

**REORIENTING EXCLUSIONARY CONDUCT LAW TOWARD
COMPETITIVENESS**

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I. INTRODUCTION

Studying the competitiveness of European industry has become a popular occupation by academics and officials alike. For example, a recent report by the European Commission writes:

“Current concern over the competitiveness of industry arises from a widely-held but vague general feeling that the [Union] is in danger of ‘losing the race’. Several factors have combined to bring about this unease: the decline of a number of traditional industries which, in the past, provided the main-stay of economic prosperity; [...] the emergence of newly industrializing and certain developing countries as direct competitors for a wide range of markets; [...] and the recognition of the importance of the new technologies to ‘post-industrial’ society and the awareness that other countries [...] are further advanced than the [Union] in the commercial application and development of these technologies.”

Similarly, another inquiry by the European Parliament laments the EU’s “failure to grow as vigorously, in productivity terms, as countries in its peer group, particularly the United States. [...] Some of this is attributable to slower adoption of new technologies, primarily IT. [...] The EU also trails the US and, increasingly, China in patents in frontier technologies.”

The example reports, and many others, converge on a common theme: declining European competitiveness resulting from failing to embrace technological change, productivity slowdown, and the rise of rivalling economies.¹ At this point, the reader is asked to forgive us for playing a little trick. For the quotes provided above only partially reflect the truth. In fact, whereas the EP’s statements have been made in 2024², the EC quote is not recent but is more than four decades old.³ It seems that the EU’s competitiveness problem is a persistent one, indeed.

Some figures can illustrate the discussion. Although positive, average productivity growth in the EU has been weaker than other major economies.⁴ To be clear, Europe did experience rapid growth in the 1960s and 1970s. However, this was due to catching-up with the technological frontier based on imitation. Once imitation opportunities were exhausted and productivity became important, Europe started stagnating.⁵ Today, the EU creates fewer than half the number of successful startups

¹ In 2019, the EU altered its stance toward China by declaring it “an economic competitor and [...] a systemic rival”. See, EUROPEAN COMMISSION, ‘EU-China – A strategic outlook’ JOIN(2019) 5 final.

² EUROPEAN PARLIAMENT, ‘Coordination for EU competitiveness’ (2024) EP EGOV PAPER NO. 747.838 [https://www.europarl.europa.eu/RegData/etudes/STUD/2024/747838/IPOL_STU\(2024\)747838_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2024/747838/IPOL_STU(2024)747838_EN.pdf).

³ EUROPEAN COMMISSION, ‘The Competitiveness of European Community Industry’ (1982) DOCUMENT NO. III/387/82 <http://aei.pitt.edu/5542/1/5542.pdf>.

⁴ EUROPEAN COMMISSION, ‘Long-term competitiveness of the EU: looking beyond 2030’ COM(2023) 168 final.

⁵ ALBERTO ALESINA & FRANCESCO GIAVAZZI, *The Future of Europe: Reform or Decline* (MIT PRESS 2006).

as China, and only 12% as the US.⁶ In terms of material prosperity, the picture is similar. One study concludes that if European countries were US states, they would belong to the poorest group. If trends continue, the wealth gap between the average European and American in 2035 could be as big as between the average European and Indian today.⁷ These facts show that “the EU’s representation among the world’s largest economies [has been] sharply decreasing in favour of rising Asian economies”, not to mention it’s “lagging behind the US market”.⁸

There are no easy answers to a perennial question like the EU’s competitiveness problem. Addressing it would likely require the EU’s own ‘whole-of-government approach’. An important part of this toolbox, however, is antitrust law and policy.⁹ Not only is antitrust law responsible for ensuring that the internal market remains undivided, but it also enables efficient firms to arise, therefore contributing to EU’s economic power. As noted by Craig, antitrust law has “always been of real significance for attainment of the overall economic objectives of the EU”.¹⁰ But is that claim true for competitiveness? **To what extent has EU antitrust law contributed to resolving the EU’s competitiveness problem? What would it look like if EU antitrust law supported competitiveness as its goal?**

It is standard knowledge in economic literature that competitiveness depends on productivity. For example, Ketels and Porter note that enhancing European competitiveness “ultimately depends on robust productivity growth”.¹¹ A recent report by the EC on antitrust law also uses productivity to define competitiveness.¹² According to Oxford Dictionary, productivity means “the rate at which a worker, a company, or a country produces goods, and the amount produced, compared with how much time, work, and money needed to produce them”. Put simply, productivity refers to creating more output with less input.

⁶ *Ibid*, p. 8.

⁷ FREDRIK ERIXON, OSCAR GUINEA, & OSCAR DU ROY, ‘Comparing Economic Growth Between EU and US States’ (2023) ECIPE POLICY BRIEF NO. 07/2023 https://ecipe.org/wp-content/uploads/2023/06/ECI_23_PolicyBrief_07-2023_LY02.pdf.

⁸ ENRICO LETTA, ‘Much More Than A Market: Empowering the Single Market to deliver a sustainable future and prosperity for all EU citizens’ (2024) <https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>.

⁹ A. R. THURIK, E. STAM, & D. AUDRETSCH, ‘The rise of the entrepreneurial economy and the future of dynamic capitalism’ (2013) 33 *TECHNOVATION* 302.

¹⁰ PAUL CRAIG, *The Lisbon Treaty, Revised Edition: Law, Politics, and Treaty Reform* (OUP 2013).

¹¹ CHRISTIAN KETELS & MICHAEL E. PORTER, ‘Rethinking the role of the EU in enhancing European competitiveness’ (2021) 31 (2) *COMPETITIVENESS REVIEW* 189.

¹² ANDREAS BOVIN, THOMAS DEISENHOFER, & VINCENT VEROUDEN (eds), *Protecting competition in a changing world: Evidence on the evolution of competition in the EU during the past 25 years* (EU PUBLICATIONS OFFICE 2024).

Firms can become productive in many ways.¹³ If creating more output with equal (or less) input is the goal, one way of achieving that is through lowering costs. Firms can adopt best practices, streamline production methods, or improve organizational processes to lower costs.¹⁴ Alternatively, firms can create new products or enter new markets to become more productive. As decades of economic research shows, innovation is responsible for the vast majority of welfare growth due to increased productivity.¹⁵ For simplicity, we call the former (lowering costs) *efficiency competition* and the latter (new products) *innovation competition*.

Our hypothesis to the research question is simple. EU economic law would support competitiveness best by incentivizing efficiency and innovation competition. This would be accomplished through a division of labour between two main pillars of economic law. In this scenario, free movement and harmonization rules enable scale and scope economies by allowing firms to expand operations in a larger, integrated market. Antitrust rules, on the other hand, ensure that resources generated by the free movement rules flow away from inefficient firms and toward those that can best utilize them. In other words, the role of antitrust law in promoting competitiveness would be the prevention of inefficient and lazy monopolists from capturing economic resources.

Although the hypothesis is intuitive, it is not without challenges. Our scenario makes the determination of efficient and/or innovative firms crucial. This requires an antitrust enforcer to evaluate efficiency and/or innovativeness at the firm level. But this is uncommon in antitrust law. Barring rare circumstances, the law treats firms as black boxes. Instead, efficiency or innovation potential is determined by looking at market structure. The greater the dominance commanded by a firm, the less efficient it is assumed to be. Rivals are almost never analyzed. Moreover, the little analysis made by the law is also static. As a result, the law determines the efficiency or innovation potential of firms at a certain point in time based on structural indicia.

Protecting static efficiency by relying on structural indicia is a method based on assumptions. This is not a problem in itself. The law lives on assumptions. They work through complexity and reduce decision costs. But assumptions may also raise error costs significantly. Hence, an appropriate

¹³ This is usually described as firms “moving toward the technological frontier or moving the technological frontier forward”. See, JOSEPH E. STIGLITZ & BRUCE C. GREENWALD, *Creating a Learning Society: A New Approach to Growth, Development, and Social Progress* (COLUMBIA UNIVERSITY PRESS 2014).

¹⁴ For instance, IT adoption has driven the difference in competitiveness between the US and Europe. See, ROBERT J. GORDON & HASSAN SAYED, “Transatlantic Technologies: The Role of ICT in the Evolution of U.S. and European Productivity Growth” (2020) NBER WORKING PAPER NO. 27425.

¹⁵ For recent evidence, see UFUK AKÇIĞIT & JOHN VAN REENEN, *The Economics of Creative Destruction* (HUP 2023).

balance between decision and error costs is necessary.¹⁶ This Article proposes a better balance. Antitrust enforcers should be more willing to analyze firms to determine their efficiency or innovation potential. They should also do this in a dynamic manner – not based on a snapshot but over a timeframe. Such an epistemological expansion would address “the obsolescence of the limits of antitrust in contexts of socio-economic change”.¹⁷

To summarize, antitrust law can protect competitiveness by encouraging productivity. Productivity can be supported through lower costs or new products – efforts antitrust law must protect. But identifying which firms can potentially bring efficiency or innovation is challenging. Thus, it makes sense to start basic. Antitrust law fixes market failures. It intervenes when markets fail to allocate resources to efficient firms. But not every undesirable result stems from market failures. It is also impossible to fix every market failure. Therefore, a first question would concern the prioritization of cases.¹⁸ A simple process illustrates how enforcement resources can be allocated between free movement rules and antitrust law. The process is tested in four industries to provide examples. Next, we turn to substance. Antitrust law can remedy failing markets by selectively protecting firms with efficiency or innovation potential. Although intuitive, this formulation creates a practical question of measurement. The last section introduces methods based on efficiency and capability analyses to determine which firms fit the bill.

II. PRIORITIZATION

Ideally, law enforcement would correct every illegality and deter bad conduct from happening in the future. But this scenario is unattainable in practice. Knowledge and enforcement resources are scarce. Thus, enforcers need to prioritize some cases over others. For example, the EC’s Guidance Paper on Article 102 TFEU is conceived as a document outlining enforcement priorities.

The importance of prioritization in antitrust law cannot be overstated.¹⁹ That is perhaps why academic works on antitrust priority-setting disagree widely. Some authors suggest a risk-averse approach. These scholars advocate for targeting practices whose anticompetitive effects are almost certain. For instance, mergers to monopoly or naked price fixing schemes would be the sole targets for antitrust enforcement under this view.²⁰ By contrast, other commentators take exclusionary

¹⁶ ALAN DEVLIN & MICHAEL JACOBS, ‘Antitrust Error’ (2010) 52 WILLIAM & MARY LAW REVIEW 75.

¹⁷ NICOLAS PETTIT, ‘A Theory of Antitrust Limits’ (2021) 28 (4) GEORGE MASON LAW REVIEW 1399.

¹⁸ Prioritization is important for performance improvements gained from antitrust enforcement. See, WILLIAM E. KOVACIC, ‘Rating the Competition Agencies: What Constitutes Good Performance?’ (2009) 16 GEORGE MASON LAW REVIEW 903.

¹⁹ WILLIAM KOVACIC, ‘Deciding What to Do and How to Do It: Prioritization, Project Selection, and Competition Agency Effectiveness’ (2018) 13 COMPETITION LAW REVIEW 9.

²⁰ Bork’s seminal work is probably the best example: ROBERT BORK, *The Antitrust Paradox: A Policy At War With Itself* (Basic Books 1978).

conduct as a focal point.²¹ The illegality of exclusionary practices are less clear-cut. As such, this approach is more comfortable with possible errors, but it is also more conducive for the gradual development of the law.

A few studies can be considered as prioritizing competitiveness. For example, Tim Wu conjectures a scenario where innovation matters the most in antitrust enforcement.²² Within the context of large platforms, Petit argues that antitrust should prioritize limiting dominant firm rents in tipped markets whilst keeping technology-based competition flowing in untipped markets.²³ This ensures that current welfare losses are minimized whilst opportunity for future gains remain open. It has also been argued that antitrust enforcement can “unfreeze markets” by forcing a lazy monopolist to innovate, or by helping firms break through inefficient lock-in scenarios.²⁴

Although the literature supplies some insights, prioritization in antitrust law is complex and remains “a blind spot of administrative discretion”.²⁵ It would be useful to create a reasonably objective method by which enforcers can prioritize cases to protect efficiency and innovation. This contributes to European competitiveness.

We start from well-accepted premises to develop such a process. Antitrust law deals with market failures. Exclusionary conduct law targets a specific type of market failure called market power. Market power can be undesirable for many reasons. It can inflate prices, reduce output, constrain efficiency, and stymie innovation. A first step in remedying market power is identification.

There are different ways to measure and identify market power. A common approach is associated with the Cournot model of economic competition. To simplify, under Cournot competition, the degree of market power is inversely correlated with the number of firms in a market. Put differently, as the structure of markets become more deconcentrated, the Cournot model declares that markets are working well. Another way to measure market power is through markups.²⁶ Markups refer to price over cost. As a sign of market power is the ability to raise prices above marginal costs, the markup model assesses market failure by looking at firms’ pricing power. In the 2020s, it has

²¹ JONATHAN BAKER, ‘Exclusion as a Core Competition Concern’ (2013) 78 ANTITRUST LAW JOURNAL 527.

²² TIM WU, ‘Taking Innovation Seriously: Antitrust Enforcement If Innovation Mattered the Most’ (2012) 78 ANTITRUST LAW JOURNAL 313.

²³ NICOLAS PETIT, *Big Tech and the Digital Economy: The ‘Moligopoly’ Scenario* (OUP 2021).

²⁴ NICOLAS PETIT & THIBAUT SCHREPEL, ‘Complexity-minded antitrust’ (2023) 33 JOURNAL OF EVOLUTIONARY ECONOMICS 541.

²⁵ OR BROOK & KATALIN CSERES, ‘Priority Setting as the Blind Spot of Administrative Law Enforcement: A Theoretical, Conceptual, and Empirical Study of Competition Authorities in Europe’ (2024) MODERN LAW REVIEW (forthcoming).

²⁶ DAVID AUTOR, DAVID DORN, LAWRENCE F. KATZ, CHRISTINA PATTERSON, JOHN VAN REENEN, ‘The Fall of the Labor Share and the Rise of Superstar Firms’ (2020) 135 (2) THE QUARTERLY JOURNAL OF ECONOMICS 645.

become commonplace in antitrust scholarship to cite economic literature on rising markups to justify intervention.²⁷

EU antitrust law uses a mixture of methods to determine market failure, and thus, when to intervene.²⁸ For example, merger law evaluates transactions similarly to the markups method. If a merger inflicts an upward pricing pressure on the parties or the relevant market, then a prohibition becomes likely. The market failure stems from a fear of increased pricing power.²⁹

Unilateral conduct law approximates the Cournot model. As case law holds, the existence of a dominant firm automatically weakens competition. Exclusion of rivals becomes suspicious, and justifications unlikely.³⁰ Market failure is tethered to concentration. Greater concentration implies inefficiency and a lack of innovation. But concentration is not universally undesirable. Competition implies winners and losers. Some products and manufacturing technologies may require high investments in fixed costs that only a few firms can undertake. As a result, some markets may be concentrated with firms holding market power. In such cases, markets are not failing; they are working as intended. A more nuanced understanding of market failure is therefore needed.

