reasoning;²⁵¹ (ii) emphasis on rationality in the form of utility maximization; (iii) focus on equilibrium analysis; (iv) and a neglect of certain forms of uncertainty.²⁵²

That mainstream, neo-classical economics has long remained deaf to the teachings of other fields is well-known. Since the second half of the XXth century, anything that deviates from standard neo-classical frameworks is catalogued as “heterodox”, and channeled towards distinct economic circles.²⁵³ To be fair, things have evolved in the past decades. Heterodox economics has gained some mainstay. And orthodox economics has opened to other research approaches, like evolutionary economics or experimentalism.²⁵⁴

However, the limitations of the mainstream, neo-classical framework are nakedly exposed by tech giants competition. Its over simplistic specifications and arbitrary generalizations disconnect it from what can be observed in XXIth century markets.²⁵⁵ In a 1988 article, Harold Demsetz, a key figure of the Chicago school, criticized traditional price theory as follows: “*The real tasks of management, to devise or discover markets, products, and production techniques, and actively to manage the actions of employees, have no place in the perfect decentralization model because it assumes that all products, markets, production techniques, and prices are fully known at zero cost*”.²⁵⁶ And as early as 1968, Marschack lambasted the lack of interest of textbook economics for business acumen with telling words: “[t]here exist almost unique, irreplaceable research workers, teachers, administrators; just as there exist unique choice locations for plants and harbours. The problem of unique or imperfectly standardized goods is not peculiar to the economics of inquiring, communicating, and deciding. But it has been indeed neglected in the textbooks.”²⁵⁷

The methodological isolation of mainstream theory maladies can be cured with greater openness to other fields, which say things of potential relevance for the analysis of oligopoly competition.²⁵⁸ The theory of organizational capabilities is one of them. It considers that knowledge is the most strategic resource of the firm, and proceeds to explain that firms seek to outcompete each other through discrete arrangements of individuals’ resources.²⁵⁹ The focus ought more to be on the supply side, and in particular, on “markets for

²⁵⁰ Cowen, Tyler. “Entrepreneurship, Austrian Economics and the Quarrel between Philosophy and Poetry.” *The Review of Austrian Economics* 16.1 (2003): 5-23.

²⁵¹ Lawson, Tony. “The Nature of Heterodox Economics.” *Cambridge Journal of Economics* 30.4 (2006): 483-505.

²⁵² For the three last factors, see Dequech, David. “Neoclassical, mainstream, orthodox, and heterodox economics.” *Journal of Post Keynesian Economics* 30.2 (2007): 279-302.

²⁵³ Lee, Frederic S. “To be a heterodox economist: the contested landscape of American economics, 1960s and 1970s.” *Journal of Economic Issues* 38.3 (2004): 747-763.

²⁵⁴ See, Lawson, *supra* note 251 at 9.

²⁵⁵ We paraphrase Coase who said of mainstream economics in 1999 that “[e]xisting economics is a theoretical [meaning mathematical] system which floats in the air and which bears little relation to what happens in the real world”. See Coase, Ronald, “Interview with Ronald Coase”, *Newsletter of the International Society for New Institutional Economics*, 2.1 (1999).

²⁵⁶ Demsetz, Harold. “The theory of the firm revisited.” *Journal of Law, Economics, & Organization* 4.1 (1988): 141-161.

²⁵⁷ Marschak, Jacob. 1968. “Economics of Inquiring, Communicating, Deciding.” *The American Economic Review*, 58.2 (1968): 1-18, at 14.

²⁵⁸ See, Lawson, *supra* note 251 at 10 for use of the expression.

²⁵⁹ The primary role of the firm, and the essence of organizational capability, is the integration of knowledge. If markets are in a state of flux, then profits ought not be derived from strategic choices in terms on product markets and customers, but a much more stable basis for advantages is a firm’s internal resources. Grant, Robert

resources”, because competitive conditions in product depend upon “*the ability of challengers to acquire the resources needed to initiate a competitive offensive*”.²⁶⁰

Another possible source of inspiration can be found in business strategy literature, and in particular in Porter’s “*strategic group*” theory. Porter defines a strategic group as the “*group of firms in an industry following the same or a similar strategy along the strategic dimensions*”.²⁶¹ Porter’s theory acknowledges that distinct strategic groups (of firms) can compete fiercely in the market, regardless of their differences in structure and products.²⁶² Chief in his analysis is the concept of “*mobility barriers*”, which protect strategic groups from competition from other strategic groups.²⁶³ Porter moves one to graphically display competition in an industry by providing a map of “*strategy space instead of price and volume*”.²⁶⁴

4. Summation

Mainstream economics is an elegant analytical construct. It displays the advantage of versatility in dozens of applications to markets where firms compete in product markets over price or quantities. But its stylized framework does not correspond to the digital economy world. In particular, it is entirely blind to the efforts that technology make to outcompete their rivals on the basis of resources, and especially of entrepreneurial resources. Demsetz once noted: “*The entrepreneur is neither an object of analysis, nor of research, but is rather a deus ex machina of economic change*”.²⁶⁵

Interestingly, the insulation of mainstream economics has been denounced by many, including canonical figures from the discipline. At some point in their career, Frank Knight,²⁶⁶ Ronald

M., “Prospering in Dynamically-Competitive Environments: Organizational Capability as Knowledge Integration.” *Organization Science*, 7.4 (1996): 375-387, (in the abstract of his article, Grant writes: “*Unstable market conditions caused by innovation and increasing intensity and diversity of competition have resulted in organizational capabilities rather than served markets becoming the primary basis upon which firms establish their long-term strategies. If the strategically most important resource of the firm is knowledge, and if knowledge resides in specialized form among individual organizational members, then the essence of organizational capability is the integration of individuals' specialized knowledge*”).

²⁶⁰ *Id.* at 376.

²⁶¹ See, Porter, *op. cit.*, *supra* note 60 at 129. At one extreme, one firm can be a strategic group of its own. And at the other, all firms can be one same strategic group.

²⁶² *Id.* at 138-141.

²⁶³ *Id.* at 134: Mobility barriers are “*factors that deter the movement of firms from one strategic position to another*”. Porter notes that the strategic group analysis is an “*analytical device designed to aid in structural analysis*”, and in particular provides an “*intermediate frame of reference between looking at the industry as a whole and considering each firm separately*”. *Id.* at 132.

²⁶⁴ *Id.* at 152.

²⁶⁵ Demsetz, Harold, “Concluding comments” in J. Ronen (Ed.), *Entrepreneurship*, Lexington, Mass, Lexington Books, 1982, at 275.

²⁶⁶ Knight, Frank H., *The ethics of competition*. Transaction Publishers ([1935] 1997), (noting at 49: “*The mathematical economists have commonly been mathematicians first and economists afterward, disposed to oversimplify the data and underestimate the divergence between their premises and the facts of life. In consequence they have not been successful in getting their presentation into such a form that it could be understood, and in relation to real problems recognized, by practical economists. The critical reader of general economic literature must be struck by the absence of any attempt accurately to define that competition which is the principal subject under discussion*”). Emmett, Ross B., *Frank Knight and The Chicago School in American Economics*, Routledge Studies in the History of Economics, 2009 and Emmett, Ross B. “Frank Knight, Max Weber, Chicago Economics and Institutionalism.” *Max Weber Studies* 101 (2006): 119.

Coase,²⁶⁷ and Milton Friedman²⁶⁸ all expressed misgivings about the limitation of neoclassical, mainstream economics as a science. In his *Methodology of Positive Economics*, the later warned: “*Of course, the notion of a completely realistic theory is in part a straw man*”.

Mainstream economics need to open-up. As Tony Lawson wrote: “*methodological pluralism is desirable per se and no more needs to be said*”.²⁶⁹ This is a matter of ethics in scientific inquiry, not efficiency: any honest researcher should accept, understand and embrace, the falsification of his theories through recourse to tools, methodologies and frameworks distinct from those of his/her epistemic vicinity.

B. THE PROBLEM WITH APPLIED COMPETITION ANALYSIS

Arrayed against neo-classical price theory, applied competition analysis has developed as a subfield of its own, governed by idiosyncratic methods and tools. The operation of this conventional competition framework has been criticized times and times again in relation to so-called “*dynamic markets*”.²⁷⁰ In response, enforcement agencies have introduced discrete adjustments in the various areas of antitrust policy. But the limits of conventional competition analysis are more structural, and therefore remain. And even if one was to conservatively – and arbitrarily – deem observed *moligopoly* competition a trivial phenomenon, the fact that this dimension of rivalry is *never* acknowledged in modern competition analysis shall at least interrogate us on why this is the case, and in turn deserve a word of explanation. This is what we offer in the following sections.

1. Relevant Market Analysis

Conventional competition analysis sets the “*relevant market*” as the milieu within which agencies, judges and practitioners assess competition. But the relevant market is a controlled environment, inapt to capture the moligopolists’ *product competition* for the non-consumption (1.1) and the *non-product* competition for resources (1.2).

1.1. Product competition for the non-consumption

a). Relevant market, a reminder

In competition policy, the conventional inquiry aims at diagnosing market power.²⁷¹ The method to be followed is empirical. It involves the definition of a relevant market.²⁷²

²⁶⁷ Posner, Richard. “Ronald Coase and Methodology.” *The Journal of Economic Perspectives* 7.4 (1993): 195-210.

²⁶⁸ Friedman, Milton. “The methodology of positive economics.” in *Essays In Positive Economics*, Chicago: University of Chicago Press ([1953] 1966), pp. 3-43, at 32.

²⁶⁹ See Lawson *supra* note 251 at 492.

²⁷⁰ Manne, Geoffrey A. & Joshua D. Wright. “Innovation and the Limits of Antitrust.” *Journal of Competition Law and Economics* 6.1 (2010): 153-202; Rato, Miguel, and Petit, Nicolas “Abuse of dominance in technology-enabled markets: established standards reconsidered?” *European Competition Journal* 9.1 (2013): 1-65.

²⁷¹ There is a discussion as to whether agencies seek to diagnose market power or monopoly power, but it is not material for this discussion. See Krattenmaker, Thomas G., Robert H. Lande & Steven C. Salop. “Monopoly power and market power in antitrust law.” *Georgetown Law Journal* 76 (1987): 241. Others consider that the inquiry is never over market power, but this is a marginal position, see Baker, Jonathan B. & Timothy Bresnahan. “Economic Evidence in Antitrust: Defining Markets and Measuring Market Power”. *Stanford Law and Economics Olin Working Paper* No. 328 (2006), available at SSRN 931225.

²⁷² Landes, William M. & Richard Posner. “Market Power in Antitrust Cases.” *Harvard Law Review*, 94.5 (1981): 937-996 at 938: “*The standard method of proving market power in antitrust cases involves first defining*

Friedman explains that relevant market analysis draws on a “*hypothesis*” created by Alfred Marshall. This hypothesis is that: “*for many problems, firms could be grouped into “industries” such that the similarities among the firms in each group were more important than the differences among them*”.²⁷³ In turn, a firm “*belongs to an “industry” defined as a group of firms producing a single ‘product’*. A ‘*product*’ is defined as a collection of units that are perfect substitutes to purchasers so the elasticity of demand for the output of one firm with respect to the price of another firm in the same industry is infinite for some price and some outputs”.²⁷⁴

Against this backdrop, US and EU antitrust laws have made the identification of a *product* – and of its actual and/or potential substitutes – the central question of antitrust analysis.²⁷⁵ And though product market definition may have lost some prominence in certain areas of antitrust policy like merger control, it remains the standard method for diagnosing market power, including in technology markets.

b). Relevant market, application to oligopoly competition

We have seen previously that oligopolists compete against the non-consumption. They seek to find new or low-end product footholds. What causes this is the modern entrepreneur fear of disruption. Its consequence is to transform technology firms into conglomerates.