1. The Method

Developing a different view of market failure requires revisiting the basics. The primary claim of this study was as follows. Antitrust law would best support competitiveness by ensuring that the scaling opportunities generated by free movement rules do not accrue to unproductive firms. If one can detect where markets fail to steer resources toward productive firms, a robust case for intervention could appear. The hypothesis here is very simple. If a firm's relative productivity is not reflected in its market shares, then the markets do not perform well. Put differently, markets where unproductive firms command higher shares over time are failing. Where this premise obtains, markets do not perform their allocative functions properly. This would be an opportunity for antitrust intervention.

Operationalizing this test is not difficult. However, it requires preparation. First, one needs to calculate the shares of firms in a market. Second, the productivity of the same firms must be determined. Last, one must evaluate the correlation between the two. If the correlation value is

²⁷ This is despite the fact that economic studies rule out lax antitrust enforcement as a cause of rising markups. For a literature review, see NATHAN H. MILLER, 'Industrial Organization and *The Rise of Market Power*' (2024) <http://www.nathanhmilller.org/iomktpower.pdf>.

²⁸ For example, the EC relied on markups and concentration levels to determine market power in a recent case. See, Case AT.40437 *Apple – music streaming* [2024], paras. 370 – 372.

²⁹ Here, we use prices as a shorthand for other competitive parameters like quality.

³⁰ ÜNEKBAŞ (n X) 124.

positive, the markets allocate reasonably well. Higher values represent better allocation. In such markets, one can assume that firms investing in productivity will be rewarded over time by capturing a larger share of resources. By contrast, if the correlation value is very low or negative, the markets do not allocate resources well. As this represents market failure, antitrust enforcement can be called in.

The first step in testing this intuition is selecting industries. Although any industry with available data is a good candidate, this study opts for aviation, chemicals, energy, and pharmaceuticals. This mix is not arbitrary. Rather, all four industries have been designated as crucial for competitiveness by various EU bodies. For example, in its single market report, the EC highlighted all four industries (among others) as “strategic” for competitiveness.³¹ Similarly, the Council and the Parliament included these industries and their sub-markets as “critical” in secondary law, such as the Investment Screening Regulation.³²

After choosing industries, the top five firms in each are identified. Again, the selection is not arbitrary; it relies on publicly available data from Statista to find out which firms had the largest market capitalization in 2023. The same procedure is repeated for both EU and US firms to obtain a comparative analysis.³³

It can be observed that we introduce a firm dimension into antitrust analysis. Instead of relying on structural indicia to determine if firms are efficient or not, directly examining what firms do promises more accuracy. But firm-level observations are insufficient on their own. One must also observe how firms operate *through time*. This allows the observer to escape the static analysis trap employed in contemporary antitrust law. Hence, the data for five firms are collected over a ten-year period to explore the firms’ *tendency* to improve productivity (2014 – 2023).

Calculating market shares is a simple exercise. The formula divides a firm’s yearly sales with overall industry revenue. Thus, we need access to firm-level sales data. Annual sales data are readily available through public disclosures. For example, US firms traded in a stock exchange declare business information in their annual reports (10-K filings). Public European firms often have

³¹ EUROPEAN COMMISSION, ‘Commission Staff Working Document Accompanying “The 2024 Annual Single Market and Competitiveness Report”’ (2024) SWD/2024/78 final.

³² Regulation (EU) 2019/452 of the European Parliament and of the Council of 19 March 2019 establishing a framework for the screening of foreign direct investments into the Union [2019] OJ L1 79/1.

³³ European economic performance is frequently compared with the US in official documents. See, *e.g.*, EUROPEAN COMMISSION (n X – SWD 2024 annual single market) 13. This report mentions EU total factor productivity in comparison with the US. See also ‘Introduction’.

similar duties (20-F filings) or in any case publish annual reports to inform their investors. Relying on these documents is an objective way to gather industry- and firm-specific data on output.³⁴

Determining firm productivity requires a few extra steps. Productivity can be calculated in many ways. For example, one can look at the average productivity of labor. This denotes average output per worker and is found by dividing total sales with the number of employees. A well-known productivity formula is total factor productivity (“TFP”). TFP measures the ratio of aggregate output to aggregate inputs. Generally, TFP is calculated based on an established formula where output is a function of capital and labor inputs relativized with a productivity coefficient. Nonetheless, precisely measuring TFP is difficult as there are many inputs factoring into a production function (e.g., energy). This limitation invites caution. Many studies therefore speak of multi-factor productivity (“MFP”) as knowing the totality of inputs is impractical.

Caveats aside, a simplified way to assess productivity can be established for the purposes of this study. MFPS of firms can be measured by isolating the productivity coefficient.

$$\text{Output (Y)} = \text{Capital (K)} \times \text{Labor (L)} \times \text{Productivity Coefficient (A)}$$

In other words, dividing firm-level output (Y) with two types of input (capital – K and labor – L) should provide an estimate of firm productivity. Here, two more clarifications need highlighting. First, output data in the form of goods produced are often unavailable. A standard practice in economic studies is to substitute Y with total sales, which we follow.³⁵ Second, different types of inputs contribute differently to output. Some industries depend on labor for most of their output. For example, hospitality, agriculture, and healthcare can be labor-intensive. By contrast, output in some industries are driven by capital investments. Aviation, chemicals, pharmaceuticals, and energy are all examples of capital-intensive industries.³⁶ This nuance can be reflected by applying weights on inputs. Standard weights for labor intensive industries are (0,3) for capital and (0,7) for labor.³⁷ Since all industries in our example are capital intensive, we simply reverse these values. Consequently, we end up with the following formula

$$MFPR = \frac{Y}{\sqrt{K^{0,7} \times L^{0,3}}}$$

³⁴ To the extent of our knowledge, the first study that utilized this resource in antitrust was PETIT (n 6) 64. Newer studies continue the trend. See, e.g., QIWEN SHENG & TOMISLAV VUKINA, ‘Public Communication as a Mechanism for Collusion in the Broiler Industry’ (2024) 64 REVIEW OF INDUSTRIAL ORGANIZATION 57.

³⁵ CHAD SYVERSON, ‘What Determines Productivity?’ (2011) 49 (2) JOURNAL OF ECONOMIC LITERATURE 326.

³⁶ FOTINI VOULGARIS & CHRISTOS LEMONAKIS, ‘Competitiveness and profitability: The case of chemicals, pharmaceuticals and plastics’ (2014) 11 THE JOURNAL OF ECONOMIC ASYMMETRIES 46.

³⁷ ROBERT J. GORDON, *The Rise and Fall of American Growth* (Princeton 2017).

where MFPR denotes multi-factor productivity based on revenue. For data on capital and labor inputs, we rely on Standard & Poor's Capital IQ Pro database. This database aggregates firm-level data on manufacturing plants, equipment, and property assets, which we take as proxy for capital inputs. For labor, we collect the number of employees as disclosed in annual reports and 10-K filings.

Calculating market shares and productivity of firms allows an estimation of market failure. To determine if markets allocate well, we measure the correlation between firm productivity and market share. This can be done by applying the covariance formula to the arrays of values under each variable.³⁸ Covariance is a statistical term that measures how much two variables vary together. A positive and large covariance value would mean that productivity increases lead to market share increases. This would imply a reasonably well functioning market.

2. Execution

Below, we present the results derived from applying the above formulation to ten firms (5 US and 5 European) in each of the four industries.

A. Aviation

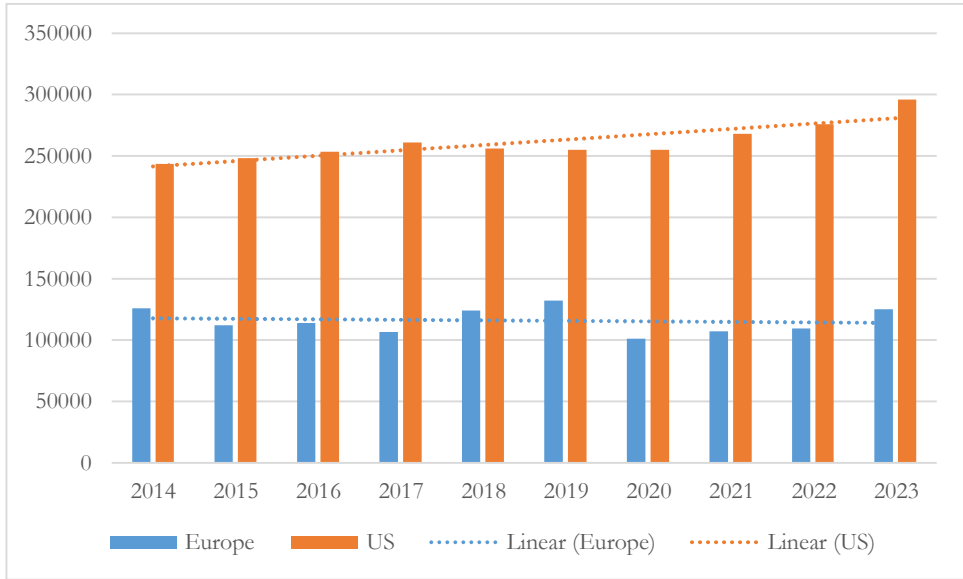
Aviation is a leading high-technology industry and a contributor to competitiveness. For this reason, aircraft manufacturing has been traditionally subsidized by many jurisdictions. For many decades, aviation has retained its position as a large export industry as well.³⁹ Aviation is important also because it is “dual-use”; developments in aviation can have wide application both in civil and military cases.

Sophisticated technology and high capital intensity concentrates the largest European aviation firms in Western Europe. The top five consists of Airbus, Safran, MTU, Dassault, and Leonardo. Their US counterparts are Boeing, Raytheon, Lockheed Martin, General Dynamics, and Northrop Grumman. Below, we first provide the total revenue of these firms (Graph X) and estimate their market share (Graphs X1 and X2).

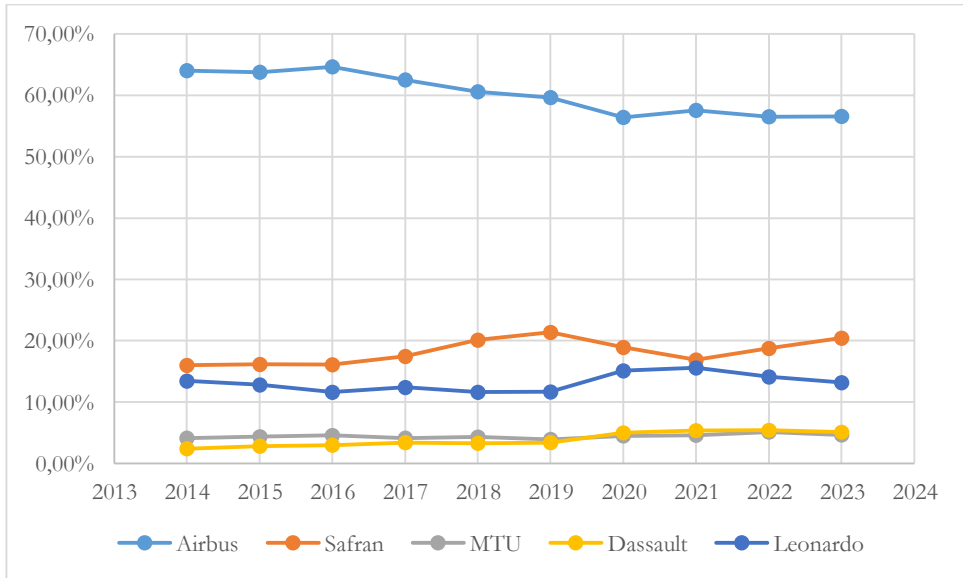
Graph – X: Aviation sales in Europe and the US

³⁸ The intuition derives inspiration from a seminal study in productivity economics. See, STEVEN OLLEY & ARIEL PAKES, ‘The Dynamics of Productivity in the Telecommunications Equipment Industry’ (1996) 64 (6) *ECONOMETRICA* 1263.

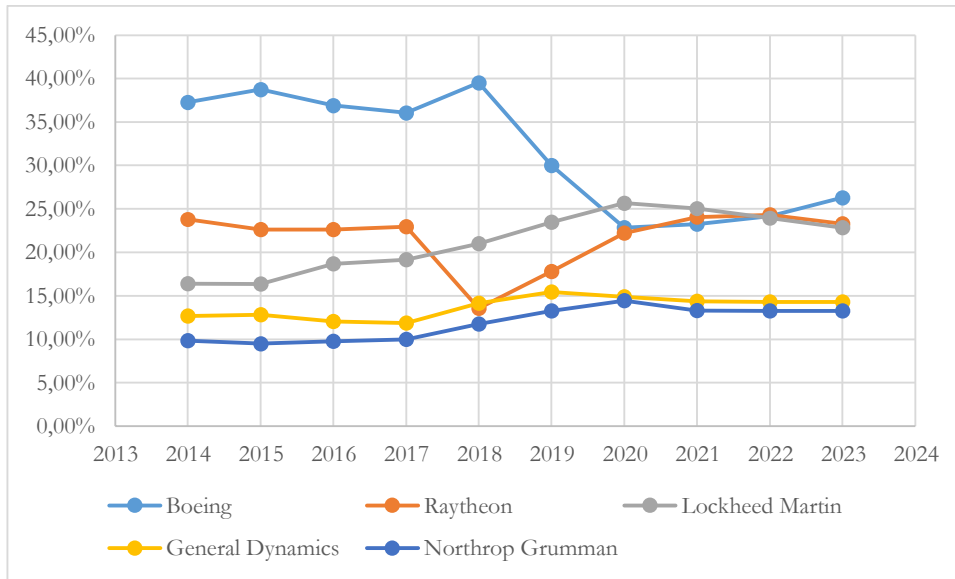
³⁹ DANIEL VERTESY, ‘The contours of the global commercial aircraft manufacturing industry’ in ERIKSSON & STEENHUIS (eds), *The Global Commercial Aviation Industry* (Routledge 2016).



Graph – X: Market shares in aviation in Europe



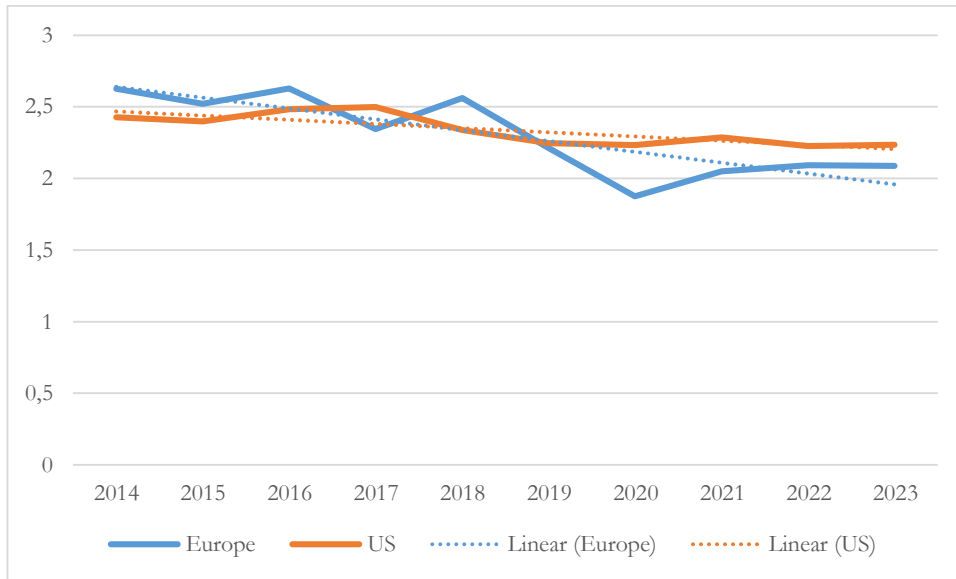
Graph – X: Market shares in aviation in the US



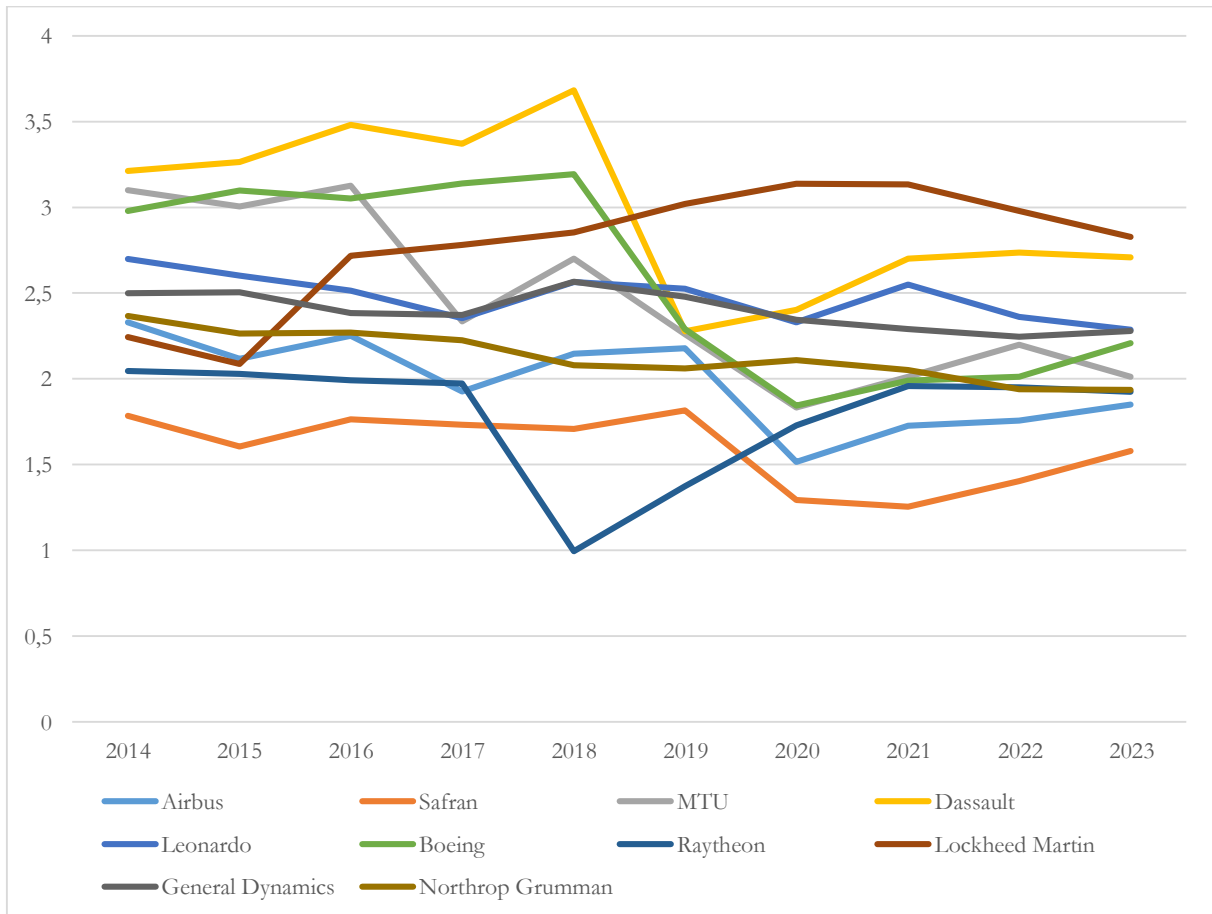
The graphs show that over the past decade, aviation sales in Europe have stagnated. European firms made approximately the same revenue in 2023 as they did in 2014. By contrast, the US firms increased their sales over time by around 20%. In terms of market share distribution, Airbus is a clear winner in Europe, capturing more than half of the sales. Safran and Leonardo trail behind and seem to compete with each other vigorously, while Dassault and MTU have sub-10% shares. The market is much more contested in the US, with Boeing’s share declining from 37% to 26%. The emerging competitor is Lockheed Martin, who steadily gained market share and overtook Raytheon. General Dynamics and Northrop Grumman constitute the lower end of the US market with shares hovering around 15%.

After constructing the market structure, we explore how firms compete. We gather the following graphs by applying the productivity formula to all 10 firms. These graphs illustrate average industry productivity as well as firm-level observations.

Graph – X: Average industry productivity in Europe and the US



Graph – X: Firm-level productivity in Europe and the US



The average productivity graph shows decline for both markets. Although European firms were more productive on average in 2014, their steeper decline curve gave US firms an edge in 2023. Nonetheless, both US (-7%) and European (-25%) aviation firms became less productive over time. At the firm level, we see that leaders in market share are not leaders in productivity. Boeing

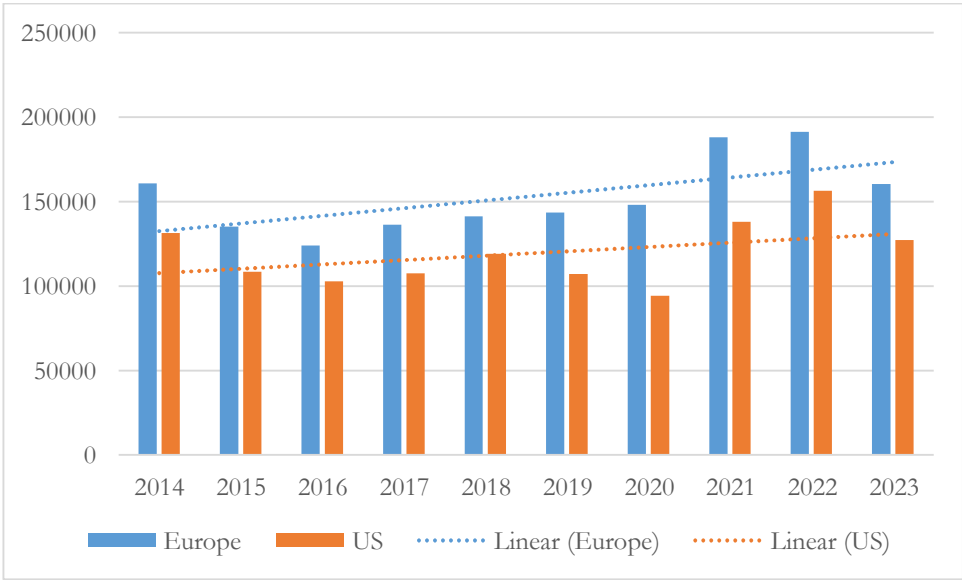
comes fifth in productivity, and Airbus is one spot away from being the biggest laggard. In fact, the most unproductive firm seems to be Safran, which has the second largest market share in Europe. By contrast, smaller firms like Dassault (5% share in Europe) score higher in productivity. In the US, one can observe Lockheed Martin’s rise and Boeing’s decline in their respective productivity trends. These observations arouse initial suspicion that competition aviation markets may be distorted, especially in Europe.⁴⁰

B. Chemicals

Although a legacy industry, chemicals are crucial for competitiveness. Chemicals are essential components of lithium ion batteries used in electric vehicles. Chemicals are also used in other critical industries like semiconductor manufacturing. In the European context, innovation in chemicals is an important part of the Green Deal, tying into the overall competitiveness strategy.⁴¹

The top five chemicals firms based in Europe are BASF, Air Liquide, Umicore, Brenntag, and Johnson Matthey. Their US counterparts are Dow, LyondellBasell, Mosaic, Westlake, and Ecolab. We first calculate total revenue and each player’s market share for both economies. Graphs X to X2 illustrate these figures.

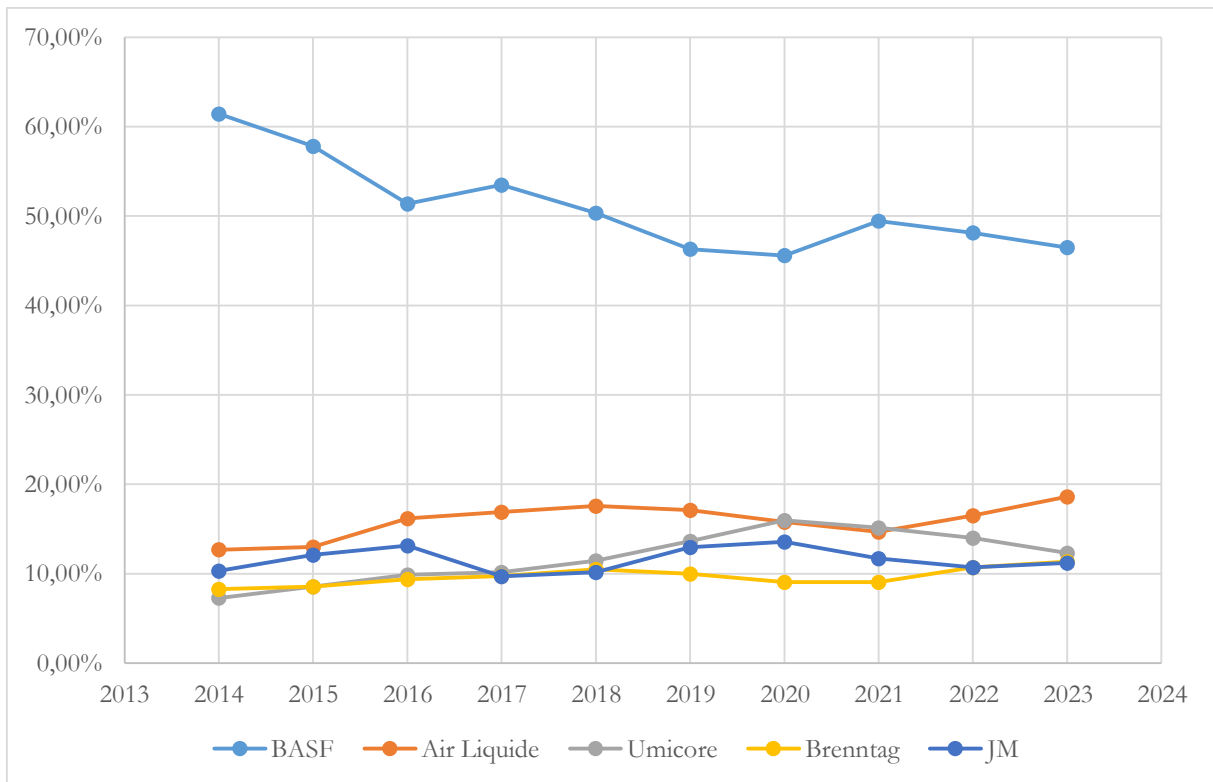
Graph – X: Chemicals sales in Europe and the US



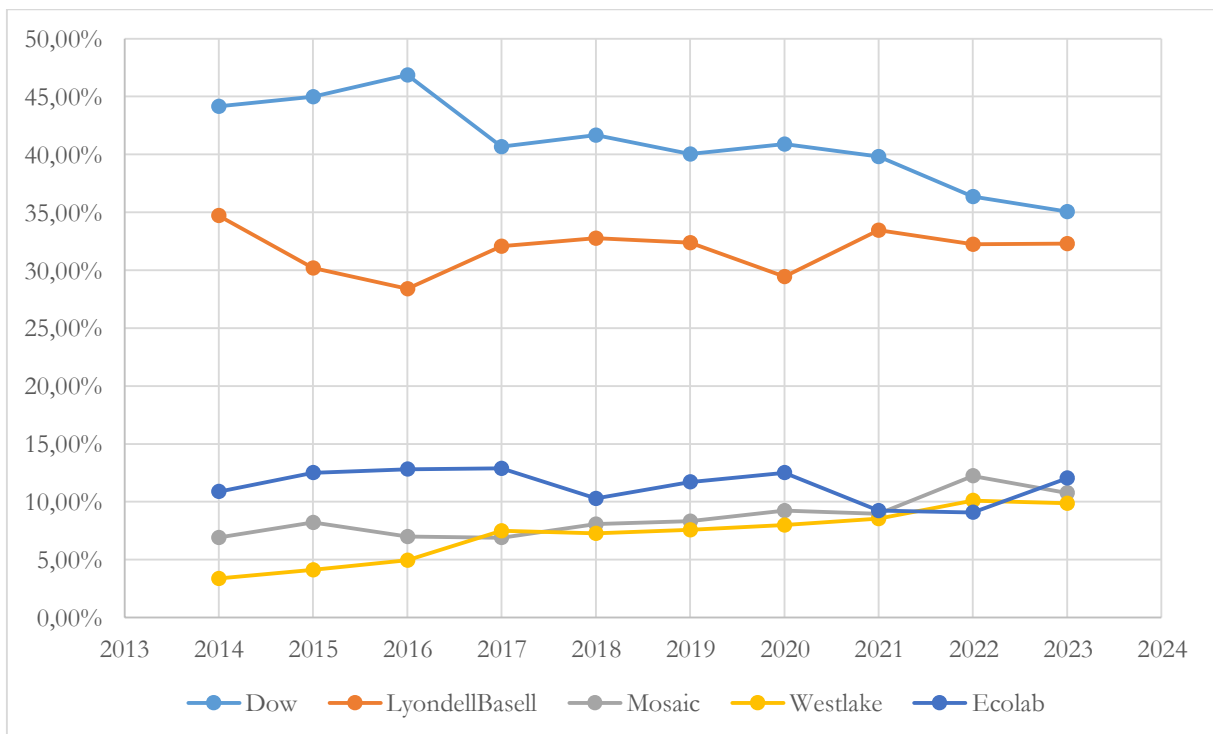
Graph – X1: Market shares in chemicals in Europe

⁴⁰ It is well-known that aviation industries, and particularly firms with leading market shares like Airbus and Boeing, have been subsidized by public funds for a long time. See, DOUGLAS IRWIN & NINA PAVCNIK, ‘Airbus versus Boeing revisited: international competition in the aircraft market’ (2004) 64 (2) JOURNAL OF INTERNATIONAL ECONOMICS 223. These subsidies led to prolonged trade wars between the EU and the US. See, JEFFREY D. KIENSTRA, ‘Cleared for Landing: Airbus, Boeing, and the WTO Dispute over Subsidies to Large Civil Aircraft’ (2012) 32 NORTHWESTERN JOURNAL OF INTERNATIONAL LAW & BUSINESS 569.