With its emphasis on *products* and in particular on *actual* and *potential* substitutes – also known respectively as “*actual competition*” and “*potential competition*” – the antitrust frame of reference is necessarily doomed to miss the competitive pressure exerted by efforts to discover products that serve non-existing needs or address the unserved low end of the demand curve. Let us look at those two variants in turn. In so far as new market footholds are concerned, the antitrust framework proposes to resort to the concept of an “*innovation market*”. The 1995 US Antitrust Guidelines for the licensing of IP define innovation markets as the “*research and development directed to particular new or improved goods or processes, and the close substitutes for that research and development*”.²⁷⁶ And the 2014 EU Guidelines on Technology Transfer Agreements recognize that there can be “*effective competition in innovation*” as long as there are “*a sufficient number of competing research and development poles*”.²⁷⁷ But, this is as far as it goes, and in both the US and the EU, the inquiry into an innovation market then revolves back into the ability of the antitrust examiner to “*identify*” prospectively “*close*” substitutes.²⁷⁸ This conservative approach leaves little space to the

a relevant market in which to compute the defendant's market share, next computing that share, and then deciding whether it is large enough to support an inference of the required degree of market power”.

²⁷³ See, Friedman, *supra* note 268 at 35.

²⁷⁴ *Id.*

²⁷⁵ See, U.S. Dep’t of Justice & Fed. Trade Comm’n, Horizontal Merger Guidelines (2010), available at <http://www.justice.gov/atr/public/guidelines/hmg-2010.pdf>. (“The hypothetical monopolist test requires that a product market contain enough substitute products so that it could be subject to post-merger exercise of market power significantly exceeding that existing absent the merger”). See also, Commission Notice on the Definition of the Relevant Market, *OJ C* 372 [1997], p. 5–13 (hereafter, “EU Guidelines on Market Definition”).

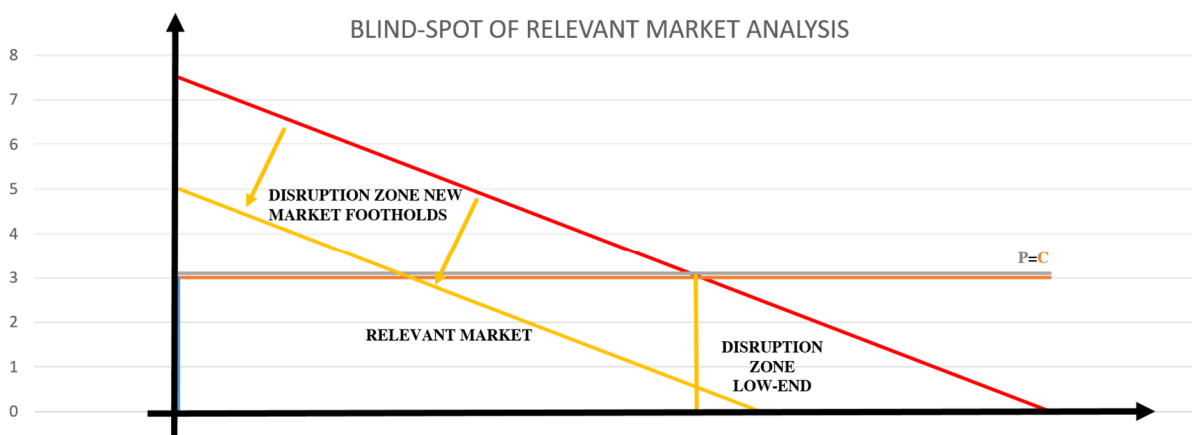
²⁷⁶ See, Dep’t of Justice & Fed. Trade Comm’n, Antitrust Guidelines for the Licensing of Intellectual Property (1995), at section 3.2.3, (hereafter “US IP Licensing Guidelines”)

²⁷⁷ See Communication from the Commission — Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements, *OJ C* 89, 28.3.2014, p. 3–50 at §26 (hereafter “EU TTBER Guidelines”)

²⁷⁸ The EU TTBER Guidelines explain that it must be “*possible at an early stage to identify research and development poles*” (see §26). The US IP Licensing Guidelines state that “*The close substitutes are research and*

consideration of true, disruptive products in the antitrust assessment (see “Disruption Zone New Market Footholds”, in graph below).²⁷⁹

As far as low-end footholds are concerned, the conventional antitrust analysis is also riddled with defects. The Hypothetical Monopolist Test (“HMT”), which governs the discipline, cannot properly factor the demand of customers in the low-end of markets. This is because the HMT offers to consider as substitutes all products to which demands switches away in response to a 5-10% “*small but significant and non-transitory increase in price*” (SSNIP test) using the competitive price level – *ie* marginal costs – as the initial baseline. A proper understanding of disruptive competition would necessitate tweaking the analysis and test the demand response to a *decrease* in price and/or quality. This would be both conceptually (and practically) difficult to perform, for even in a competitive market, firms – even monopolists – cannot be supposed to price below marginal costs (see “Disruption Zone Low-End”, in graph below).



The limitations of product market definition in sectors governed by technological disruption are emerging in several antitrust decisions. The decisional practice of the EU agencies is more telling than that of the US authorities, which remains to emerge. In the *Facebook/WhatsApp* decision, the EU Commission declined to consider whether SMS were subject to the disruptive competition of consumer communications apps like WhatsApp, and proceeded to examine the merger transaction on the basis of a “*market definition limited to consumer communications apps for smartphones and excluding traditional communication services*”.²⁸⁰ Similarly, in its on-going investigation against Google, the EU Commission has considered that Google is dominant in the market for “*licensable smart mobile operating systems*”, plausibly failing to envision Android as a competitive, low-end attack on the

development efforts, technologies, and goods that significantly constrain the exercise of market power with respect to the relevant research and development, for example by limiting the ability and incentive of a hypothetical monopolist to retard the pace of research and development” (see section 3.2.3).

²⁷⁹ Moreover, in practice, the delineation of antitrust innovation market analysis is hard to implement. Käseberg, Thorsten. *Intellectual Property, Antitrust and Cumulative Innovation in the EU and the US*. Bloomsbury Publishing (2012), at pp.118-119.

²⁸⁰ See Commission Decision, Case No COMP/M.7217, *Facebook/ WhatsApp*, C(2014) 7239. The Commission relied on WhatsApp contention that it had no plans to offer its service outside of the smartphone environment (see §21). However, this finding was contradicted a few months later when WhatsApp enabled in January 2015 a web browser based version of its app and again in June 2016, when WhatsApp launched its desktop app. See, WhatsApp Blog, 10 May 2016, available at <https://blog.whatsapp.com/10000621/IntroducingWhatsApp-desktop-app?l=en&set=yes>

leading, pre-existing Apple smartphone platform iOS.²⁸¹ The Commission found that the OS of vertically integrated manufacturers like Apple or Blackberry were not in the same relevant market as, and thus did not exert pressure on, Google Android.²⁸² The on-going search investigation against Google has also led the Commission to make bold findings on market definition. It has separated, in particular (i) general search engines which “*provide search results covering any category of information on the web*”, and vertical search engines which “*provide search results for specific categories of information on the web*”.²⁸³ This has entitled the Commission to reach the preliminary finding that Amazon, which it considers a vertical infrastructure, is not a competitor of Google in general search, despite evidence that Amazon leapfrogs a significant number of search queries from Google.²⁸⁴

1.2. Non-product competition for resources

The focus of conventional antitrust analysis on competition in products or (services) is reductionist. It restricts the inquiry on the supply and demand of products (and services). In contrast, antitrust examiners hardly ever look at the supply and demand of skills and/or of capital, which are the entrepreneurial *resources* that monopolists seek to harness to bring about competitive disruption.²⁸⁵

To be fair, a certain degree of scrutiny may be given to entrepreneurial inputs when R&D expenses are accommodated in the assessment of innovation markets. That said, the practice of antitrust regulators in digital economy markets is inhospitable to R&D expenses, in comparison with other sectors like pharmaceuticals or defence. Perhaps no decision conveys better this impression than the EU Commission 2004 infringement decision against *Microsoft* where “*research and development*” is only mentioned once over hundreds of pages (and only refers once to the acronym “R&D”).

The viewpoint that emanates from antitrust regulators investigations seems to be that digital economy R&D has reached excessive levels. This is due to the misperception that R&D expenses mean infrastructure, facilities and manufacturing investments (machines, equipment, laboratories, etc.),²⁸⁶ and that such investments should be lower in digital economy sectors

²⁸¹ See EU Commission, Antitrust “Commission sends Statement of Objections to Google on Android operating system and applications”, *Press Release IP/16/1492*, 20 April 2016.

²⁸² *Id.*

²⁸³ Commission Staff Working Document, Online Platforms Accompanying the document Communication on Online Platforms and Digital Single Market (COM(2016) 288 final), at 27.

²⁸⁴ See, on the study by Forrester Research, Davis, Andrew, “Amazon Passes Google as Top Destination for Shopping Research [Report]”, *Search Engine Watch*, 5 Aug. 2012, available at <https://searchenginewatch.com/sew/study/2196747/amazon-passes-google-as-top-destination-for-shopping-research-report>

²⁸⁵ See Shelanski, Howard A. “Information, innovation, and competition policy for the Internet.” *University of Pennsylvania Law Review* 161 (2012): 1663-1705, at 1684 noting “*If there is any single force that best characterizes digital platform markets it is probably the intensive and continuous investment in research and development to improve existing products and develop new platforms and applications*”.

²⁸⁶ The definition of R&D used in the EU instruments is derived from the old version of the well-known Frascati definition of the OECD, which has long been criticized for its excessive emphasis on manufacturing capabilities, and its inability to capture service sector R&D. See for instance, Commission Regulation (EU) No 1217/2010 of 14 December 2010 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to certain categories of research and development agreements, *OJ L335* 18 Dec. 2010, pp. 283-289, at Article 1(c): “*“research and development” means the acquisition of know-how relating to products, technologies or processes and the carrying out of theoretical analysis, systematic study or experimentation, including experimental production, technical testing of products or processes, the establishment of the necessary facilities and the obtaining of intellectual property rights for the results*”. Whilst the Frascati definition has been upgraded to cover more of services sector innovation, the concepts used by the antitrust agencies remain influenced by the

where firms compete on intangible goods.²⁸⁷ A Staff working document on online platforms of the EU Commission conveys that brick and mortar vision of R&D expenses:

*“The industry is characterized by significant costs for creating the web index, developing the search algorithm and building computing centres. At its minimum, search engines are required to invest in a substantial server infrastructure to be able to crawl and index the Internet in order to closely match results to search queries. Furthermore, finance-intensive R&D activities are required to maintain and constantly improve the quality of search and advertising tools. Google being the market leader has spent nearly \$11 billion on real estate purchases, production equipment, and data centre construction and \$10.5 billion on research and development in 2014 alone. It operates more than a million servers to respond to more than a billion search requests per day.”*²⁸⁸

But this wholly misses that in services sectors like where the moligopolists operate, R&D expenditures consist mainly in investments in the acquisition, retention and combination of skills.²⁸⁹ Non-antitrust regulators like the SEC know this, who request reporting firms to undertake “*competitive market assessments*” of the firms they compete with for the compensation of senior executive talent.²⁹⁰

Conventional competition analysis seems to reserve a similar unamicable treatment to indirect R&D through financial transactions. Since the onset of the late 1990s technological dot.com bubble, it has become mainstream to look down with contempt on investments in startups²⁹¹.²⁹² In modern antitrust policy, startups investments are either looked as fads or rationalized as evidence of anticompetitive conduct. The “*infanticide by acquisition*” narrative is becoming mainstay on both sides of the Atlantic.²⁹³ A “*natural instinct*” in

initial versions. See Miles, Ian. “Research and development (R&D) beyond manufacturing: the strange case of services R&D.” *R&D Management* 37.3 (2007): 249-268. This is for instance very clear in the 2006 Communication from the Commission Framework for state aid for research and development and innovation which talks of R&D in terms of infrastructure and organisations. See Community framework for state aid for research and development and innovation OJ C 323, 30 Dec. 2006, p. 1–26.

²⁸⁷ See Shelanski, *supra* note 285 at 1685 writing about the predominant, and restrictive production view of R&D: “*Innovation is to some degree a component of any industry. The difference with digital platforms is that R&D is the central input of production, not merely an episodic activity that affects the production process*”.

²⁸⁸ See Commission Staff Working Document on Online Platforms *supra* note 283, at section 3.3.3.1.

²⁸⁹ Pisano, *supra* note 219, explains that an R&D strategy involves four strategic levers: architecture, processes, people and portfolio.

²⁹⁰ See *supra* ____.

²⁹¹ Alan Greenspan talked of “*irrational exuberance*”. See Greenspan, Alan, *The Age of Turbulence*. Penguin, 2008, at 176.

²⁹² See also Ariely, Dan, *Predictably Irrational: The Hidden Forces that Shape our Decisions*, Harper Perennial, NY, 2010.

²⁹³ See Warren’s Keynote Remarks, *supra* note 21: “*Left unchecked, concentration will destroy innovation. Left unchecked, concentration will destroy more small companies and start-ups*”. In the EU, see Vestager, Margrethe “*Refining the EU Merger Control System*” *Keynote Speech at Studienvereinigung Kartellrecht*, Brussels, 10 Mar. 2016: “[A] company might be valuable simply because of its ability to innovate. A merger that involves this sort of company could clearly affect competition, even though the company’s turnover might not be high enough to meet our thresholds”); Foer, Albert A., “A vocabulary for conversing about entrepreneurship, innovation, and antitrust”, *American Antitrust Institute*, at 25, also warning about the weaknesses of that narrative: “*Although antitrust has not demonstrated much ability to stop the acquisition of an innovative startup that does not currently affect the purchaser’s market, the doctrine of “potential competition” lingers on the outskirts of antitrust, which an aggressive enforcement effort might resuscitate to protect the innovation from being purchased and then strangled. Ironically, defending innovation by refusing to permit an acquisition because the acquirer might eliminate future competition might send a negative message to entrepreneurs and early investors:*

antitrust may be to explain M&A by large technology firms as a way of gobbling up competitive disruptors.²⁹⁴

1.3. Summation

Antitrust examiners are aware of the idiosyncratic nature of relevant market analysis and of its operational tool the HMT.²⁹⁵ Yet, little has been done to accommodate the teachings of other disciplines. True, the early XXIst century has seen a retreat from formulaic reliance on relevant market analysis. This is in particular the case in the merger policy field, and especially in the FTC and DOJ's 2010 revised U.S. Horizontal Merger Guidelines as well as in the EU Commission 2012 Guidelines on the assessment of non-horizontal mergers. But this evolution is not predicated on the inadequacies of traditional structural tools, and on their exposition by the specificities of innovation markets.²⁹⁶ Much to the contrary, it owes to refinement in applied competition economics, and in particular, to increased sophistication in the techniques of measurement of price elasticities.

In decisional practice, market definition remains the antitrust book of practice. In a report to the OECD, the DoJ and the FTC said that although innovation intensive industries present some theoretical challenges, cases have not presented the agencies with major market definition difficulties.²⁹⁷ In its scrutiny of mergers like *Microsoft/Skype* and *Facebook/WhatsApp*, the EU Commission proceeded to delineate relevant markets prior to assessing anticompetitive harm. Unsurprisingly, antitrust experts on all sides, including those in favor of stronger enforcement, have been critical of the market definition prerequisite. Professor Howard Shelanski for instance has advocated in favour of a revision of the methodology “*from one that begins with market definition to one that begins with competitive effects*”.²⁹⁸

At more granular levels, the flaws contaminate the tools of market definition analysis. Take HMT. The test focuses on gauging cross-price elasticity of demand. This has given a headache to antitrust economists in digital markets where output is often given away for free. Some have looked at prices on the other side of platforms (when users are subsidized by

You will not have the unmitigated right to sell out to the highest bidder. The answer here is to condition antitrust enforcement on very strong evidence of the acquirer's negative intention”.

²⁹⁴ Litan, Robert E., “Entrepreneurship, Innovation, and Antitrust”, forthcoming in *American Antitrust Institute Entrepreneurship of 2016 Presidential Transition* (2016), at 13-14 warning that this “*legitimate source of concern must be balanced against the fact that one important way in which startup investors (angels and venture capital firms, in particular) can achieve satisfactory exits—and thus be able to deploy their capital elsewhere—is through acquisition*”.

²⁹⁵ For instance, the EU Guidelines on Market Definition recognize that “*the concept of ‘relevant market’ is different from other definitions of market often used in other contexts. For instance, companies often use the term “market” to refer to the area where it sells its products or to refer broadly to the industry or sector where it belongs*”. See EU Guidelines on Market Definition, at §3.

²⁹⁶ See, for an early treatment, Pleatsikas, Christopher & David Teece, “The analysis of market definition and market power in the context of rapid innovation.” *International Journal of Industrial Organization* 19.5 (2001): 665-693 (“*antitrust lawyers must rethink some basic assumptions and revise their methods*”; “*the inadequacies of the traditional structural indicia that have been used by economists and others to define markets and assess market power in high technology industries*”)

²⁹⁷ OECD, Roundtable on Market Definition, DAF/COMP/WD(2012)27, 7 June 2012, Note by the Delegation of the United States.

²⁹⁸ See, Shelanski, *supra* note at 285 at 1693.

content providers, for instance) or have tried to reconstruct the hidden price of free.²⁹⁹ Another area of disconcert arises when one tries to apply HMT analysis to distinct business models, and in particular distinct ecosystems. For example, firms like Microsoft and Google, who license their operating systems (“OS”) Windows for PC and Android for mobile to OEMS, are deemed antitrust-dominant on the relevant market for their own OS. This is because, if the price of the license increases, an OEM cannot turn to a proprietary OS like iOS which is not openly licensed by Apple. This analysis is certainly right within the frame of reference defined by antitrust law. But it is obviously wrong, because it misses that Apple’s walled garden constrains both Microsoft and Google’s expansion in OS and vice-versa.³⁰⁰ That inter-ecosystems (closed v open) rivalry can give rise to fierce competition is a blind spot for antitrust enforcement, though some authorities are coming to realize this.³⁰¹

2. Incumbency Bias

Similar riddles affect other areas of the antitrust inquiry. Within the market power assessment, the concept of barriers to entry is central. In today’s practice, the antitrust examiner textbook embraces the interpretation given by Joe Bain that any cost that is incurred by a new entrant is an obstacle to new competition.³⁰² With this, it has become conventional antitrust wisdom to consider that incumbency is a source of barriers to entry. In particular, incumbency is deemed to generate economies of scale that slow the entry of new firms in the market.³⁰³

Moligopolists tend to upset this accepted incumbency wisdom. In the literature, an increasing amount of books and studies have been hammering that in the digital economy, first mover advantages do not matter³⁰⁴ and that many thriving companies were those who last entered the market.³⁰⁵ Clayton Christensen’s theory of disruptive innovation is a case in point.³⁰⁶ And

²⁹⁹ Auer, Dirk & Nicolas Petit, “Two-Sided Markets and the Challenge of Turning Economic Theory into Antitrust Policy.” *The Antitrust Bulletin* 60.4 (2015): 426-461 and Gal & Rubinfeld, *supra* note 7.

³⁰⁰ See, Apple 2015 10-K form, noting “Price competition has been particularly intense as competitors selling Windows-based personal computers have aggressively cut prices and lowered product margins”. In the mainstream literature, some writers report that Google may be giving way to Apple’s walled garden business model. For instance, see Rushkoff, Douglas, *Throwing Rocks at the Google Bus: How Growth Became the Enemy of Prosperity*. Portfolio Trade / Penguin, 2016, at 37.

³⁰¹ Note, however, *The Economics of Open and Closed Systems*, 16 December 2014, CMA-Autorité de la concurrence report, available at http://www.autoritedelaconcurrence.fr/doc/economics_open_closed_systems.pdf

³⁰² Bain, Joe, *Barriers to new competition*, Cambridge: Harvard University Press, 1956.

³⁰³ For examples taken from EU law, see EU Commission Guidance on its enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings *OJ C* 45, 24.2.2009, p. 7–20, at §17 which lists economies of scale as a possible barrier. The EU Commission Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings *OJ C* 31, 05.02.2004, p. 5-18 (hereafter, “EU Horizontal Merger Guidelines”), at §71 consider that “barriers to entry may also exist because of the established position of the incumbent firms on the market”. And in *Intel*, the Commission noted that scale was a barrier to entry, §866: “it will be necessary to achieve a high capacity utilisation to maximise average cost reductions and hence compete most efficiently with the producers already in the market (essentially, AMD and Intel)”. See GC, Case T-286/09 *Intel Corp. v Commission*, [2014] ECLI:EU:T:2014:547 (hereafter, “Intel”).

³⁰⁴ Some economic theorists have proposed to revisit the mainstream wisdom. Gerorski and Markides argue that that it is more profitable to enter an industry as a “fast second”, when a dominant model is about to emerge. See Markides, Constantinos C., & Paul A.Geroski. *Fast second: How smart companies bypass radical innovation to enter and dominate new markets*, John Wiley & Sons, 2004. They use the example of IBM, who patiently waited that UNIVAC became dominant on mainframe to penetrate the market.

³⁰⁵ See, Thiel and Masters *op. cit. supra* note 147, at chapter 5: “It’s much better to be the last mover”.

³⁰⁶ Christensen, Clayton, *The innovator's dilemma: when new technologies cause great firms to fail*. Harvard Business Review Press, [1997] 2013.

industry history corroborates those findings. For instance, little known is the fact that Google was the 35th search engine to penetrate the search sector, and that incumbency played no role in undermining Google search penetration.³⁰⁷ The same can be said of Friendster, king of social networks in 2000, demoted by MySpace and then leapfrogged by Facebook.³⁰⁸ Last, many observers have forgotten that Amazon was not the company that created online book retailing.³⁰⁹

At the same time – and this is not the smallest paradox – no heed is paid to the age of companies in antitrust assessment. Yet, several moligopolistic firms are relatively old companies. This disinterest for firms' duration may be due to the fact that we talk of firms whose market position has fluctuated across the years, and sometimes in high variance. A company like Apple was dominant in the mid-1980s, marginal in the mid-1990s, and prominent again since the mid-2000s. The same can be said of Microsoft. Against this backdrop, however, one could convincingly argue that this ability to resist to competition over time denotes better what should define moligopoly power, rather of a mere photographic assessment of their market position in a narrow market. Put differently, should not the key focus of the antitrust investigation be on permanence, instead of dominance?

3. Conglomerate Void

The antitrust framework provides no process to balance the monopoly power diagnosed in one relevant market with the intensity of competition, disruption and innovation that exists in other markets.³¹⁰ In competition policy, holistic analysis is a curiosity. Out of market rivalry or efficiency that originates outside of the relevant market cage has little, if no place in contemporary antitrust assessment.³¹¹ In *United States v. Philadelphia Nat'l Bank*, the US Supreme Court held: “*If anticompetitive effects in one market could be justified by procompetitive consequences in another, the logical upshot would be that every firm in an industry could, without violating § 7, embark on a series of mergers that would make it, in the end, as large as the industry leader*”.³¹² And in the EU, the wording of the Treaty provisions on efficiencies,³¹³ the case-law³¹⁴ and the soft law of the EU Commission,³¹⁵ leave little doubt

³⁰⁷ See, Gandal, *supra* note 82.

³⁰⁸ Evans, David S. & Richard Schmalensee. “Failure to launch: Critical mass in platform businesses.” *Review of Network Economics* 9.4 (2010).