⁴¹ EUROPEAN COMMISSION, ‘Chemicals Strategy for Sustainability’ (2020) SWD(2020) 225 final.



Graph – X2: Market shares in chemicals in the US

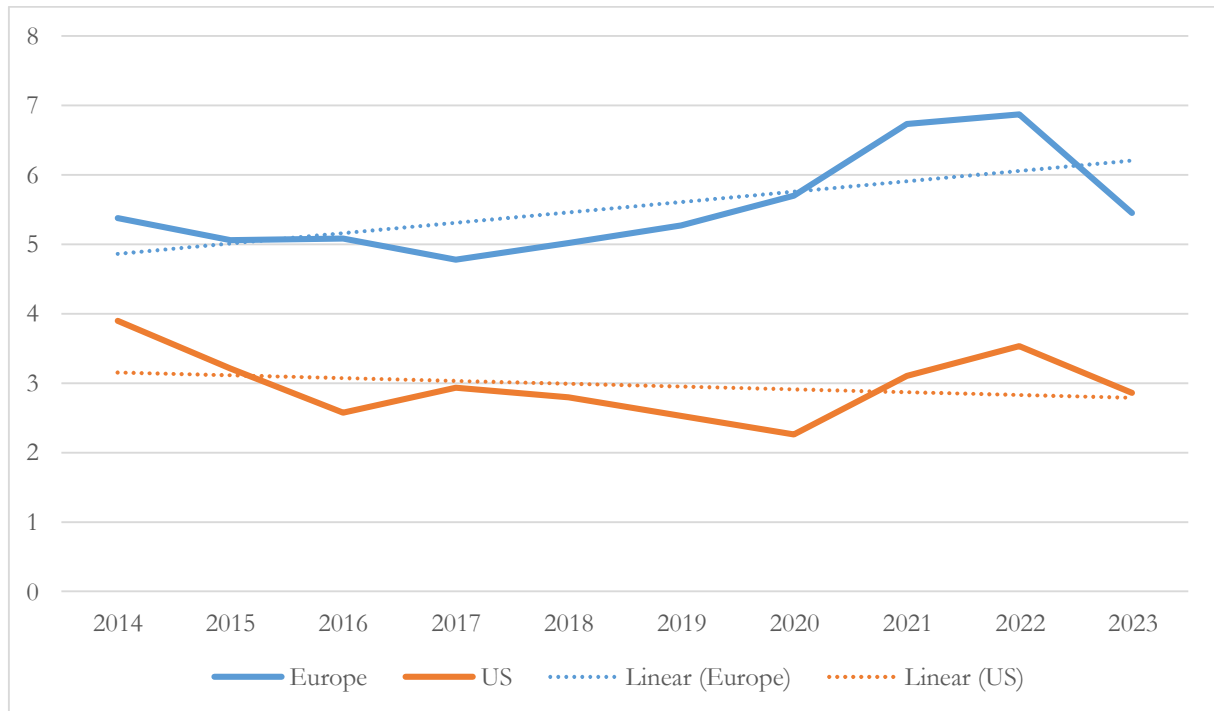


It appears that over the last decade industry revenue has been cyclical. Sales in both markets trend upward, although Europe seems to be increasing output slightly faster. In terms of positioning, BASF is the clear leader in Europe, although its market share has been declining steadily. The other four players compete with roughly equal shares. The situation is similar in the US, with Dow

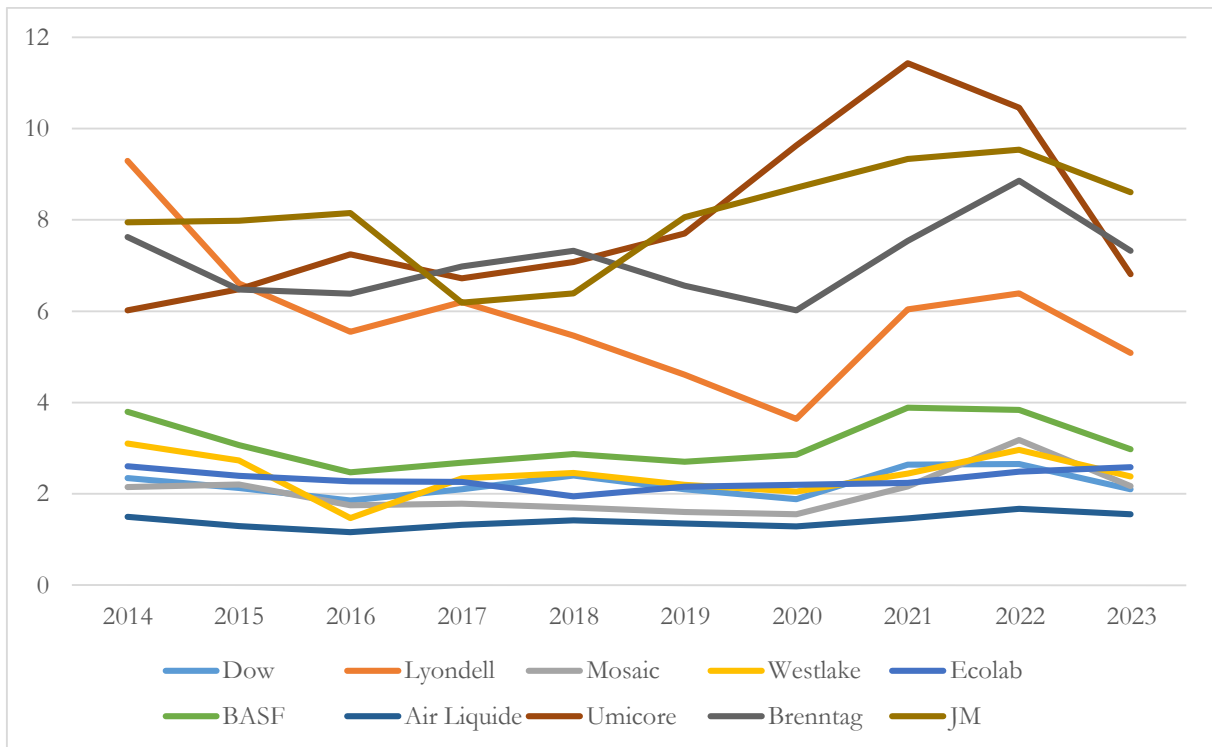
leading. However, LyondellBasell seems to have caught up over the ten years. If trends continue, Dow is set to lose its leadership position in the near future.

After setting out the structure of the market, we attempt to observe how firms compete. By applying the productivity formula to all ten firms, we obtain the following graphs on average industry productivity over time (Graph X) as well as firm-level developments (Graph X).

Graph – X: Average industry productivity in Europe and US



Graph – X: Firm-level productivity in Europe and the US



The first graph shows that US productivity has actually declined among the top five firms in the last decade. This is in line with slower growth in overall sales. By contrast, European firms slightly increased their productivity on average. At the firm-level, all of the most productive firms are European. The largest chemicals firm, BASF, comes fifth, with an average productivity two-and-a-half times lower than the leader, Johnson Matthey. US firms populate the lower end of the group in terms of productivity. Except LyondellBasell, which occupies the fourth place, American firms possess similar productivity levels. The biggest laggard is Air Liquide.

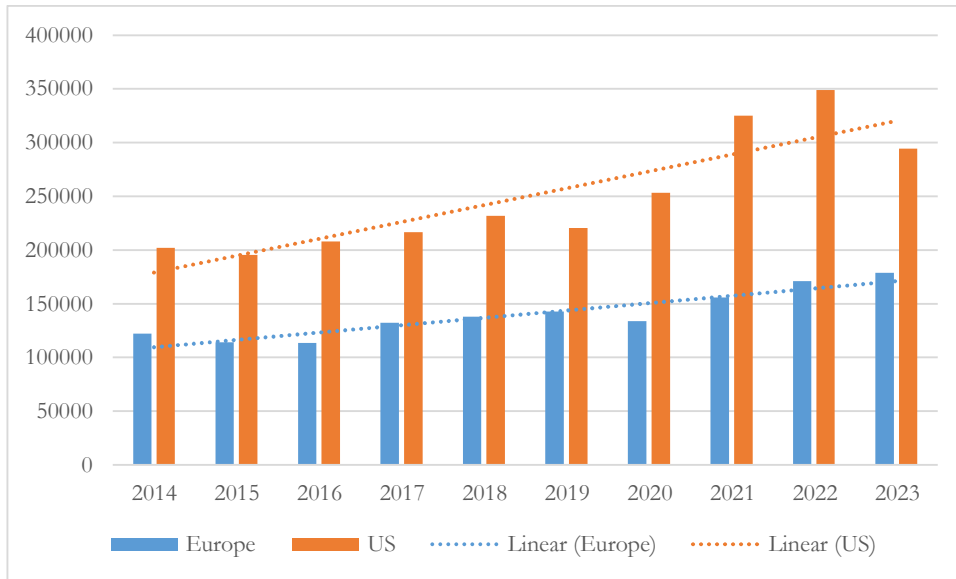
C. Pharmaceuticals

Pharmaceuticals have always been at the forefront of innovation and technological development. The recent pandemic highlighted the crucial role of efficient, innovative pharmaceutical firms in providing solutions to pressing crises. The EC recognized pharmaceuticals among the “key enabling technologies that are strategically important for Europe’s industrial future”.⁴²

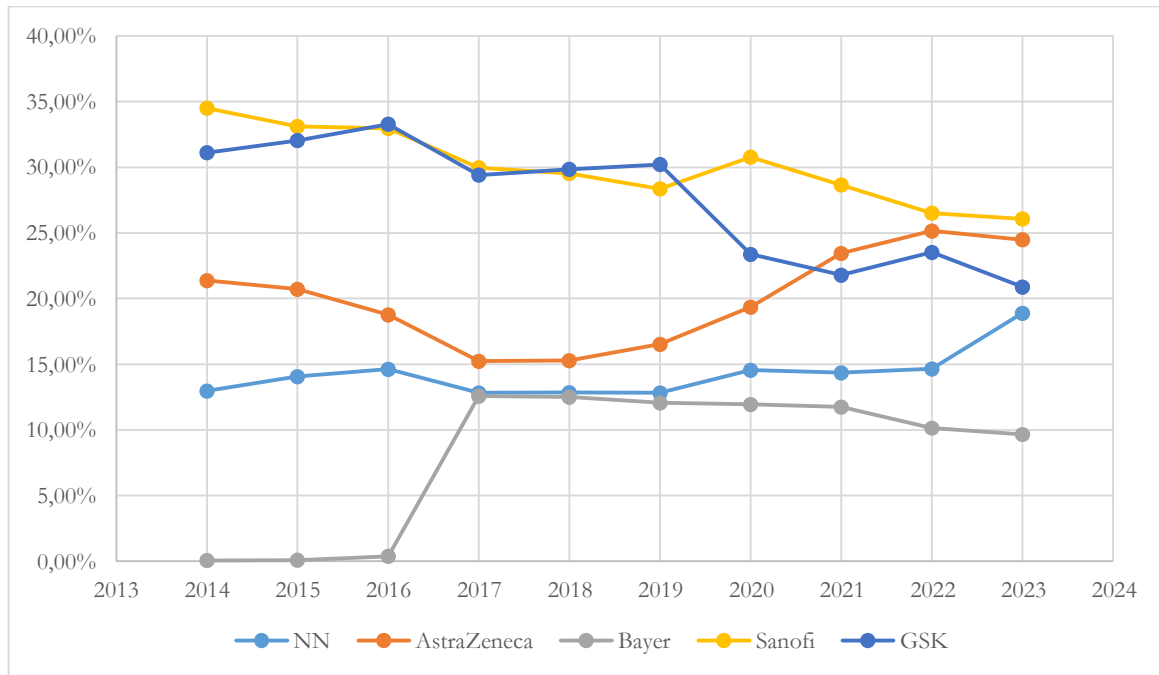
The top five pharmaceuticals firms based in Europe are Novo Nordisk, AstraZeneca, Bayer, Sanofi, and GlaxoSmithKline, whilst their US counterparts are AbbVie, Pfizer, Bristol Myers Squibb, Johnson & Johnson, and Merck. The graphs below chart the total industry revenue (Graph X) followed by the distribution of market shares in both economies (Graphs X and X).

Graph – X: Pharmaceuticals sales in Europe and the US

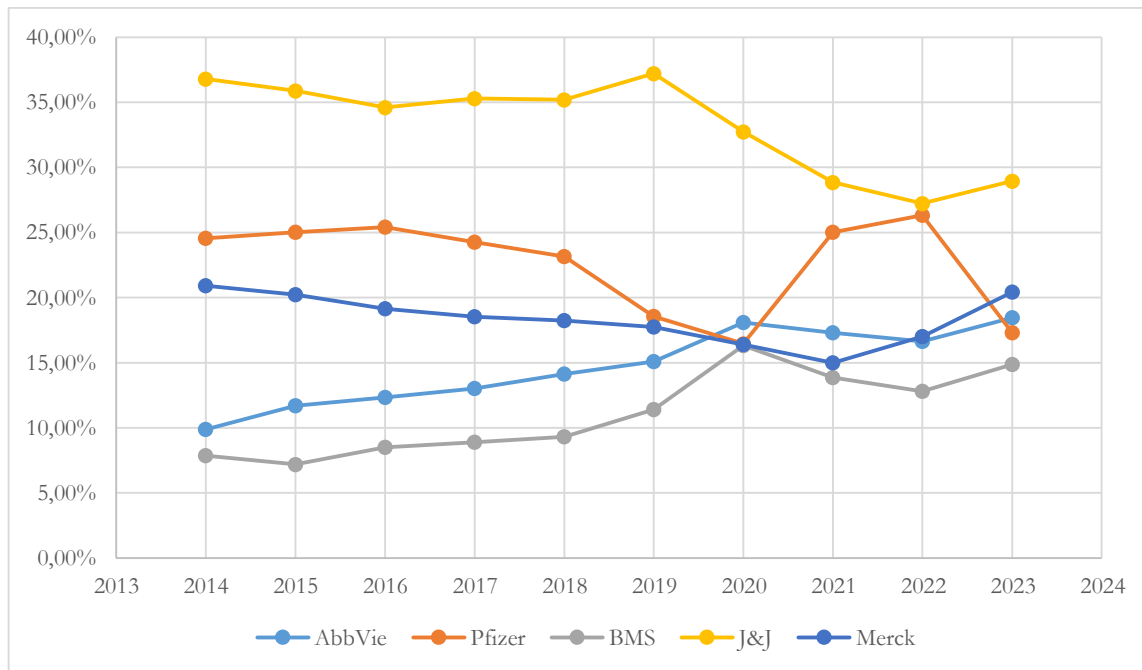
⁴² EUROPEAN COMMISSION, ‘A New Industrial Strategy for Europe’ (2020) COM(2020) 102 final.