³⁰⁹ The idea originated with Charles Stack, an Ohio-based bookseller in 1991. Lei, David & John W. Slocum. “Strategic and organizational requirements for competitive advantage.” *The Academy of Management Executive* 19.1 (2005): 31-45.

³¹⁰ See Shelanski, *supra* note 285 at p.1678: “*the interdependency of the different market sides of a platform can make it much harder to determine what the 'relevant market' is*”.

³¹¹ See Wright, Joshua D. “Comment on the Proposed Update on the Horizontal Merger Guidelines: Accounting for Out-of-Market Efficiencies.” *George Mason Law & Economics Research Paper* No. 10-38 (2010).

³¹² *United States v. Philadelphia Nat'l Bank* 374 U.S. 321 (1963).

³¹³ Article 101 TFEU for instance require to prove that users victim of the restriction of competition be awarded a “fair share” of the benefits realized by the impugned agreement. See Consolidated version of the Treaty on the Functioning of the European Union (TFEU) *OJ C* 115, 9.5.2008, p. 88–89.

³¹⁴ CJEU, Case C-209/10 *Post Danmark A/S v Konkurrencerådet* [2012] ECLI:EU:C:2012:172, at §42: “*It is for the dominant undertaking to show that the efficiency gains likely to result from the conduct under consideration counteract any likely negative effects on competition and consumer welfare in the affected markets.*” See also, *GC, Intel*, at §94: “[I]t is open to the dominant undertaking to justify the use of an exclusivity rebate system, in particular by showing that its conduct is objectively necessary or that the potential foreclosure effect that it brings about may be counterbalanced, outweighed even, by advantages in terms of efficiency that also benefit consumers.”

that out of market rivalry or efficiency will only be considered if it occurs within the relevant market where anticompetitive effects were diagnosed. In recent years, some slight adjustments have been brought to this strict solution, but they invariably require some severe conditions and notably that consumers in the several markets are substantially similar.³¹⁶

To make this point more graphic, let us stylize an ordinary garden variety competition assessment. The antitrust examiner starts by drawing an inventory of the markets where the firm under review is active. These are called “*affected markets*”. He then attempts to circumscribe what products are perfect or quasi-perfect substitutes on each affected market, which gives a relevant market. The next stage consists in gauging the market position of the firm under examination on each relevant market. In this process, consideration is given to entry barriers. The investigation then either stops or concentrates on a subset of relevant markets where the firm under review holds significant market power (“SMP”). Ultimately, the antitrust examiner possibly finds SMP and moves on to conduct remediation. In any case, no declaration is made about the affected relevant markets where competition can be fierce. No consideration is given to rivalry or efficiency that exists out of the SMP market. In brief, a firm that is dominant on one market, and competitive on ten others remains a monopolist to the antitrust eye. And if it is, then the markets where it is competitive are disregarded. To take a metaphor, an antitrust approach to construction work would lead to declaring a 100 floors skyscraper fit for destruction simply because traces of asbestos has been found on the top floor, in disregard of the pristine state of the 99 lower floors.

The moligopoly hypothesis creates an unprecedented friction point for the conventional antitrust framework. But in suggesting a more holistic approach, we are breaking no new ground. Antitrust authorities have many times gone beyond the relevant market cage when the point was to affirm liability against technology firms for anticompetitive leveraging that takes place through multi-market strategies (tying, bundling, margin squeezed, input foreclosure, etc.). No good conceptual reason has been advanced to restrict that holistic approach to liability findings, and to sweep conglomeral competition under the rug when it may lead to immunity.

4. *Dystopian Theories of Harm*

Formal economic theory does not offer much views on how markets deliver in the real world. Empirical economics, however, fill this space. Empirical studies provide diverse representations of markets. In some studies, markets are shown to work. In others they are described at failure. Empirical conclusions that are sufficiently robust can serve as a basis to elaborate theories.

In regulatory circles, “*dismal*” representations of market failures often dominate descriptions of well-functioning markets, in particular with specialized administrative agencies. Public

³¹⁵ EU Horizontal Merger Guidelines at §79: “[E]fficiencies should be substantial and timely, and should, in principle, benefit consumers in those relevant markets where it is otherwise likely that competition concerns would occur”.

³¹⁶ For an isolated illustration, see Commission Decision COMP/39.595 – *Continental/United/Lufthansa/Air Canada*, C(2013) 2836 final, and, more generally, Communication from the Commission – Notice – Guidelines on the application of Article 81(3) of the Treaty, OJ C 101, 27.4.2004, p. 97–118, §43: “where two markets are related, efficiencies achieved on separate markets can be taken into account provided that the group of consumers affected by the restriction and benefiting from the efficiency gains are substantially the same”. For a thorough discussion, see Ducci, Francesco. “Out-of-market Efficiencies, Two-sided Platforms and Consumer Welfare: A Legal and Economic Analysis.” *Journal of Competition Law and Economics* 12.3 (2016): 591-622.

choice theory hints at a possible explanation. Any administrative agency faces a conflict of interest – by contrast, possibly, to a court. As soon as an agency fulfills its goals, the logic of any budget-constrained government should be to reduce its resources and/or to phase it out. Yet, no rational agency manager has any incentive to experience a reduction and/or termination in professional occupation. This incentivize agencies to either (i) discharge their duties sub optimally; (ii) adduce evidence of new market failures; or (iii) expand their mandate beyond their original missions. By necessity, a utilitarian agency will incline towards pessimistic market predictions and discount optimistic ones. The same logic applies when after years of case work, an agency is confronted to evidence that eviscerate its proposed theory of harm. In such circumstances, agencies have no incentives to adjust “*their positions appropriately to generate socially desirable outcomes*”.³¹⁷

The antitrust structure is thus prone by nature to push dystopian theories of harm on the policy agenda. A classic example is the “*platform threat*” theory. In *US v Microsoft Corp*, the case before the Court of appeals focused on Microsoft’s maintenance of its Windows operating system (“OS”) monopoly through the exclusion of middleware developers such as Netscape.³¹⁸ The Court of Appeals upheld large parts of the District Court’s ruling, confirming “*both Navigator and Java showed potential as middleware platform threats*”.³¹⁹ Chief in the Court of Appeals concerns was that Microsoft had tried to protect its dominant OS platform from the competition exerted by browsers, but also e-mail clients, instant messaging, and media players who could soon become technological gateways.³²⁰ In retrospect, the evidence is severe for those who nurtured the platform threat narrative.³²¹ The technology did not develop as predicted.³²² Windows faced growing competition from other market segments, such as Web services, tablets, and handheld devices.³²³ Moreover, competition did not really attack the core of Microsoft’s dominant platform, namely its OS.³²⁴ Instead, the competition that Microsoft is facing seems to be coming from more remote, non-software directions (including search, cloud computing, etc.).

The possibly skewed incentives of agencies to prefer fearmongering narratives over optimistic descriptions of markets should invite us to prudence when new theories of harm are brought

³¹⁷ Winston, Clifford, *Government failure versus market failure: microeconomics policy research and government performance*. Brookings Institution Press, 2007, at pp.79-80

³¹⁸ *United States v Microsoft Corp*. 253 F.3d 34, 74 (D.C. Cir. 2001).

³¹⁹ *Id.*

³²⁰ In the EU, a similar theory was followed by the EU Commission, but it was ancillary to the main theory of harm which consisted in anticompetitive leveraging. See Microsoft Commission Decision at §972: “*middleware such as Java in combination with a media player could in fact be a general purpose platform substitute today. As such, the media player can be deemed a necessary component of a full-fledged platform threat. In this sense, Microsoft has incentives to foreclose third party media players through tying*”. See, for a discussion of those differences, Economides, Nicholas & Ioannis Liannos. “A Critical Appraisal of Remedies in the E.U. Microsoft Cases.” *Columbia Business Law Review* (2010): 346-420, (at 418: “*In comparison, the narrative of the first European Microsoft case fits better with the remedies imposed. The issue here was that the dominant firm was using an existing fort to attack a new area and extend its fortification*”).

³²¹ Fisher, Franklin M. & Rubinfeld, Daniel L., “U.S. v. Microsoft - An Economic Analysis”, *The Antitrust Bulletin* 46 (2001): 1.

³²² Predictions that Microsoft would face platform threat from other types of software, like Google Desktop or Deskbar also did not materialize. See Ferguson, Charles H. “What’s next for Google.” *Technology Review* 108.1 (2005): 38-46.

³²³ Page, William H., and Seldon J. Childers. “Antitrust, Innovation, and Product Design in Platform Markets: ‘Microsoft’ And ‘Intel’.” *Antitrust Law Journal* 78.2 (2012): 363-395.

³²⁴ Shapiro, Carl. “Microsoft: A Remedial Failure.” *Antitrust Law Journal* 75.3 (2009): 739-772, (concluding in retrospect that “*the general threat level facing Windows remains low*”).

to the fore. Economic history books have warned us of the risk to succumb to “*fables*”,³²⁵ and have proceeded to expose a number of them on the basis of *ex post* empirical work.³²⁶ The point here is not that all pessimistic theories of harm must be dismissed out of hand as baseless, but instead to take careful time to assess their veracity on the facts, and consider alternative theories.³²⁷ Take the “*walled garden*” strategy.³²⁸ A walled garden is “*a system where an entity controls as many aspects of a product as possible and where features are only available if approved by a central authority*”.³²⁹ A firm that cultivates a walled garden imposes activity restrictions on users of its platform.³³⁰ An often cited example of a walled garden is Apple.³³¹ The opposite of a walled garden is an open platform. The best example is the open source software community.

The walled garden strategy is a popular concern in technology markets.³³² In the EU, some of the current antitrust allegations levelled at Google come very close to a walled garden narrative. In particular, Google is said to license its smartphone OS Android under a restrictive open-source agreement, one that would prevent device manufacturers from developing and marketing their own modified and potentially competing versions of Android (so-called “Android forks”).³³³

When looked at from the outset, it is not Google, but Apple that seems the epitome of a walled garden. Yet, all antitrust interest focuses on Google. Moreover, anecdotal evidence runs counter to the idea that Google has endorsed a strict walled garden model. In the critical field of AI, Google not Apple, has decided to open source the software engine that runs its neural networks.³³⁴ In turn,³³⁵ this has set in motion a wider open-source industry trend, which has been subsequently followed by Microsoft,³³⁶ Facebook,³³⁷ and Baidu.³³⁸ Last, from a more

³²⁵ See Casadesus-Masanell, Ramon & Daniel F., Spulber “The Fable of Fisher Body.” *The Journal of Law and Economics* 43.1 (2000): 67-104, (noting that “*The dismal science is enlivened occasionally by colorful fables that illustrate key points of economic theory*”). See also, Cheung, Steven N. “The Fable of the Bees: An Economic Investigation.” *The Journal of Law and Economics* 16.1 (1973): 11-33; Coase, Ronald H. “The Lighthouse in Economics.” *The Journal of Law and Economics* 17.2 (1974): 357-376 and Liebowitz, Stan J., & Stephen E. Margolis “The fable of the keys.” *The Journal of Law and Economics* 33.1 (1990): 1-25

³²⁶ For a full account, see Spulber, Daniel, *Famous fables of economics: myths of market failures*. Wiley-Blackwell, 2001.

³²⁷ Often, fables originate in mainstream press, policy essays or technology punditry.

³²⁸ See, for a mainstream description, Zittrain, Jonathan. *The Future of the Internet and How to Stop it*. Yale University Press, 2008.

³²⁹ Wolk, Michael H. “The iPhone Jailbreaking Exemption and the Issue of Openness.” *Cornell Journal of Law & Public Policy* 19 (2009): 795.

³³⁰ Mehra, Salil K., “Paradise is a walled garden? Trust, antitrust and user dynamism.” *George Mason Law Review*, 18 (2011): 889-952.

³³¹ Though one should look product by product.

³³² For a complete account, see, Hazlett, Teece & Waverman, *supra* note 143.

³³³ See Antitrust: Commission opens formal investigation against Google in relation to Android mobile operating system, Brussels, 15 April 2015. For a thorough discussion, see Auer, Dirk, “Appropriability and the European Commission's Android Investigation” (2016), available at SSRN 2767452

³³⁴ Metz, Cade, “Google Open-Sourcing TensorFlow Shows AI's Future Is Data”, *Wired* [Blog] 16 Nov. 2015, available at <https://www.wired.com/2015/11/google-open-sourcing-tensorflow-shows-ais-future-is-data-not-code/>

³³⁵ Google actually responded to an initial move by OpenAI, a company founded to develop non-profit AI research. See, Metz, *supra* note 205.

³³⁶ Finley, Klint, “Microsoft Open Sources Its Artificial Brain to One-Up Google”, *Wired* [Blog], 26 Jan. 2016, available at <https://www.wired.com/2016/01/microsoft-tries-to-one-up-google-in-the-open-source-ai-race/>

³³⁷ See, Metz, *supra* note 169 (10 Dec. 2015).

³³⁸ “Baidu's Silicon Valley AI Lab Releases Warp-CTC, Open Source AI Software”, *Baidu Tech Blog* [Blog], 14 Jan. 2016, available at <http://research.baidu.com/warp-ctc/>

theoretical standpoint, some scholarly works offer procompetitive narratives alternative to walled garden theories.³³⁹ “*Platform leadership*” is one of them.³⁴⁰ This literature draws a distinction between an “*internal platform*” which is a firm “*working by itself or with suppliers*” and an “*external platform*” which tries to establish its “*products, services or activities as foundation upon which outside firms (organized as a “business ecosystem”) can develop their own complementary products, technologies, or services*”.³⁴¹ Internal platforms are completely closed.³⁴² External platforms are more open, though they also tolerate a degree of closure, for instance in terms of the level of access to information on interfaces to link to the platform, of governance rules, or of cost of access. Whilst external platforms seem to foster more innovation, the theorists of platform leadership are not free market ideologues. Instead, they call for a close assessment of whether platform leaders can seek to adopt “*inducement mechanisms*” in order to steer external innovation efforts towards platform complements, and discourage other kinds of innovation, and in particular non-incremental one. This possible reduction in innovation, in turn, ought to be discussed in terms of anticompetitive harm to be brought to an antitrust theory of harm. This balanced approach is, however, very distinct from populist “*walled garden*” rhetoric, and should be the preferred entry narrative in antitrust circles.

Against this backdrop, what emerges is the necessity of a humble, evidenced-based approach to novel theories of harm. This responsible approach commands a verification of the theory on the facts and knowledge available in the state of the art, and a confrontation to contrarian theories.

The responsible approach that we recommend is all the more necessary, given the many dystopian theories of harm currently lined-up for antitrust transposition. One is the infanticide by acquisition narrative. The theory describes how entrenched firms use brute force M&A to eliminate disruptive startups. Interestingly, we have not managed to find any trace of this rationale in theoretical and empirical works of strategy and M&A scholars. Often, scholars from those fields describe such transactions as driven by efficiency considerations.³⁴³ Most of the (scant) literature on this originates from antitrust specialists who may be disciplinarily hardwired to see the world through exclusionary lenses,³⁴⁴ or from the odious practices – “*sell or be ruined*” – of late 19th century trusts.³⁴⁵

Another is the “*Cycle theory*” popularized by Professor Tim Wu. In a history of the media industry, Wu explains that every few decade when a new communications technology happens (in telephony, radio, broadcasting, films, and computers) it ends up being controlled by an orderly monopolist.³⁴⁶ The informational nature of technological industries naturally bridges Wu’s concern close to the antitrust populist tradition, which warns against how

³³⁹ See Thomas Hazlett, David Teece and Leonard Waverman, *supra* note 143.

³⁴⁰ Gawer, Annabelle & Michael A. Cusumano. “Industry platforms and ecosystem innovation.” *Journal of Product Innovation Management* 31.3 (2014): 417-433.

³⁴¹ *Id.* at 418.

³⁴² They promote only incremental innovation and constrain other types of innovation.

³⁴³ Benson, David, and Rosemarie H. Ziedonis. “Corporate venture capital as a window on new technologies: Implications for the performance of corporate investors when acquiring startups.” *Organization Science* 20.2 (2009): 329-351.

³⁴⁴ See Owings, Taylor M. “Identifying a Maverick: When Antitrust Law Should Protect a Low-Cost Competitor.” *Vanderbilt Law Review* 66 (2013): 323.

³⁴⁵ See Geelhorn, Ernest & Bill Kovacic, *Antitrust Law and Economics in a Nutshell*, Thomson - West Group, [1976] 2004, at 20; Golodner, Adam M. “Antitrust, Innovation, Entrepreneurship and Small Business”, 21 Jan. 2000, available at <https://www.justice.gov/atr/speech/antitrust-innovation-entrepreneurship-and-small-business>

³⁴⁶ Wu, Tim. *The master switch: The rise and fall of information empires*. Vintage, 2011.

corporate power endangers fundamental freedoms and the democratic process.³⁴⁷ Yet, Wu's account of economic history has been derided as a convenient reinterpretation, which pays little currency to other theoretical works and dispenses with a discussion of empirical counter-evidence.³⁴⁸

A last one is perhaps the emerging literature on “*virtual competition*” which paints a grim picture of a future where artificially intelligent machines fed with big data can harm consumers through algorithmic tacit collusion, behavioral discrimination and applications developers through false, “*frenemy*” relationships.³⁴⁹ This literature has one main weakness. It proposes no investigation of *ex ante* safety regulation (including on-going standardization efforts) and *ex post* technology countermeasures available to third parties and public institutions (including active cybersecurity policies).

With all this, skepticism should be our default position. Sometimes skepticism has prevailed. Antitrust agencies have for instance resisted social demands for network neutrality regulation³⁵⁰ or recognized the merits of closed ecosystems.³⁵¹ Sometimes it has not. Some major antitrust jurisdictions are today taking initiatives to apply competition law to data protection issues.³⁵²

5. Summation

The resilience of mainstream economics at theoretical and applied levels despite empirical evidence of its limitations is an arresting enigma. Perhaps, mainstream economics gives some elements of explanation.³⁵³ The concepts and tools of monopoly, oligopoly and perfect competition constitute a regulatory structure that has been “*acquired by an industry, and [has been] designed and operated primarily for its benefits*”. Its exponents are an original form of special interests groups namely the “*antitrust industry*”, *ie* economic consultants, lawyers and public officials versed in industrial organization (“IO”) theory.³⁵⁴ In real life, the epistemological rent of competition specialists complicates the opening of competition theory to other disciplines like business strategy, management studies, behavioral sciences, etc. In the following section, we propose a way forward for competition policy.

³⁴⁷ See David K. Millon, “The Sherman Act and the Balance of Power.” *Southern California Law Review* 61.5 (1988): 1219. Pitofsky, Robert. “The political content of antitrust.” *University of Pennsylvania Law Review* 127.4 (1979): 1051-1075.

³⁴⁸ In relation to his concerns of excessive vertical integration and proposed “*Separations principle*”. Decherney, Peter, Nathan Ensmenger & Christopher S. Yoo. “Are those Who Ignore History Doomed to Repeat It? (Reviewing the Master Switch: The Rise and Fall of Information Empires by Tim Wu).” *University of Chicago Law Review*: 78.4 (2011): 1627-1685.

³⁴⁹ See Ezrachi Ariel & Maurice E. Stucke. *Virtual Competition: The Promise and Perils of the Algorithm-Driven Economy*. Harvard University Press, 2016.

³⁵⁰ To our knowledge, the Dutch competition authority is the sole agency that has a network neutrality mandate in the world.

³⁵¹ See, *The Economics of Open and Closed Systems*, *supra* note 301.

³⁵² See Boot, Nuria & Georgios Petropoulos. “German Facebook probe links data protection and competition policy”, *Bruegel* [Blog], 14 March 2016, available at <http://bruegel.org/2016/03/german-facebook-probe-links-data-protection-and-competition-policy/>

³⁵³ Stigler, George J. “The theory of economic regulation.” *The Bell Journal of Economics and Management Science* (1971): 3-21.

³⁵⁴ For an early intuition, see R. Reich, “The Antitrust Industry.” *Georgetown Law Journal* 68 (1980): 1053-1073. See, for support to more technocratic reform, Crane, Daniel. “Technocracy and Antitrust.” *Texas Law Review*, 68 (2008): 1159.

V. A WAY FORWARD FOR COMPETITION POLICY?

The above analysis brings us to propose a rechanneling of modern antitrust policy in two directions.³⁵⁵ To start, concerns of accumulation of market power in one relevant product or service market should be systematically filtered through a prior examination of the two dimensions of technology competition, in order to establish whether the firm under scrutiny is a moligopolist. We call this the moligopoly screen (1). If the firm under scrutiny is a moligopolist subject to fierce multi-dimensional rivalry, this should be the end of the antitrust inquiry. If it is not, then moligopoly competition is insufficient, and the antitrust inquiry should focus in priority on conduct that elevates barriers on entrepreneurial resources, which are the engine of competition in digital markets (2).

I. *Moligopoly screen*

Under our proposed approach, antitrust agencies must only consider allegations of anticompetitive market power (and conduct) within core product or service markets, upon verification that the intensity of competition against the non-consumption and on entrepreneurial assets is insufficient. The idea is one of a safe harbor: the second and third dimensions of technology competition can tell us if a firm is a monopolist subject to little pressure in an itemized product or service market, or whether it is a moligopolist exposed to oligopolistic rivalry outside of its core market. To be completely graphic, a hypothetical investigation into allegations of Amazon dominance in online bookstores should not be pursued if we can observe fierce competition in other markets, including for example cloud computing, aerial delivery systems, artificial intelligence, space transportation, etc.

With this background, the next question consists in understanding how to operationally measure the multidimensional degree of moligopoly competition. We have seen previously that antitrust laws currently leave little space to holistic market balancing. Moreover, even if this was possible, calibration issues would be daunting: for instance, can we really be sure that we can compare linearly units of market power in search with units of competition in other fields, like social networks, virtual reality, video games, etc.?

In our view, a possible way to overcome this problem, and avoid the (unlawful) balancing exercise, consists in using firms-related variables, not market-related ones. The firm's portfolio of activities casts light on its dedication to compete against the non-consumption. And the firm's direct and indirect R&D investments give indications on its commitment to compete for entrepreneurial assets. The overall point would be that when a firm turns extractive, and shirks on its ethos to discover new things, maintaining some market power in a core segment is no longer tolerable. From a normative standpoint, this firm's centred approach is, we believe, perfectly intelligible to regulated entities.

At a more granular level, we propose to concentrate the inquiry on three sets of observable features. *First*, antitrust agencies should assess the firm's degree of "*serendipitism*", which itself can be decomposed in two proxies. One is conglomeratism. The point here consists in assessing the number, size, value and diversity of market footholds developed by the firm

³⁵⁵ We are not the first to propose a redirection of antitrust policy. In a 2013 paper, H. Shelanski proposed a "*refocusing*" of antitrust enforcement, but in quite distinct directions, namely on "*customer information*" and "*innovation effects*". This proposal is interesting, because it offers to change the framework, from one that begins with market definition to "*one that begins with anticompetitive effects.*" See, Shelanski, *supra* note 285, at 1692.

under scrutiny. The other is experimentalism. The idea entails an assessment of the firm’s research strategy, and on where to place it on the long-short term/open ended-market driven matrix. *Second*, antitrust agencies should assess the firm’s commitment to “*patient capital*”. This means its pledge to ensure that “*the capabilities that derive from organizational learning to cumulate over time, notwithstanding the inherent uncertainty that the innovation process entails*”.³⁵⁶ Possible metrics of patient capitalism include the R&D/profits ratio as well as the importance of retained earnings that signal a pro-innovation spirit (as opposed to dividend allocation).³⁵⁷ *Third*, the antitrust investigation shall seek to understand if the firm is a platform leader, in other words whether it serves as the foundation of an ecosystem of innovative companies. The data points that can be used to that end are the firm’s activity on the M&A market (especially with startups), its investments in CVC and VC, as well as its corporate and technological culture in terms of openness or secrecy. This includes the firm’s Intellectual Property (“IP”) policy (for example, whether the firm contributes to standard setting processes), its policy in relation to open-source software, etc.