Graph – X: Market shares in pharmaceuticals in Europe



Graph – X: Market shares in pharmaceuticals in the US



Unlike chemicals, pharmaceutical sales over the last decade have steadily increased. The trend is more pronounced in the US. The COVID pandemic significantly accelerated output for American firms, but the same did not materialize for European firms. This is not a surprising scenario, as the most commercialized COVID vaccines were products of Pfizer and Johnson & Johnson. Although both AstraZeneca and Sanofi developed their own vaccines, their use was not as widespread.⁴³ Pfizer’s success is mostly attributed to the superior capabilities of its vaccine based on messenger-RNA technology, co-developed with BioNTech.⁴⁴ Nonetheless, Pfizer’s victory seems limited, as its market share reverted back to pre-pandemic levels after a surge between 2020 – 2022. By contrast, every other US firm increased market share as the pandemic receded. AbbVie and BMS almost doubled their market shares over the decade.

In terms of structure, the European pharmaceutical market resembles an oligopoly. Four out of five firms obtain a 20% share or more. Some players like Novo Nordisk and AstraZeneca have been increasing their market shares, whilst Sanofi and GSK experienced declines. AstraZeneca’s rise coincides with the pandemic and its successful vaccine effort. Novo Nordisk likely owes its recent success to innovations in weight loss drugs like Ozempic, which made it the most valuable European company.⁴⁵ By contrast, Sanofi and GSK’s decline can be attributed to poor response to

⁴³ For data, see ‘COVID-19 vaccine doses administered by manufacturer’ (*Our World In Data*, 21 May 2024) <https://ourworldindata.org/grapher/covid-vaccine-doses-by-manufacturer?country=European+Union~USA>.

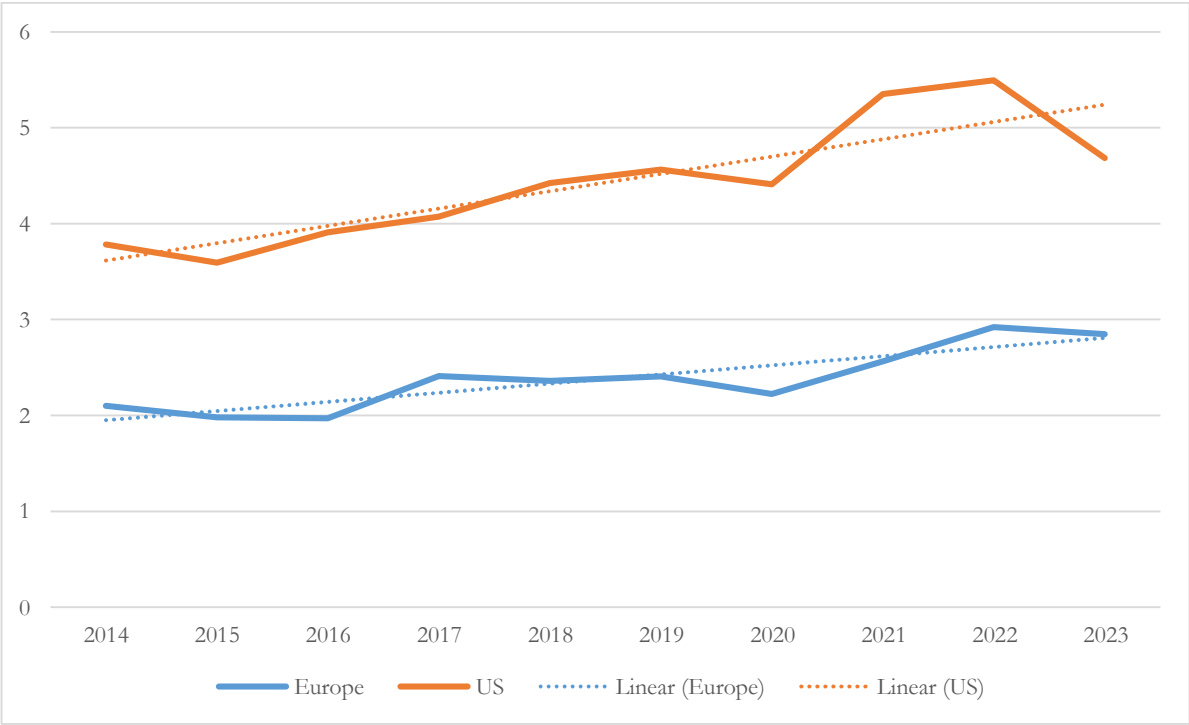
⁴⁴ VRINDA GOTE et al., ‘A Comprehensive Review of mRNA Vaccines’ (2023) 24 (3) *International Journal of Molecular Sciences* 2700.

⁴⁵ SANNE WASS & NAOMI KRESGE, ‘The Ozempic Effect: How a Weight Loss Wonder Drug Gobbled Up an Entire Economy’ (*Bloomberg*, 30 April 2024) <https://www.bloomberg.com/news/features/2024-04-30/denmark-and-novo-nordisk-ozempic-maker-s-success-makes-huge-impact>.

demands for innovative drugs. Both firms took a reputational hit for failing to deliver a COVID vaccine for a long time.⁴⁶

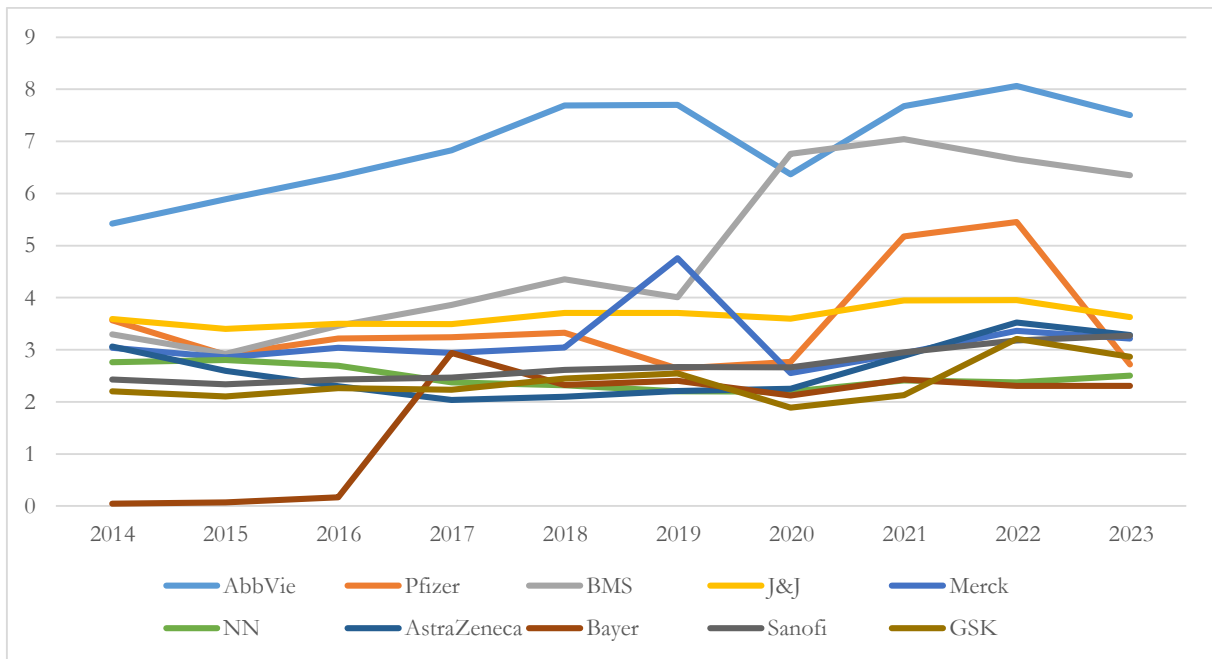
We contrast the evolution in sales and structure with productivity data. Below, we first explore how productivity evolved in each jurisdiction (Graph X) and follow up with firm-level observations (Graph X).

Graph – X: Average industry productivity in Europe and the US



Graph – X: Firm-level productivity in Europe and the US

⁴⁶ DANICA KIRKA, ‘Sanofi, GSK say COVID-19 shot won’t be ready until late 2021’ (*AP News*, 11 December 2020) <https://apnews.com/article/europe-coronavirus-pandemic-b465ce2e9483b972ad546b8c91021c01>.



While firms in both economies boosted productivity, the trend was more pronounced in the US. Put differently, the productivity gap between the two pharmaceutical markets has widened. At the firm-level, it can be observed that four of the top five most productive firms are American. European firms score about equally on the productivity scale, with firms clustering around each other. These observations are mirror images of the chemicals industry. Pfizer’s limited success in attaining market share during the pandemic is reflected in its productivity growth, which experienced a steep increase between 2020 – 2022 before falling back to pre-pandemic levels in 2023.

D. Energy

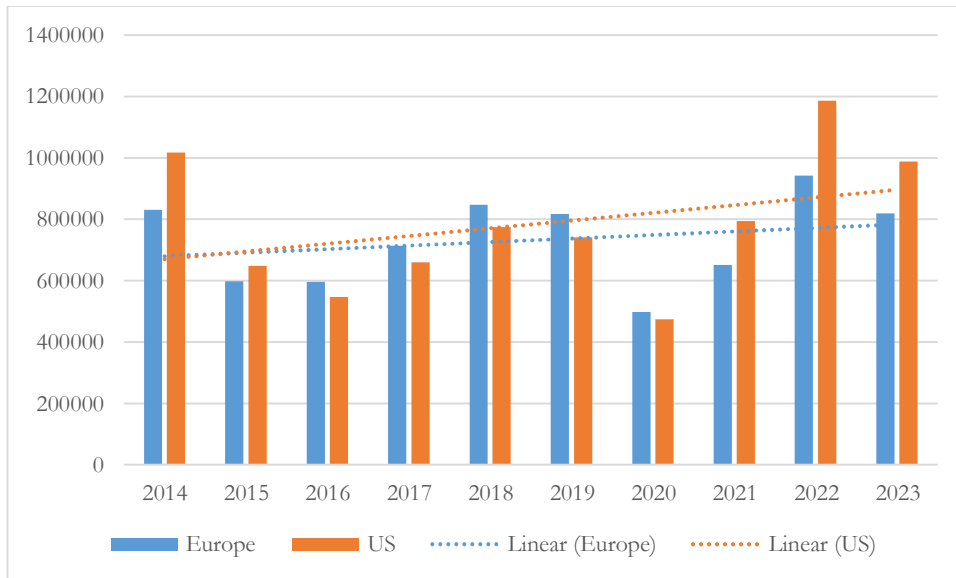
Energy is a crucial input for industry. Energy production is capital intensive, which is compounded by the transition toward renewable energies and new production methods like fracking.⁴⁷ Policy developments in both sides of the Atlantic highlight the importance of energy for competitiveness.⁴⁸

In Europe, the top five energy firms are Shell, BP, EDF, Engie, and E.ON. Their US counterparts are Exxon, Chevron, Marathon, Phillips, and Valero. Below, we illustrate total revenues for each economy (Graph X) followed by the structure of the markets (Graphs X and X).

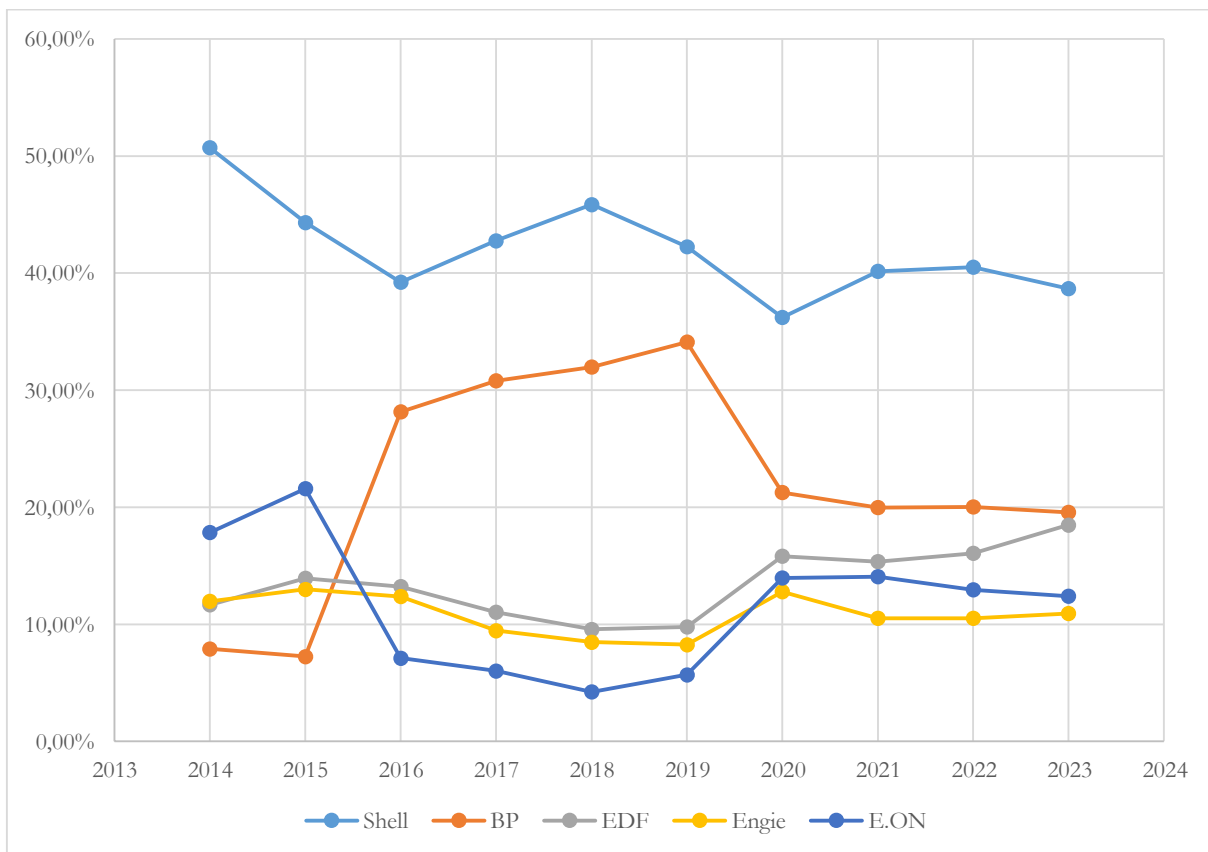
⁴⁷ ROHAN BEST, ‘Switching towards coal or renewable energy? The effects of financial capital on energy transitions’ (2017) 63 ENERGY ECONOMICS 75.