Of course, we are painfully unable to explicit threshold levels for antitrust intervention. At the same time, it would not be in line with the cautious, evidenced-based policy philosophy that we have previously advocated if we were to draw lines without assistance of expert economists, strategists and innovation specialists. The trajectories that we are exposing will, hopefully, guide future work. That said, we provide hereafter a possible application of our framework, by distinguishing – admittedly arbitrarily – between high and low values under each of the three metrics. As can be seen, sometimes the framework suggests antitrust exoneration, sometimes prioritization.

	SERENDIPITISM?		PATIENT CAPITALISM?		PLATFORM LEADERSHIP?
	Conglomeratism (footholds)	Experimentalism	R&D to revenue/profit	Retained earnings	Number and value of transactions; private equity funding; internal v industry platform
HIGH? (MOLIGOPOLY)	GOOG; AMZN; MSFT	GOOG; AMZN; MSFT	FB (21,0%); GOOG (14,9%); MSFT (11,9%); AMZN (10,42%)	AAPL: 87b GOOG: 61b	GOOGL; MSFT; FB; AMZN
LOW? (NON MOLIGOPOLY)	AAPL; FB	AAPL; FB	AAPL (3,0%)	MSFT: 9b FB: 6b AMZN: 1,9b	AAPL

³⁵⁶ See Lazonick, William. “The US stock market and the governance of innovative enterprise.” *Industrial and Corporate Change* 16.6 (2007): 983-1035, at 999.

³⁵⁷ *Id.* at 990 noting that “*Intel, Microsoft, Oracle, Sun Microsystems, and Cisco Systems*” experienced significant growth in both revenues and employment during the 1980s and 1990s by means of a “*retain-and-reinvest*” allocation regime; they retained corporate revenues, paying little if any dividends (although most of them did some stock repurchases), and reinvested earnings in innovative products and processes. In general both the revenues and employment levels of these companies grew over this period, especially during the 1990s, and these companies were highly profitable”.

To close, we want to clarify that our framework is not a variant of a sophisticated appropriability defense of the kind often met, and dismissed, in antitrust policy.³⁵⁸ Appropriability is designed to keep *ex ante* innovation incentives high, by remunerating *ex post* investors' entrepreneurial, risk-taking activity. In an antitrust regime open to appropriability, the Government tolerates a certain degree of anticompetitive market power or restraints so as to entitle firms to generate rents, and its shareholders to appropriate them. Vertical restraints are a good example: US and EU antitrust laws tolerate a certain degree of appropriability by firms through intra-brand restraints, as long as competition is sufficient in the distinct market(s) where brands compete. In our framework, the firms that escape antitrust scrutiny are *not* appropriating rents. Instead of returning them to shareholders which is what appropriation is, they are *retaining* and *reinvesting* them in R&D and/or conglomerate activities. This is a subtle point, but one of major significance.

2. *Barriers to entrepreneurial assets*

The second angle of our proposed framework consists in refocusing competition enforcement towards a novel set of anticompetitive restraints. Those restraints target inputs, but not in the classic sense of raw materials or basic infrastructure. Instead, they limit the free exchange of entrepreneurial resources, and in particular of capital and labour. At the same time, those restraints generate ambivalent pro and anticompetitive effects. And they cast light on a number of gaps of modern antitrust law.

After a brief exposition of the framework, we examine possible anticompetitive restraints related to venture capital and to workforce mobility and we conclude with a discussion of the challenges for applied competition law. We note here that those restraints shall in principle be only investigated below the moligopoly threshold, though we concede that the approach may also work above it.

2.1. Framework

As seen above, digital economy firms compete by way of disruption. Technology giants and unicorns are obsessed with the idea that they must find new market footholds – *e.g.*, new products like the driverless car, virtual reality or exoskeletons – or attack each other in the low end of markets, where some customers are not served – *e.g.*, Amazon's low end attack on FedEx, UPS and TNT; of Facebook's low end attack on SMS with the acquisition of WhatsApp; or of Google's Android low end attack on Apple's iOS.

This fierce competition for disruption can be seen in the R&D expenses of technology firms and in the significant amount of "*indirect R&D*" flows that streams through the M&A, VC and CVC markets. But we shall look beyond the veil of large R&D numbers to reach understanding of an often forgotten reality. A significant share of those expenses is not equipment related, but labor related. As seen before, the inputs of disruptive competition are not machines, tools or laboratories, but "*entrepreneurs*" in the Schumpeterian sense. By this, we mean individuals, or groups of them thereof, working independently or within larger corporate organizations, on issues ranging from product/service design, to testing,

³⁵⁸ See Baker, Jonathan B. "Evaluating appropriability defenses for the exclusionary conduct of dominant firms in innovative industries." *Antitrust Law Journal* 80.3 (2016).

maintenance, monitoring, as well as specialized marketing and strategy functions.³⁵⁹ And we can safely assume that firms compete over the identification, incubation, education and retention of entrepreneurial skills.

If we therefore trust our standard theory of competition, a degree of rivalry in relation to entrepreneurship should exist. Yet, the world witnesses emerging pattern of vertical practices – in Posnerian sense –³⁶⁰ where firms increasingly lock entrepreneurial inputs, and in turn may distort competition. We may call them barriers to entrepreneurial assets.³⁶¹ Let us look in more details at two of those practices.

2.2. Barriers to Capital

The first set of vertical practices concerns the fundraising market on which entrepreneurs compete for capital. At one or more stages of their evolution, and in particular when they emerge as startups, digital economy firms are financed externally by venture capital (“VC”) funds and/or³⁶² Corporate Venture Capital (“CVC”) funds.³⁶³ Well known examples of VC funds include Andreessen Horowitz, Y-Incubator, FirstMark, etc. Well known examples of CVC include Google Ventures or Microsoft’s Accelerator. Oftentimes, digital economy firms undergo several rounds of fundraising – called series A, B or C – which grow in importance until their exit by IPO or M&A.

VC and CVC share some similarities. Both in VC and CVC, investors are often given a seat on the board of the financed company, even though there are differences in their degree of managerial implication (it tends to be bigger with VC).

Besides this, there are important differences between VC and CVC funds. One is that the VC funds do not have product/service lines, whilst CVC funds are branches of firms with product/service lines. Another is that VC funds often invest in a larger spread of companies, including competitors, than CVCs. VC funds work on power law distributions and fat tails. They invest in a large amount of firms which will likely fail, and hope of generating extreme benefits on one firm (or just a few others).³⁶⁴

From a competitive standpoint, capital equity can be seen conceptually as an input. The contracting that takes place between VC and CVC funds, on the one hand, and digital economy firms, on the other hand thus gives rise to a vertical relationship, and to possible

³⁵⁹ Howells, Jeremy. “New directions in R&D: current and prospective challenges.” *R&D Management* 38.3 (2008): 241-252.

³⁶⁰ Posner, Richard. “Vertical Restraints and Antitrust Policy.” *The University of Chicago Law Review* 72.1 (2005): 229-241.

³⁶¹ In his paper on organizational capabilities, Grant noted the existence of “*barriers to the transfer and replication of knowledge*”, which can confer strategic advantages. See, Grant, *supra* note 259 at 377.

³⁶² See Lantz, Jean-Sébastien, Jean-Michel Sahut & Frédéric Teulon. “What is the real role of corporate venture capital?” *International Journal of Business* 16.4 (2011): 367 at 374 finding that CVC accounts for 1/6 of all VC funding.

³⁶³ *Id.* They may also be financed by Special Purpose Vehicles (“SPV”) which twin both on SPVs. See, Macmillan, Douglas, “In Silicon Valley Frenzy, VCs Create New Inside Track.” *Wall Street Journal*, 2 April 2015, available at <http://www.wsj.com/articles/in-silicon-valley-frenzy-vcs-create-new-inside-track-1427992176>

³⁶⁴ See, “Power Laws Rule Everything Around Me: Distribution of Venture Capital Returns” *Cornell University Blog* [Blog], 22 Nov. 2015, available at <https://blogs.cornell.edu/info2040/2015/11/22/power-laws-rule-everything-around-me-distribution-of-venture-capital-returns/>

restraints.³⁶⁵ Exclusivity agreements are commonplace in fundraising markets.³⁶⁶ Under an exclusivity agreement, there is a period in which a startup is prevented from doing business with a competitor. Many scenarios can be envisioned. A VC backed startup in round A may be prevented to approach certain type of VC funds in round B. Or a startup talking with a VC in round B may be prevented to approach competing funds during the negotiation.

The practical effect of such restraints can be best pictured with a case study of the Belgian startup Take Eat Easy (“TEE”). TEE had been founded to provide quality restaurants with a delivery service to customers.³⁶⁷ In July 2016, TEE reported that it was filing for bankruptcy, days after it had announced crossing the symbolic figure of 1 million deliveries on its platform. In a blogpost, TEE’s founder suggested that it had been prevented to approach a sufficient number of VC funds for 3 months, due to an exclusivity requirement given to an early potential investor in the “*term sheet*”.³⁶⁸ Interestingly, TEE’s bankruptcy had a structural market impact. In Brussels and other Belgian cities, TEE’s exit left British competitor Deliveroo in a *de facto* dominant position.³⁶⁹

Other statutory clauses that are not formally akin to exclusivity may produce a similar effect. This is, for example, the case of rights of first refusal clauses,³⁷⁰ which give stockholder the right to refuse the transfer of stock to a competitor.³⁷¹ A CVC like Google Ventures may be reluctant to let Uber – in which it invested – openly enter into investment discussions with Tesla or other potential competitors in the driverless car market. Another possible example is the right to source code on Change of Control (“COC”), which gives investors the right to benefit from the source code if the startup sells to another company.³⁷² This practice, which is under-examined could consist in a virtual reality device company loosing part of its exclusive control over its software if there was a change in investor.

³⁶⁵ See, Lantz, Sahut and Teulon, *supra* note 362. “Capital equity often comes with technical or strategic expertise. Although there is a discussion, both VC and CVC funding give rise to managerial implication from the fund into the startup. Often, the VC and CVC firms take a board seat on the company.

³⁶⁶ See Shah, Kumar. “Doing Deals With The Devil? A Corporate Venture Capitalist Speaks Up For The Value Of CVC.” *CB Insights* [Blog], 16 Aug. 2016, available at <https://www.cbinsights.com/blog/corporate-venture-investing-advantages/>

³⁶⁷ Through an app, the customers could order from the restaurant of their choice. A courier picks up the order at the partner restaurant, and delivers it to the customer whilst the meal is still warm.

³⁶⁸ One of the reasons was the failure to raise further capital. 3 months before, TEE had entered into talks with a French investor for a possible €30 million investment. The investor decided to withdraw.

³⁶⁹ Johansson, Jessica. “Take Eat Easy files for bankruptcy”, *Brussels Times*, 26 July 2016, available at <http://www.brusselstimes.com/business/6081/take-eat-easy-files-for-bankruptcy> and “Les restaurateurs partenaires de Take Eat Easy dans l’incertitude quant aux paiements”, *SudInfo*, 27 July 2016 available at <http://www.sudinfo.be/1631910/article/2016-07-27/les-restaurateurs-partenaires-de-take-eat-easy-dans-l-uncertitude-quant-aux-paie>

³⁷⁰ But the most likely problematic could be rights of first refusal clauses. As Fan defines them: “*The purpose of the right of first refusal and co-sale agreement is to keep a company’s capital stock within the group of existing stockholders thereby preventing transfer of control to competitors [...]*”. See Fan, Jennifer S. “Regulating Unicorns: Disclosure and the New Private Economy.” *Boston College Law Review* 57 (2016): 583-642, at 597.

³⁷¹ Moreover, in the NVCA right of first refusal document, there is a definition of right of first refusal which says: “*each Key Holder hereby unconditionally and irrevocably grants to the Company a Right of First Refusal to purchase all or any portion of Transfer Stock that such Key Holder may propose to transfer in a Proposed Key Holder Transfer*”; a list of “*prohibited transferees*” which says that “*Notwithstanding the foregoing, no Key Holder shall transfer any Transfer Stock to (a) any entity which, in the determination of the Company’s Board of Directors, directly or indirectly competes with the Company*”. “Key Holders” include major common stock or option holders in addition to the individuals who actually founded the Company. See, NVCA Model Legal Documents, available at <http://nvca.org/resources/model-legal-documents/>

³⁷² This depresses the startup value.

Exclusivity agreements also work the other way around. A VC may be barred from making business with rival digital economy firms. In 2015, for instance, it was reported that in their fundraising efforts, both Uber Technologies Inc. and Lyft Inc. “*ha[d] asked potential investors to sign agreements stating they won’t invest in competitors for a period of six months to a year, according to people familiar with the policies*”.³⁷³ Exclusive supply agreements elevate barriers to the entry of entrepreneurs, by drying the fundraising market for some time.

In digital economy markets with network effects and tipping points, a relatively short period of exclusivity may elevate a barrier to entrepreneurship. The TEE example just shows this. At the same time, exclusivity seems fair compensation for existing and prospective investors who undergo costly due diligence operations. For example, if VC fund X will spend a lot of time auditing startup Y, and it would be a waste if startup Y meanwhile decided to deal with VC fund Z. Similarly, free riding issues and agency problems plausibly enter into consideration. For example, VC fund X has financed startup Y in series A, and requests pitching priority in series B because of the management advice given to the founders.

To close, we want to note that beyond VC funds, the fact that CVC funds belong to product/service firms with which the funded startup may compete creates an additional conflict of interest. Unlike VC funds that invest only to make a return, one cannot rule out that CVC funds’ investments into potential competitors may be driven by strategic considerations. Keeping disruption in watch – and nipping entrepreneurial competition in the bud – is one of them. At the same time, the literature stresses their procompetitive efficiencies, including their stronger ability and incentives than VC funds to generate value.³⁷⁴ From an empirical perspective, the evidence is scant. On the one hand, one may view large firms passive banking strategies as investments into future cooperative strategies. In this context, Uber has benefited from sizeable investments by Google, and it is a prospect that Uber’s technology could be used preferentially in Google’s self-driving cars.³⁷⁵ On the other hand, some startups funded by large firms have morphed into non-cooperative players. Facebook has for instance, received financial support from Microsoft, and has later turned into a formidable competitor.

2.3. Barriers to Labour

The second type of vertical practice that should deserve attention are non-compete clauses.³⁷⁶ Non-compete clauses can be defined as those “*designed to restrict an employee’s postemployment ability to work for a competitor or start a competing company*”.³⁷⁷ Those clauses lock entrepreneurs in organizations. They are often used in digital economy markets. The tech press got agitated when Microsoft, in 2011, prevented a general data center systems

³⁷³ See Swisher, Kara. “Man and Uber Man”, *Vanity Fair-Hive* 5 Nov. 2014, available at http://www.vanityfair.com/news/2014/12/uber-travis-kalanick-controversy?mbid=social_twitter#. See also, “Did Uber Successfully Kneecap Lyft’s Investor Options?” *CB Insights* [Blog], 16 Jan. 2015, available at <https://www.cbinsights.com/blog/uber-lyft-funding/>. Other tactics were also implemented by Uber, which include cold preemptive calls to investors.

³⁷⁴ See, Lantz, Sahut and Teulon, *supra* note 362 at 379.

³⁷⁵ See, Brewster, Signe, “Uber Starts Self Driving Car Pickups in Pittsburgh”, *TechCrunch*, 14 Sep. 2016, available at <https://techcrunch.com/2016/09/14/1386711/>

³⁷⁶ To be clear, we do not talk here about confidentiality clauses or anti-IP theft obligations. We focus on disproportionately long non-compete agreements, which prevent a worker to remain in the industry for several years.

³⁷⁷ Amir, On & Orly Lobel. “Driving performance: a growth theory of noncompete law.” *Stanford Technology Law Review* 16 (2012): 833-874 at 839.

manager to move to Apple.³⁷⁸ Closer to us, Amazon triggered a controversy when it prohibited employees under a 3 months contract to work at “*any company where they directly or indirectly support any good or service that competes with those they helped support at Amazon, for a year and a half after*”.³⁷⁹ An even more convoluted practice is that used by Uber, which only entitles leaving employees to exercise their option on stock during 90 days.³⁸⁰ Take a top engineer who got a .5 stake when Uber was \$60 million worth. In 2016, the firm is valued \$60 billion. His stake has moved from \$300,000 to \$300 million... Last, preoccupations of monopolization emerge in relation to AI, where Google and Facebook seem to concentrate a majority of key researchers, even though several AI researchers have been able to leave Google for other firms in the last years.³⁸¹

The enforceability of non-compete clauses under labor law varies from one country to the other. In some countries they are strictly enforced. In others, non-compete clauses can be litigated, and declared unenforceable if they are unreasonable. And in a minority of jurisdictions like California, Colorado and Oregon, the law bans non-compete clauses outright, and declares them not enforceable.

Even in those States where they are judicially or legally invalidated, non-competes remain present in many employment contracts. In California, for example, non-compete clauses appear in 22% of the contracts.³⁸² Hiring firms know that regardless of the law, non-compete clauses dissuade worker mobility, because of costs of information and litigation costs.³⁸³

In the US, this situation has led the White House to issue a report on May 2016 about unfair non-compete agreements. The report underscores the harmful effects of non-compete clauses. First, they harm rival firms by reducing the size of the labor market.³⁸⁴ Second, they also deter entry, by preventing “*workers from launching new companies*”.³⁸⁵ Third, they reduce external economies for other firms, which are in essence the positive externalities that arise from spillover of knowledge and access to a larger labor market.³⁸⁶ Fourth, they exert a detrimental effect on consumer welfare, through a restriction of consumer choice.

³⁷⁸ Lynley, Matt, “Steve Ballmer Torched This Ex Microsoft Employee's Chance To Work On iCloud For Apple”, *Business Insider*, 28 Oct. 2012, available at <http://www.businessinsider.com/microsoft-may-have-blocked-apple-from-poaching-its-data-center-guru-2011-10?IR=T>

³⁷⁹ Mott, Nathaniel, “Amazon demands employees sign 18-month non-compete agreement to get a three-month-long job” *PANDO*, 26 March 2015, available at <https://pando.com/2015/03/26/amazon-demands-employees-sign-18-month-non-compete-agreement-to-get-a-three-month-long-job/>

³⁸⁰ Loizos, Connie, “Handcuffed to Uber”, *TechCrunch*, 29 April 2015 available at <https://techcrunch.com/2016/04/29/handcuffed-to-uber/>

³⁸¹ See, Metz (27 April 2016), *supra* note 205.

³⁸² White House Report, “Non-Compete Agreements: Analysis of the Usage, Potential Issues, and State Responses.” May 2016, at 3, available at https://www.whitehouse.gov/sites/default/files/non-competes_report_final2.pdf (hereafter “White House Report”)

³⁸³ Workers thus tend to sign noncompete contracts, failing to understand their implications. *Id.*, White House Report at 10.

³⁸⁴ *Id.* at 2: “*constricting the labor pool from which to hire.*”

³⁸⁵ *Id.*

³⁸⁶ *Id.* For more on this (and a critical review), see Saxenian, AnnaLee “Inside-Out: Regional Networks and Industrial Adaptation in Silicon Valley and Route 128” *Cityscape: A Journal of Policy Development and Research* 2.2 (1996): 41-60, at 42. Another harmful effect is that firms avoid competitive wages, because one strategy to retain workers was to increase salary.

At the same time, the report advances two justifications for non-compete clauses. A first one is to ensure the protection of trade secrets from competitor acquisition. The second is the necessity to keep firms' incentives to invest in human capital, training, etc.

Let us try to consider the non-compete clauses imposed by technology firms through this framework. On the one hand, the digital economy is an area with highly skilled workers exposed to trade secrets. Non-compete clauses could therefore be justified on that count. That said, given the rapid pace of digital technology evolution, the life cycle of trade secrets obsolesces at rapid pace. Moreover, workers can be subject to non disclosure agreements that fall short of a non-compete clause, yet meet the employer's objectives.

Similarly, the second justification for non-compete justifications is not necessarily compelling in the technology sector. Human capital and training expenses are generally lower in areas with high skilled workers – like tech – than in areas with low skilled workers – like car manufacturing.

The justification of a non-compete clause imposed on a digital economy worker is therefore essentially an empirical question.

The same is true of the harmful effects of non-compete clauses. In the VC world, a trade association called Open Alliance for Competition has argued that successful technology companies are the progenitor of many startups, and that allowing non-competes “*silently kills*” innovation.³⁸⁷ Moreover, non-compete clauses would be particularly problematic in industries that are “*clusterized*” like high tech, where they prevent “*agglomeration benefits*”.³⁸⁸

Last, scholars have written that non-compete clauses enforcement negatively affects small firm entrepreneurship. Start-ups are by definition small firms in expansion. They lack the structures and processes to train talent in-house, and they therefore rely intensely on lateral hires to feed their organic growth.³⁸⁹

2.4. Implications for Antitrust Policy

a). Preliminary remarks

Against this backdrop, what should be the implications for antitrust policy? In our view, there is no obvious policy reason to leave competition on entrepreneurial resources out of the protective scope of the antitrust laws. In its executive order of April 2016 on steps to increase competition across the US economy, President Obama inclined in this direction urging the agencies to “*identify specific actions that they can take in their areas of responsibility to build upon efforts to detect abuses such as ... anticompetitive behavior in labor and other input markets*”.³⁹⁰ In the EU, a Commissioner declared: “*An important feature of the global*

³⁸⁷ See Amir & Lobel *supra* note 377 at 843. Some studies even go as far as to report a positive correlation between bans on non-competes, VC support, patentable inventions, number of firm start (entry) and employment. In the macro-economic literature, studies explain the economic growth of regions like the Silicon Valley by the mobility of workers. See Angel, David P. “High-technology agglomeration and the labor market: the case of Silicon Valley.” *Environment and Planning A* 23.10 (1991): 1501-1516.

³⁸⁸ See, White House Report, *supra* note 382 at 7.

³⁸⁹ Amir & Lobel, *supra* 377 at 859: “*Start-ups find it particularly difficult to compete under a non-compete clauses regime through their usual means of recruiting other employees to the new venture*”.