⁴⁸ See, e.g., HEATHER BOUSHEY & JUSTINA GALLEGOS, ‘Building a Thriving Clean Energy Economy in 2023 and Beyond’ (*The White House Briefing Room*, 19 December 2023) <https://www.whitehouse.gov/briefing-room/blog/2023/12/19/building-a-thriving-clean-energy-economy-in-2023-and-beyond/>. See also, DAVIDE CONSOLI, VALERIA COSTANTINI, & ELENA PAGLIALUNGA, ‘Sustainable energy and economic competitiveness in the EU’ (2023) 52 RESEARCH POLICY 104644

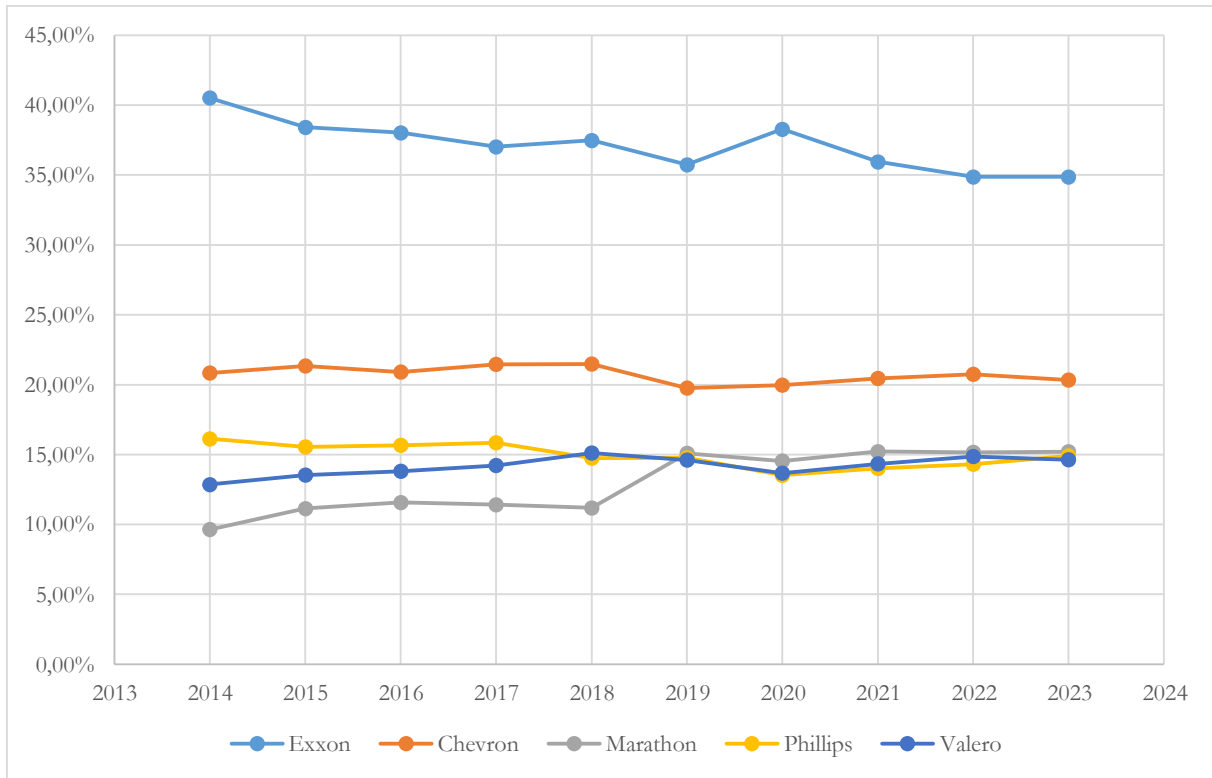
Graph – X: Energy sales in Europe and the US



Graph – X: Market shares in energy in Europe



Graph – X: Market shares in pharmaceuticals in the US



Energy sales resemble both chemicals and pharmaceuticals. On one hand, business is cyclical.⁴⁹ On the other hand, the overall trend has been an increase in overall output, with American sales volume accelerating slightly faster. Sales crashed during COVID for both economies, although recovery has been robust. The markets are also similarly structured. Shell and Exxon are leading the European and American energy markets, respectively, with around 35-40% market share each. The other firms compete with comparable market shares, converging around 15 to 20%. One notable feature of the US market is stability – market shares remained relatively constant over the ten year period. By contrast, firms in Europe experienced some churn; for example, BP’s share was around 7% in 2015 and 34% in 2019.

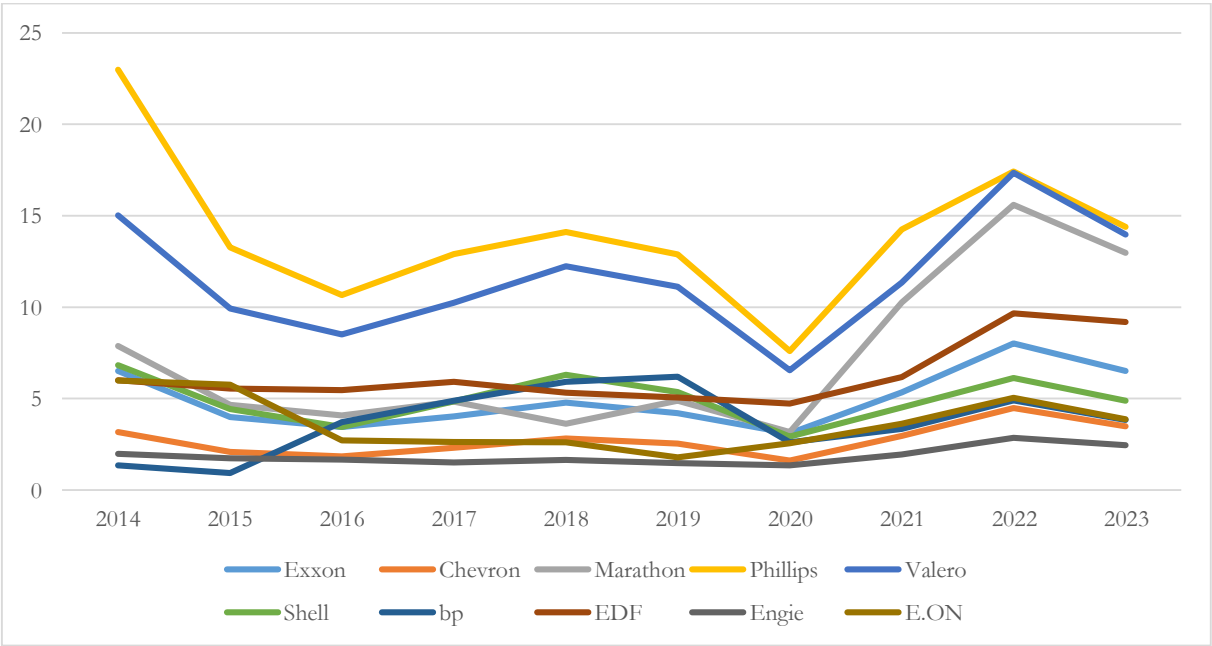
To observe how firms compete, we draw up two charts on productivity. The first one focuses on average productivity of all firms in a given market, whereas the second graph zooms into firm-level data.

Graph – X: Average industry productivity in Europe and the US

⁴⁹ Fluctuations in global commodity prices influence energy revenue significantly. See, Sam Meredith, ‘BP full-year net profit falls 21% on weak oil and gas prices’ (*CNBC News*, 4 February 2020) <https://www.cnbc.com/2020/02/04/bp-earnings-q4-2019.html>.



Graph – X: Firm-level productivity in Europe and the US



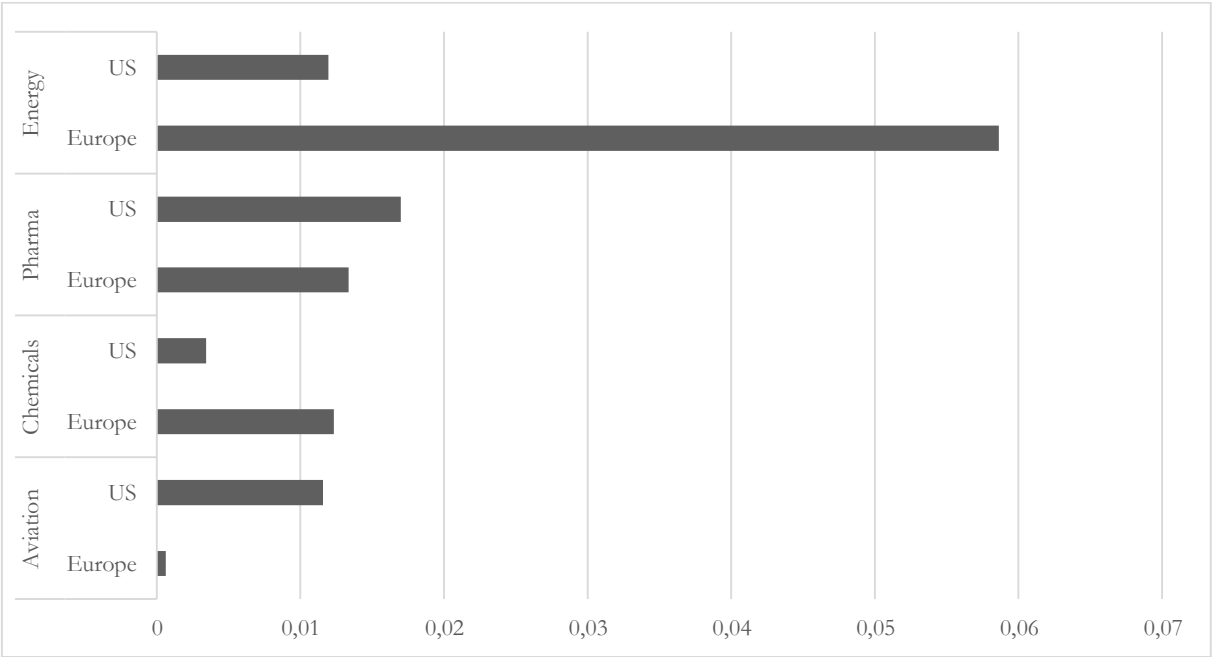
We observe that firms in both markets increased productivity over the decade. However, US firms have been more successful. While both markets display a similarly shaped productivity curve, the upward and downward moves in the US are more dramatic. In other words, US firms seem to both lose and gain productivity in a more pronounced manner. By contrast, European firms are more conservative – they do not lose much productivity, but they also do not gain much either. Looking at individual firms, one can observe that American firms dominate. Similar to pharmaceutical

markets, four out of top five most productive firms are US-based. The only European firm in the top five, Electricité de France, is approximately half as productive as the top US firms, Phillips and Valero. Engie is the biggest laggard.

E. Observations

Charting the market shares and productivity of firms allows us to run the covariance formula. We would expect a well-functioning market to allocate output toward productive firms over time. By contrast, if market share is distributed randomly or laggard firms are capturing bigger portions of the market, this would warrant further scrutiny. A large and positive covariance value reflects the former scenario, whilst a low or negative value describes the latter. Below, we provide the covariance values for all four industries in Europe and the US over a ten-year period.

Graph – X: Covariance values in Europe and the US



A few observations can be made based on the graph. Firstly, European markets seem to allocate resources better in two industries, namely chemicals and energy. The difference with the US is stark in both cases. By contrast, US markets perform somewhat better (~30%) in pharmaceuticals and much better in aviation. These values suggest that energy and chemicals firms striving to become more productive are likely to be better rewarded for their efforts in Europe. The same situation applies to aviation and, to a lesser degree, pharmaceutical firms in the United States.

How does this data translate into implications for case prioritization? Covariance values should be interpreted together with productivity figures. The idea is the following. The main claim of this dissertation is that competitiveness could be protected through a legal division of labor. While free

movement rules enable firms to expand activities and scale up, antitrust rules help markets allocate that scale away from unproductive firms. Therefore, low productivity can be the result of two things: either free movement rules fail or the antitrust law fails. In other words, low productivity may stem from firms *not investing enough* in productivity, or firms *not being rewarded* for their investments in productivity. Based on this premise and aided by the preceding data, we can make analyses on case prioritization.

If an industry is relatively productive and the covariance value is relatively high, it follows that markets are working well and firms are investing in productivity. In Baumol's words, firms are engaging in "productive entrepreneurship" under well-functioning markets.⁵⁰ In such cases, there exists little space for government intervention.⁵¹ In our sample, European chemicals and US pharmaceutical markets correspond to this scenario. This argument does not preclude intervention for the sake of it. It merely advocates for prudent use of public funds. Instead of chasing nirvana-like performance, state resources could be better utilized elsewhere.⁵²

In industries where productivity is relatively low but markets allocate well, low productivity likely stems from firms not investing enough in productive ventures like R&D. This is because the covariance value tells us that markets work reasonably well. In such cases, antitrust enforcement should be approached cautiously. Again, this does not mean enforcement would carry zero benefits. But resources are constrained. Instead, the EC can focus on free movement rules and legislative harmonization. This is because in well-functioning markets, low productivity can be a sign of low demand or weak access to talent or capital.⁵³ Firms will refrain from investing in productivity if their demand pool is stagnating, they struggle to find funding, or face fragmented regulation.⁵⁴ Thus, strengthening free movement rules on goods, persons, and capital as well as adopting harmonized legislation could be explored first before resorting to antitrust enforcement.⁵⁵

⁵⁰ WILLIAM J. BAUMOL, 'Entrepreneurship: Productive, unproductive, and destructive' (1996) 11 JOURNAL OF BUSINESS VENTURING 3.

⁵¹ This scenario is not completely free of errors. One cannot observe the absence of monopoly power from good performance. Our argument is simply that other scenarios present comparatively better opportunities for intervention. See, FRANKLIN M. FISHER, 'Diagnosing Monopoly' (1979) 19 QUARTERLY REVIEW OF ECONOMICS AND BUSINESS 7.

⁵² HAROLD DEMSETZ, 'Information and Efficiency: Another Viewpoint' (1969) 12 THE JOURNAL OF LAW & ECONOMICS 1.

⁵³ Growing markets are more conducive to technology adoption. See, YALE BROZEN, 'Invention, Innovation, and Imitation' (1951) 41 (2) THE AMERICAN ECONOMIC REVIEW 239.

⁵⁴ In a 2023 report, the European Investment Bank found that close to half of European businesses cite "availability of funding" as an impediment to investment. See, EUROPEAN INVESTMENT BANK, 'Investment Survey 2023: European Union Overview' (2023) <https://www.eib.org/en/publications/20230285-econ-eibis-2023-eu>.