³⁹⁰ The White House, “Executive Order -- Steps to Increase Competition and Better Inform Consumers and Workers to Support Continued Growth of the American Economy” *Office of the Press Secretary*, April 15, 2016,

software industry is that it constantly requires a new, educated workforce, as the life cycle of products and related software solutions is very short compared to the life cycle of its personnel. The competition between employees from the EU and from outside the EU is fierce".³⁹¹ That being said, there is no reason either to wave the antitrust red flag at any vertical practice that elevates a barrier to entrepreneurship. Given our embryonic experience with digital economy markets and more particularly, with entrepreneurial issues, evidence-based antitrust is a prerequisite.³⁹² Moreover, in an area where conduct which is not "*plainly anticompetitive*" and may find "*redeeming virtue*" antitrust enforcement shall advance on rule of reason mode.³⁹³ Agencies should carefully look into the "*circumstances, details and logic of a restraint*", prior to reaching liability determinations and formulating policy prescriptions.³⁹⁴ In the next sections, we underline zones of possible friction in the antitrust analysis of barriers to entrepreneurship.

b). Barriers to Capital

The antitrust evaluation of fundraising exclusivity is likely to meet defences based on the ancillary restraints doctrine.³⁹⁵ Investors may arguably claim that the restriction is directly related and necessary to the implementation of the investment contract. The claim is *prima facie* strong in relation to CVC funding, for corporations may be reluctant to invest in startups if this is later to benefit to competitors. That said, the claim that exclusivity is a necessity is much less evident for VC funding. Few, if no VC funds, invest alone in startups. Similarly, the assessment will involve complex proportionality discussions.

Complex evidentiary issues are also likely to arise, in particular in relation to CVC investments into digital economy firms. Eliciting whether a CVC investment is driven by a standard return on investment rationale or instead by strategic motives is a hard inquiry, though one that the antitrust structure is not unused to. Such investigations will involve the discussion of circumstantial evidence: *e.g.*, degree of implication of the CVC in the management of the startup, nature of its access to R&D results, structure that led the CVC investment. On this last point, for example, it may be that an investor does not use its dedicated CVC arm, but its standard corporate structure to carry out the M&A transaction. Google's funding of Orkut's social network successor Hello has been discretely carried out by Google's own M&A arm, instead of Google Capital or Google Ventures. This has led to suspicions of surveillance, should the independent Hello develop a social network that Google failed to deliver with Orkut.³⁹⁶ At the same time, Google has also used the same model for its investment into Nantic, the startup that launched Pokemon Go!. This investment has generated significant returns for Google, and there are no signs that Google pursues a strategic objective with this investment.

available at <https://www.whitehouse.gov/the-press-office/2016/04/15/executive-order-steps-increase-competition-and-better-inform-consumers>

³⁹¹ See, EU Commission, "Commission proposes €5.3 million from Globalisation Fund for former Microsoft workers in Finland" *Employment, Social Affairs & Inclusion Press News*, 29 July 2016 available at <http://ec.europa.eu/social/main.jsp?langId=en&catId=326&newsId=2590&furtherNews=yes>

³⁹² Wright, Joshua D. "Abandoning Antitrust's Chicago Obsession: The Case for Evidence-Based Antitrust." *Antitrust Law Journal* 78.1 (2012): 241-271.

³⁹³ *Broadcast Music, Inc. v. Columbia Broadcasting System, Inc.* 441 U.S. 1 (1979).

³⁹⁴ *California Dental Association v FTC.*, 526 U. S. 756 (1999).

³⁹⁵ This also applies, *mutatis mutandis*, to noncompete clauses.

³⁹⁶ Bergen, Mark, "Google keeps ex-Googlers close by investing in their startups", *RedCode* [Blog], 22 Aug. 2016, available at <http://www.recode.net/2016/8/22/12587644/google-investing-startups-orkut>

Last, *de minimis* arguments and public choice considerations may trump an antitrust assessment of fundraising exclusivities. Startups are small firms whose death is unlikely to impact the global economy. In addition, a degree of attrition in startup markets is a key component of entrepreneurial dynamism. Resource constrained agencies and career driven officials may thus understandably invest in bigger cases.

At the same time, many digital economy firms that serve millions of users are by all margins, relatively small firms. This is true of startups, but also of some of those companies often referred to as “*technology giants*”. Even more than in classic economic sectors, in the digital economy, firm size is a poor proxy of market power. By contrast, the significance of network effects and tipping points in digital economy markets can entrench small firms with massive dominance. Anticompetitive harm can thus occur at relatively low levels of firm size.

2.3. Barriers to Labour

The fact that non-compete clauses remain used despite statutory legislation that prescribes non-enforceability justifies stronger remedies that deter such as fines. Antitrust law thus seems ideally positioned to play a role in this area. That said, non-compete clauses also create vexing issues for antitrust regimes. Amir and Lobel recall that in the US, one sentence of the Clayton act of 1914 says that the “*labor of a human being is not a commodity or an article of commerce*”.³⁹⁷ In the EU, the rules on (vertical) agreements between undertakings are presumably inapplicable for several reasons. First, the competition rules on coordinated conduct do not seem to apply agreements between firms and natural persons. Second, employer and employee, once they have contracted, are deemed to belong to a “*single economic unit*”.³⁹⁸

But there is a growing attention to the anticompetitive effects caused by restrictions to the mobility, fluidity and transferability of workers. In *US. v. Adobe Systems, Inc., et al.*, the DoJ prosecuted a series of bilateral agreements amongst several large technology firms – including Google, Apple, Intel, Pixar, Intuit and Adobe – who had agreed to refrain from soliciting, cold calling, recruiting or otherwise competing for each others’ computer engineers and scientists. The DoJ noted that in a “*well-functioning labor market, employers compete to attract the most valuable talent for their needs*”.³⁹⁹ And it considered that the agreement as facially anticompetitive because it “*disrupted the normal price setting mechanisms that apply in the labor setting*”.⁴⁰⁰ Under the settlement, the defendants refrained from entering again into horizontal, no solicitation agreements.⁴⁰¹

³⁹⁷ Amir and Lobel, supra note 377 at 839 (ft.18). See Oct. 15, 1914, ch. 323, § 6, 38 Stat. 731: “*The labor of a human being is not a commodity or article of commerce. Nothing contained in the antitrust laws shall be construed to forbid the existence and operation of labor, agricultural, or horticultural organizations, instituted for the purposes of mutual help, and not having capital stock or conducted for profit, or to forbid or restrain individual members of such organizations from lawfully carrying out the legitimate objects thereof; nor shall such organizations, or the members thereof, be held or construed to be illegal combinations or conspiracies in restraint of trade, under the antitrust laws*”. At the same time, this exclusion seems only related to labor unionism. It is placed under the heading “labor organizations”, and thus does not seem not prevent agencies to start charges against non-competes.

³⁹⁸ Besides, the rules on unilateral conduct are subject to the demanding dominance threshold.

³⁹⁹ DoJ Complaint: *U.S. v Adobe Systems et al.* §14.

⁴⁰⁰ *Ibid.* §34.

⁴⁰¹ Yet, the judgment makes clear that the defendant remained free to unilaterally insert no direct solicitation provisions in the relationships with employees, OEMs or service contractors. Those clauses must be assessed

In the Netherlands, a Court of appeals deemed anticompetitive an agreement amongst fifteen hospitals that had jointly agreed to observe a 12 months non-compete commitment in relation to anaesthesiologists.⁴⁰² The court found that the agreement unlawfully restricted competition amongst the hospitals on the labor market for trained anaesthesiologists.

With this background, the growing recognition that firms may horizontally restrict competition on the labour market invites research on whether firms may vertically harm labor market competition through non-compete agreements. Some scholars have already mooted this opinion. Amir and Lobel consider that “*resistance to postemployment restrictions can be conceptualized as a form of systemic antitrust in cognitive resources, skills, and knowledge*”.⁴⁰³ In this emerging debate, a valid counterpoint is that discrete non-compete clauses in individual contracts are unlikely to yield material harm to the competitive process. At the same time, however, when non-compete clauses are the default practice at individual firm level or, even worse, at industry wide level, they may cumulatively distort competition in the labor market.⁴⁰⁴ A careful assessment of the coverage of non-compete clauses, as well as of their target and duration is therefore necessary.

Similarly, the point that non-compete are not enforced by the employer shall not play too much importance in the antitrust inquiry.⁴⁰⁵ Non-compete clauses generate rigidity in labor markets, even absent the threat of litigation. Poorly informed employees tend to disproportionately observe them.

On top of this, further research is also needed to understand if individuals that present themselves as supplier of skills on the labor market constitute “*undertakings*” within the meaning of the antitrust laws. In the standard case law, an undertaking is “*any entity engaged in economic activity, regardless of the legal status of the entity and the way in which it is financed. Any activity consisting in offering goods and services on a market in exchange for economic consideration is economic activity*”.⁴⁰⁶ This definition seems sufficiently wide to catch the contracting activity that takes place before a supplier and a buyer of skills become parties to a hierarchical relationship within a “*single economic unit*”.⁴⁰⁷ In an old decision, the EU Commission vindicated that position.⁴⁰⁸

Last, we can foresee two scenarios involving the application of antitrust law to non-compete clauses. In the first scenario, an antitrust agency starts proceedings against a firm and a natural person for the unlawful conclusion of non-compete agreements. Clearly, if antitrust fines are on the table, they should be reserved to the employer, and not applied to the employee that has been locked in the labour relationship. In the second scenario, an employee

under the rule of reason. They differ from non-competes because they are provided to the benefit of the employee.

⁴⁰² LJN: BM 3366 (Court of Hertogenbosch) HD 200,056,331 (Date of Judgment: 5 April 2010)).

⁴⁰³ Amir and Lobel, *supra* note 377 at 846.

⁴⁰⁴ See, for an expression of this idea, in relation to exclusive dealing requirements between breweries and pub tenants, CJEU Case C-23/67, *SA Brasserie de Haecht v Consorts Wilkin-Janssen*, ECLI:EU:C:1967:54 and CJEU, C-234/89 *Delimitis v Henninger Bräu*, ECLI:EU:C:1991:91.

⁴⁰⁵ For this point, see Bhatii, Jay, “How I left Microsoft and started a company without violating my non-compete”, *Business Insider*, 18 Dec. 2011, available at <http://www.businessinsider.com/you-can-move-to-a-competing-company-without-violating-your-non-compete-2011-12?IR=T>

⁴⁰⁶ See, among many others, CJEU, C-41/90, *Höfner and Elser v Macrotron*, ECLI:EU:C:1991:161, §21 and Joined Cases C-180/98 and to C-184/98, *Pavel Pavlov and others*, ECLI:EU:C:2000:428, §74.

⁴⁰⁷ CJEU, Case C-73/95 P - *Viho v Commission*, ECLI:EU:C:1996:405, §§16-18.

⁴⁰⁸ See Commission Decision, COMP IV/28.996 – *Reuter/BASF*, OJ L 254 pp. 40-50, at 45-6.

that has left a firm with whom it had contracted a non-compete is sued before a court. The defendant raises an antitrust defense based on Section 1 of the Sherman Act or Article 101 TFEU in the hope of having the clause declared unenforceable. In the US, it is unclear if the defendant can discharge proof of antitrust injury, as is required under the case law.⁴⁰⁹ In the EU, no such requirement exists.

V. CONCLUSION

In this paper, we have shown that the antitrust monopolists may be firms engaged in a process of fierce holistic competition. Those firms that we call the moligopolists, compete against the non-consumption, in search of new and low-end market footholds. The failure of the antitrust structure to see that rivalry – whose intensity may vary from one company to another – originates both in formal and applied economics theory. We believe those defects can be cured with a rechannelling of antitrust policy towards certain types of restraints, in certain types of market settings.

Our study has also highlighted areas where research is urgently needed. One of the research questions that needs to be carefully looked at is whether our proposed moligopoly screen could have led to a different outcome in closed competition cases. *Ex post* assessment of antitrust and merger decisions may help cast light on the suitability, and workability of our proposals.

Another avenue for research is what we call the public interest hypothesis. Amongst the reasons that motivate ongoing regulatory assaults against moligopoly firms despite ambiguous evidence of consumer harm, one may be that those firms are emerging as disruptors of the welfare State for the allocation of public goods and services to society. This, no doubt, will demand much thinking.

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⁴⁰⁹ *Brunswick Corp. v. Pueblo Bowl-O-Mat, Inc.*, 429 U.S. 477 (1977).