⁵⁵ For example, demand can be boosted by reforming procurement rules. Sustainable and innovation procurement have been on the EC's agenda for a while, but progress has proven elusive. See, EUROPEAN COURT OF AUDITORS, 'Public procurement in the EU' (2023) ECA SPECIAL REPORT NO. 28 https://www.eca.europa.eu/ECAPublications/SR-2023-28/SR-2023-28_EN.pdf.

In markets where productivity is relatively high but markets allocate badly, like US energy markets, there is room for antitrust enforcement. Antitrust can boost productivity even further by incentivizing firms to perpetuate investment. However, the usual caveat applies here too. Enforcement resources may find better use elsewhere. Admittedly, the industry in question may be a policy priority for other reasons like improving a certain sector or production method.⁵⁶ In that case, antitrust intervention may be justified. Nonetheless, since productivity is relatively high, enforcement may generate diminished returns.

The last scenario is when industry productivity and the covariance value are relatively low or even negative. This leads to an inference that markets do not work well. Here, there is room for both free movement rules and antitrust law. Focusing on antitrust enforcement would improve the covariance value. This makes the markets allocate better. However, low productivity signifies that there is not much to allocate to begin with. In other words, productive firms may be failing to capture market share because demand or funding opportunities are insufficient.

Consequently, both antitrust law and free movement law can find use. Antitrust law remains important because enlarging demand or access to labor and capital in a badly functioning market may create perverse outcomes. Since markets do not allocate well, newly unlocked resources may accrue to unproductive firms. This is exactly the opposite of what competitiveness-minded antitrust law should do. Consequently, low productivity markets with poor allocative functions benefit from a policy mix that incorporates both free movement and antitrust intervention.

The four scenarios outlined above can be summarized in a “case prioritization matrix”.

⁵⁶ This may be tied to industrial policy too. Recent literature increasingly diverges from the traditional negative outlook surrounding industrial policy. See, *e.g.*, REKA JUHASZ, NATHAN LANE, & DANI RODRIK, ‘The New Economics of Industrial Policy’ (2023) NBER WORKING PAPER NO. 31538.

Table – X: Case prioritization matrix

Markets	<i>High productivity</i>	<i>Low productivity</i>
<i>Positive covariance</i>	No intervention European chemicals, US pharma	Internal market legislation European energy
<i>Negative covariance</i>	Antitrust enforcement (lower impact) US energy	Internal market legislation & antitrust enforcement (higher impact) European aviation

III. SUBSTANCE

Prioritizing which cases to analyze is only the first step in antitrust enforcement. One must also set out how competitiveness can be supported concretely. Case law adopts a structured approach to antitrust enforcement. First, context is a key component of analysis. Case law requires firm conduct be evaluated within the context of which it forms part. Second, establishing anticompetitive effects is methodical. As a rule, foreclosing equally efficient competitors incurs liability. But the level of efficiency is determined mostly statically. Although there are judicial remarks on protecting less efficient competitors, which may signal an appetite to protect potential productivity gains, these remarks have not been operationalized. The remainder of this section focuses on these two subjects.

1. Context

A. Overview

As David Teece noted, “[T]he firm is the central actor for the effectuation of innovation and technological change”.⁵⁷ Protecting productivity cannot ignore what firms do. However, firms act in context. One cannot judge firm conduct independent of the context in which it takes place. EU

⁵⁷ DAVID J. TEECE, ‘Technological Innovation and the Theory of the Firm: The Role of Enterprise-Level Knowledge, Complementarities, and (Dynamic) Capabilities’ in HALL & ROSENBERG (eds), *Handbook of the Economics of Innovation* (Elsevier 2010).

antitrust law has long abandoned such formalistic examinations. Instead, a context-specific analysis of firm behavior enjoys prominence.⁵⁸

Context consists of the relevant factors influencing the practice in question. Case law suggests that context is often evaluated in legal, technical, and economic terms. Formally identical practices can be anticompetitive, benign, or procompetitive depending on their context. For example, input pricing is benign unless it causes non-integrated rivals to operate unprofitably, in which case it becomes an illegal margin squeeze.⁵⁹

Legal context includes the regulatory regime applicable to the dominant undertaking.⁶⁰ For example, telecommunications rules can mandate a vertically integrated telecoms operator to make available its cable infrastructure on non-discriminatory terms.⁶¹ Such a provision has implications for antitrust law, as the analysis starts from the assumption that access must be guaranteed. Similarly, the legal context can entail the intellectual property regime. Since intellectual property rules prohibit misrepresentation or fraudulent activity, antitrust law takes this into account.⁶²

Economic context generally refers to the economic conditions of competition prevalent in the relevant market. A broad range of factors can be incorporated into the economic context. For example, an undertaking's discontinuation of supply can be tolerated in cases where the industry in question is going through crisis.⁶³ An exclusivity agreement is usually found abusive only if it has a broad coverage of trading partners. A controversial way in which economic context may be invoked is the degree of market power commanded by the dominant firm. In some cases, dominance can reach very high levels (*e.g.*, "superdominance") due to structural characteristics intrinsic to some markets.⁶⁴ Antitrust law infers that greater dominance implies a wider scope of responsibility for the dominant firm in circumscribing its market behavior.

Technical context refers to technological characteristics underpinning a market. These characteristics may include the nature of products, the importance of a device for other players in the supply chain, or the execution of production methods. For example, whether a patent has been

⁵⁸ PABLO IBANEZ COLOMO, 'Beyond the "more economics-based approach": A legal perspective on Article 102 TFEU case law' (2016) 53 (3) COMMON MARKET LAW REVIEW 709.

⁵⁹ *TeliaSonera* (n X), para 43.

⁶⁰ NIAMH DUNNE, 'The Role of Regulation in EU Competition Law Assessment' (2021) 44 (3) WORLD COMPETITION 287.

⁶¹ *Slovak Telekom* (n X), para. 54.

⁶² *AstraZeneca* (n X), para. 93.

⁶³ *B.P.* (n X), para. 42

⁶⁴ *Google Shopping* (n X), para. 182.

classified as “standard-essential” carries implications for antitrust enforcement.⁶⁵ Similarly, if the technical properties of products reveal that only one manufacturer has the capability to satisfy consumer demand, this must be taken into account.⁶⁶

B. Context for competitiveness

Legal, economic, and technical context all impact productivity. For instance, regulations can constrain, channel, or support innovation. Some research suggests that the GDPR reduced innovation in the EU while others claim it merely channeled it.⁶⁷ By contrast, researchers found the impact of EU chemicals regulations to be positive on productivity.⁶⁸

Besides laws, economic factors also matter for productivity, and therefore competitiveness. Economic context in antitrust does not usually entail financing. This is a significant oversight. Competitiveness depends on productivity – defined as lowering costs (efficiency) or creating new products (innovation). These activities are forward-looking and risky. Firms will need greater access to funding. It is therefore important for antitrust to consider the funding environment in which competition takes place. Enforcers can assess the financing environment to determine whether efficiency and innovation are favored by markets.

Firms can raise money in many ways. Besides equity, they can rely on bank loans, capital markets, venture funding, angel investors, or capital from other corporations. An important factor that impacts the availability of funding is monetary policy. As recognized by Article 127 TFEU, monetary policy is an important parameter of competition. To see how, consider interest rates. Central banks can issue low-cost credit by keeping interest rates low. The funneling of cheap money into the economy often increases risk appetite, therefore biasing independent entry. By contrast, tight monetary policy may bias entrepreneurial stringency and steer funds toward less risky ventures undertaken by incumbents.⁶⁹ It may also induce internal innovation by firms since high borrowing

⁶⁵ *Huawei* (n X), para. 53.

⁶⁶ *Qualcomm* (n X), para. 401.

⁶⁷ Compare, KNUT BLIND, CRISPIN NIEBEL, & CHRISTIAN RAMMER, ‘The impact of the EU General data protection regulation on product innovation’ (2024) 31 (3) *INDUSTRY AND INNOVATION* 311; with REBECCA JANSSEN, REINHOLD KESLER, MICHAEL KUMMER, & JOEL WALDFOGEL, ‘GDPR and the Lost Generation of Innovative Apps’ (2022) NBER WORKING PAPER NO. 30028.

⁶⁸ NOUHA ARFAOUI, ‘Eco-innovation and regulatory push/pull effect in the case of REACH regulation: empirical evidence based on survey data’ (2018) 50 *APPLIED ECONOMICS* 1536.

⁶⁹ MICHAEL A. HITT, ROBERT E. HOSKISSON, RICHARD A. JOHNSON, & DOUGLAS D. MOESEL, ‘The Market for Corporate Control and Firm Innovation’ (1996) 39 (5) *THE ACADEMY OF MANAGEMENT JOURNAL* 1084.

costs slow down the market for corporate control. Put simply, aggregate demand management at the economy level influences production at the firm level.⁷⁰

Monetary policy is important for competitiveness. Independent entry becomes increasingly unlikely in tight money markets. In such an environment, fewer startups get funded.⁷¹ In other words, higher interest rates constrain funding opportunities for firms bent on improving competitiveness through efficiency or innovation. This impairs competitiveness as technology-based competition requires high risk appetite, which is cultivated more easily with lower interest rates. By contrast, incumbents stand to benefit from tightening trends in monetary policy. This can be an important cue for antitrust enforcement. A tighter monetary policy may translate into more antitrust protection for entrants.

Besides monetary policy, capital markets also matter for competitiveness. If capital markets work well, firms find it easier to secure funding.⁷² This ensures that firms pursuing efficiency or innovation can acquire the financial resources to persist against larger rivals at the initial stage. Hence, well-functioning capital markets housing venture firms with low discount factors will benefit competitiveness.⁷³ Enforcers can consider the availability of funders as a component of the economic context in antitrust assessments.

Financing can also help identify firms of interest in a relevant market. In EU antitrust law, economic context requires identifying competitors. In protecting competitiveness, determining which firms have the potential to increase efficiency or innovate becomes important. It is admittedly difficult to develop practical methods for this task. There may be many firms that fit the bill. But enforcers can rely on venture capital activity to narrow the population. Economic research suggests that obtaining venture capital is associated with higher firm efficiency – a dollar of venture capital is three times more likely to stimulate patenting than a dollar of traditional R&D.⁷⁴ Furthermore, venture capitalists often fund young firms who operate in uncertain and

⁷⁰ DAVID SOSKICE, 'Macroeconomics and Varieties of Capitalism' in Hancke, Rhodes, & Thatcher (eds), *Beyond Varieties of Capitalism: Conflict, Contradictions, and Complementarities in the European Economy* (OUP 2007).

⁷¹ BEN THOMPSON, 'The Four Horsemen of the Tech Recession' (*Stratechery*, 6 February 2023) <https://stratechery.com/2023/the-four-horsemen-of-the-tech-recession/> accessed 4 April 2023.

⁷² Several scholars made passing remarks to the importance of capital markets for antitrust law. See, e.g., WARD S. BOWMAN JR., *Patent and Antitrust Law*, reviewed by OLIVER E. WILLIAMSON (1974) 83 (3) *THE YALE LAW JOURNAL* 647. Bork's *Antitrust Paradox* also features analyses involving capital markets.

⁷³ Research suggests that 85% of relocating startups move to the US due to capital availability, boosting US competitiveness. See, STEFAN WEIK, ANN-KRISTIN ACHLEITNER, & REINER BRAUN, 'Venture capital and the international relocation of startups' (2024) 53 (7) *RESEARCH POLICY* 105031.

⁷⁴ SAMUEL KORTUM & JOSH LERNER, 'Assessing the Contribution of Venture Capital to Innovation' (2000) 31 (4) *THE RAND JOURNAL OF ECONOMICS* 674.

informationally asymmetric settings and help them develop capabilities.⁷⁵ Such data cannot provide exhaustive conclusions on its own. But it can still be useful.⁷⁶ Enforcers can look at which firms attract the most VC funding and consider them as a relevant part of the economic context.

Protecting competitiveness also depends on understanding the technological context. Firms improve productivity based on the nature of the technology in question.⁷⁷ Some technologies follow a science-based development path. These technologies require linear and predictable processes, flowing from research and development to design and marketing. This model is known as the serial model of innovation.⁷⁸ By contrast, other technologies are developed in a much more unpredictable way. This type of development relies on rapid feedback and features adaptability, course correction, design, and re-design.⁷⁹ Known as the simultaneous model of innovation, it finds roots in World War II, where technological arms-race required continuous redesign based on feedback from the battlefield.⁸⁰ This dynamic is playing out in many contemporary industries, where technology relies on “speed” and “rapid testing” rather than “perfecting” products over long processes.⁸¹

Technologies following the serial model are often underpinned by natural or technical forces that induce a specific pattern of development. For example, the design and manufacturing of semiconductors follow Moore’s Law. Moore’s Law states that computing power doubles roughly every two years at no extra cost. This is a principle based on physics. Similarly, production of agrochemicals is predicated upon the evolution of pest resistance as a driver of innovation.⁸² This is a principle based on biology and chemistry. These patterns enable firms to engage in long term planning and forecasting relatively reliably.⁸³

By contrast, simultaneous innovation frequently occurs in high-velocity markets and is simpler, unstable, and adaptive. Let alone providing leeway for firms to undertake innovation sequentially,

⁷⁵ STEFANO CASELLI & MARTA ZAVA, ‘Venture Capital Network’ in CUMMING & HAMMER (eds), *The Palgrave Encyclopedia of Private Equity* (Springer 2023).

⁷⁶ On the use of information from “prediction markets” in conjunction with other evidence, see REBECCA H. ALLENSWORTH, ‘Prediction Markets and Law: A Skeptical Account’ (2009) 122 HARVARD LAW REVIEW 1217.

⁷⁷ STEFANO BRESCHI, FRANCO MALERBA, & LUIGI ORSENIGO, ‘Technological Regimes and Schumpeterian Patterns of Innovation’ (2000) 110 (463) THE ECONOMIC JOURNAL 388.

⁷⁸ RICHARD NELSON & SIDNEY G. WINTER, *An Evolutionary Theory of Economic Change* (HUP 1982).

⁷⁹ JORDE & TEECE (n X) 77.

⁸⁰ PHILIP SCRANTON, ‘The Challenge of Technological Uncertainty’ (2009) 50 (2) TECHNOLOGY AND CULTURE 513.

⁸¹ SYLVIA PFEIFER & CHRIS MILLER, ‘The age of drone warfare is disrupting the defence industry’ (*Financial Times*, 8 July 2024) <https://www.ft.com/content/cf6ded0f-f595-4359-b8f7-273799f1149c>.

⁸² NICOLAS PETTI, ‘Antitrust review of ag-biotech mergers: Appropriability versus cannibalization’ (*Truth On The Market*, 31 March 2017) <https://truthonthemarket.com/2017/03/31/antitrust-review-of-ag-biotech-mergers-appropriability-versus-cannibalization-ag-biotech-symposium/>.

⁸³ SIDNEY G. WINTER, ‘Schumpeterian competition in alternative technological regimes’ (1984) 5 (4) JOURNAL OF ECONOMIC BEHAVIOR AND ORGANIZATION 287.

the dynamic environment renders existing processes nugatory, irrelevant, or even dangerous due to risks of inertia and overconfidence.⁸⁴ Firms in these conditions must rely on improvisation, prototyping, beta-testing and real-time feedback, botch many attempts, and race against time.⁸⁵ The current innovation race concerning artificial intelligence may be an example.

Technological context can also help enforcers in more practical ways. One may recall the prioritization exercise earlier. The intuition suggested that antitrust enforcement would help most where markets are not allocating resources to productive firms. Finding the covariance value to determine market failure depends on productivity. In turn, calculating productivity requires the observer to weigh the contribution of each input to firm output. When the goods produced are capital intensive, more weight must be attached to capital. Technological context can inform the range of these weights. For example, software markets are considered less capital intensive than hardware markets.⁸⁶ The productivity of firms manufacturing hardware would weigh labor inputs less relative to firms producing software.

2. Anticompetitive Effects

Article 102 TFEU generally establishes liability when a dominant firm excludes a competitor. However, not all instances of exclusion are prohibited, but only those that exclude an equally efficient competitor are (the so-called “AEC principle”). Accordingly, anticompetitive effects hinge on whether a dominant firm’s conduct excluded an equally efficient rival. However, this rule has exceptions. In certain cases, less efficient competitors may also be protected to enhance competitiveness.⁸⁷ Nonetheless, how exactly this protection should materialize, and in what circumstances, is left unarticulated.

The standard test to satisfy the AEC principle is a price-cost test. But EU antitrust law often conducts price-cost tests in a static manner. Since productivity often occurs over a longer timeframe, a tweaked test is needed to protect competitiveness. Developing an alternative test like this is allowed by the law. Thus, enforcers can demonstrate that firm conduct is capable of foreclosing efficient rivals in different ways. If one can develop a method to safeguard innovation or dynamic efficiency, antitrust law can be reoriented toward protecting competitiveness.

⁸⁴ LINDA ARGOTE & ELLA MIRON-SPEKTOR, ‘Organizational Learning: From Experience to Knowledge’ (2011) 22 (5) ORGANIZATION SCIENCE 1123.

⁸⁵ KATHLEEN M. EISENHARDT & BEHNAM N. TABRIZI, ‘Accelerating Adaptive Processes: Product Innovation in the Global Computer Industry’ (1995) 40 ADMINISTRATIVE SCIENCE QUARTERLY 84.

⁸⁶ VIJAY GURBAXANI & HAIM MENDELSON, ‘An empirical analysis of software and hardware spending’ (1992) 8 DECISION SUPPORT SYSTEMS 1.

⁸⁷ Case C-23/14 *Post Danmark II* [2015].

Below, we develop intuitions on how to do so. As argued, competitiveness mainly depends on two modes of competing. First, enforcers can safeguard efficiency. This is rivalry for a more efficient allocation of existing resources, which materializes as a race to lower prices. Second, enforcers can protect innovation. By this concept, we refer to rivalry for introducing new products or entering new markets.⁸⁸ Together, these concepts envisage the role of antitrust as guarding competitiveness.⁸⁹

A. Efficiency competition

Efficiency competition is a race amongst firms to realize potential gains in the future by using resources more efficiently. Efficient firms become successful by investing to improve their cost structures. Rather than taking technical constraints on production as given, efficient firms improve technical prowess, for example via investing in fixed costs.⁹⁰ These expenditures in the present are made to reap the rewards of lower per-unit costs in the future.

Efficiency supports competitiveness by creating more output with the same (or less) input. Efficient firms prevail over rivals by making them “X-inefficient”.⁹¹ X-inefficiency refers to the gap between actual and potential production costs for an output. By doing so, efficient firms move closer toward potential costs and gain advantage over firms stuck with current technology. Therefore, the winners of efficiency competition are firms who can reach the technological frontier the fastest. This directly contributes to competitiveness. Empirical literature demonstrates that fixing lowering costs boosts competitiveness considerably.⁹²

An example illustrates the idea. In 1978, the US Federal Trade Commission (“**FTC**”) alleged that DuPont illegally monopolized the titanium dioxide pigments market.⁹³ Titanium dioxide pigments are used to enhance the white color of papers and paint. The FTC’s theory of harm isolated four practices employed by DuPont: capacity expansion, demand foreclosure, price reduction, and refusal to license. In particular, the FTC argued that DuPont prevented rivals from competing by expanding its capacity to cover all future demand for pigments, which was possible due to its cost

⁸⁸ Some authors mention “moving toward the technological frontier or moving the technological frontier forward”. Innovation competition is similar to the latter, whereas dynamic efficiency comes close to the former. See, JOSEPH E. STIGLITZ & BRUCE C. GREENWALD, *Creating a Learning Society: A New Approach to Growth, Development, and Social Progress* (Columbia University Press 2014).

⁸⁹ This is also compatible with safeguarding “long-term welfare”. See, DAVID J. TEECE, ‘The Dynamic Competition Paradigm: Insights and Implications’ (2023) 1 COLUMBIA BUSINESS LAW REVIEW 375.

⁹⁰ This is a Kirznerian mode of entrepreneurship: constantly searching for imperfections in the market and striving to fix them by reducing costs. See, ISRAEL KIRZNER, *Competition and Entrepreneurship* (University of Chicago Press 1978).

⁹¹ HARVEY LEIBENSTEIN, ‘Allocative Efficiency vs. “X-Efficiency”’ (1966) 56 (3) THE AMERICAN ECONOMIC REVIEW 392.

⁹² ROGER FRANTZ, ‘Antitrust and X-Efficiency’ (2015) 60 (3) THE ANTITRUST BULLETIN 221.

⁹³ DOUGLAS DOBSON, WILLIAM SHEPHERD, & ROBERT D. STONER, ‘Strategic Capacity Preemption: *DuPont* (Titanium Dioxide)’ in KWOKA & WHITE (eds), *Antitrust Revolution: The Role of Economics* (OUP 1994).

advantage. However, the case was overturned on appeal. This was because DuPont's cost advantages stemmed from efficiency. While the industry was following less efficient sulfate-based production processes, DuPont invested in an alternative method based on ilmenite ores. This cost-reduction was only possible through sacrificing short-term returns and by making expenditures to lower future costs.

Firms can engage in efficiency competition through adaptivity.⁹⁴ One way to achieve this is experimenting with hierarchical or decentralized systems of organizing. Coase taught us that there are costs and benefits to using markets or firms to organize economic activity. Determining the optimal form of organizing is an ongoing calculus that depends on many factors like changing demand or technology. Hence, greater efficiency could be found by experimenting with vertical or contractual integration. For example, Apple's introduction of an agency-model pricing system attracted book publishers away from Amazon, which used a more integrated model.⁹⁵ Another example is the Danish shipping firm Maersk, whose success is mainly attributed to organizational adaptivity.⁹⁶ Throughout its history, the firm oscillated between integration and disintegration to remain competitive. A third example pertains to semiconductor manufacturing. Literature demonstrates that specializing in chip design by outsourcing production prevailed over vertical integration.⁹⁷

Efficiency competition can materialize as low-end disruption as well. Low-end disruption is a method of competition envisaged by Clayton Christensen and colleagues. It occurs in two stages. First, a rival starts serving the lower segments of an incumbent's demand pool. These segments are often ignored by the incumbent because they do not require the high-end products made to satisfy cutting-edge customers. They are also not as profitable. The rival takes advantage of this opportunity by introducing a less attractive but "good enough" product. As the rival establishes a foothold, it gradually moves up the ladder and starts exerting pressure on the incumbent's primary customers. For example, video game console makers may improve their products too aggressively and alienate some game studios by inflating their learning curve.⁹⁸ Overshooting the needs of these

⁹⁴ ALESSIO COZZOLINO, GIANMARIA VERONA, & FRANK T. ROTHARMEL, 'Unpacking the Disruption Process: New Technology, Business Models, and Incumbent Adaptation' (2018) 55 (7) JOURNAL OF MANAGEMENT STUDIES 1166.

⁹⁵ Since the agency model facilitated resale price maintenance, it was condemned by antitrust regulators. In hindsight, Apple could have opted for a more efficient arrangement of e-book sales to steal Amazon customers. See, GEOFFREY MANNE & WILLIAM RINEHART, 'The US e-Books case against Apple: The procompetitive story' (2012) 3 CONCURRENCES 18.

⁹⁶ RENE POULSEN, KRISTOFFER JENSEN, RENE S. CHRISTENSEN, & LIPING JIANG, 'Corporate Strategies and Global Competition: Odense Steel Shipyard, 1918 – 2012' (2017) 91 BUSINESS HISTORY REVIEW 707.

⁹⁷ See also, NAMCHUL SHIN, KENNETH L. KRAEMER, & JASON DEDRICK, 'R&D and firm performance in the semiconductor industry' (2016) 24 (3) JOURNAL OF INDUSTRY AND INNOVATION 280.

⁹⁸ HAKAN ÖZALP, CARMELO CENNAMO, & ANNABELLE GAWER, 'Disruption in Platform-Based Ecosystems' (2018) 55 (7) JOURNAL OF MANAGEMENT STUDIES 1203.

studios may create a vulnerable spot for low-end disruption. Rivals with a good enough console can entice those studios with a cheaper but sufficiently capable product. Markets for visual design software give another example. Rivals like Figma and Canva used to compete with Adobe by targeting neglected customers, such as social media content creators and small businesses; however, they increasingly penetrate Adobe’s main markets in professional design.⁹⁹

The law would be engineered to protect firms with a potential of becoming more efficient in the future. This corresponds to those exceptional circumstances where the law diverges from safeguarding only equally efficient competitors. Examples include *Compagnie maritime belge*, *Post Danmark II*, and *Rio Tinto Alcan*. It can also speak to protecting “potential competition”, as cases like *TeliaSonera*, *Telefonica*, and *Deutsche Telekom* explain.

In well-functioning markets, efficient firms will eventually succeed. Nonetheless, antitrust law can find room for application. This corresponds to the lower left quadrant in the prioritization matrix. Here is where antitrust enforcement can “speed up the arrival of the long run”.¹⁰⁰ By contrast, in some cases, exclusionary conduct may cause “not-yet-as-efficient” competitors to fall victim to predatory acts by incumbents in the present due to low scale or weak access to capital. This scenario reflects the lower right quadrant where antitrust enforcement can be the most useful by dissuading lazy monopolists’ attempts to nip efficiency generation in the bud.

Although intuitive, protecting efficiency entails costs.¹⁰¹ The risk of false positives is the most glaring issue. The proposed law would protect efficiency by essentially making a bet. It would confide that some firms will become more efficient than incumbents in the long term. Naturally, this requires directly assessing firms’ efficiency. In other words, we must observe how firms can improve productivity, or the ability to produce more output with less input through technical prowess. For instance, in the low-end disruption scenario, enforcers must be able to track an entrant with a disruptive potential.

B. Innovation competition

Innovation competition supports competitiveness by forcing firms to introduce new products or enter new markets. Innovation competition is essentially competition for the non-consumption. Non-consumption refers to an inability of customers to purchase and use products to fulfil their

⁹⁹ NILAY PATEL, ‘Canva CEO Melanie Perkins thinks the design world needs more alternatives to Adobe’ (*The Verge*, 8 July 2024) <https://www.theverge.com/24191080/canva-ceo-melanie-perkins-design-ai-adobe-competition-decoder-podcast-interview>.

¹⁰⁰ FRANK H. EASTERBROOK, ‘Limits of Antitrust’ (1984) 63 TEXAS LAW REVIEW 1.

¹⁰¹ FRANK EASTERBROOK, ‘Predatory Strategies and Counterstrategies’ (1981) 48 UNIVERSITY OF CHICAGO LAW REVIEW 263.

needs.¹⁰² Thus, innovation competition is a race to turn non-consumers into consumers by creating or entering new markets.

Innovation competition targets not-yet-existing markets and thus requires a greater ability to sense and seize business opportunities. But the payoff is equally larger. Innovation competition can be a profound assault on an incumbent. Although efficiency competition is intuitive, competing mainly on the basis of lower costs incurs tougher rivalry. Incumbents may find efficiency competition easier to detect and tackle.¹⁰³ By contrast, innovation competition may insulate a firm from direct rivalry by incumbents. For example, American semiconductor firms successfully avoided fierce competition from efficient Japanese manufacturers by reorienting from producing DRAMs to microprocessors.¹⁰⁴

Innovation competition can materialize in specific ways too. One mode is market unbundling. Many large firms are “conglomerates” – businesses spanning many areas of industry. For example, Amazon is not only an online retailer, but is also a provider of cloud services, video, and household items. Each of these businesses encompass many activities. Amazon’s e-commerce platform includes products ranging from books and clothing to devices and equipment.

Although diversification can bring many benefits, it is frequently cited as an antitrust concern.¹⁰⁵ But diversification presents opportunities for innovation competition by rivals. A firm serving many different customers at once faces difficulties. Chief among these is confusion and disorientation (or “diseconomies of scope”).¹⁰⁶ Serving customers with diverging needs requires executing some operations at the lowest common denominator. This puts some customers at risk of being unserved (or served insufficiently).¹⁰⁷ Such opening are ideal targets for rivals to exploit.

For example, Amazon’s horizontal e-commerce platform may be unable to satisfy specific customer needs in clothing sales. Online clothing customers may value specific functionalities on a website (*e.g.*, tools for trying-on clothes virtually) and are more price-sensitive. They may be

¹⁰² EFOSA OJOMO, ‘Nonconsumption is your fiercest competitor’ (*Christensen Institute*, 27 July 2016) <https://www.christenseninstitute.org/blog/non-consumption-is-your-fiercest-competition-and-its-winning/>.

¹⁰³ SALIM RASHID, ‘Quality in Contestable Markets: A Historical Problem?’ (1988) 103 *THE QUARTERLY JOURNAL OF ECONOMICS* 245.

¹⁰⁴ JEFFREY T. MACHER, DAVID MOWERY, & DAVID HODGES, ‘Reversal of Fortune? The Recovery of the U.S. Semiconductor Industry’ (1998) 41 *CALIFORNIA MANAGEMENT REVIEW* 107.

¹⁰⁵ Tim Wu’s scholarship illustrates this concern. See, for example, TIM WU, ‘Tech Dominance and the Policeman at the Elbow’ in K. WERBACH (ed), *After the Digital Tornado: Networks, Algorithms, Humanity* (CUP 2020); TIM WU, *The Curse of Bigness: Antitrust in the New Gilded Age* (Columbia Global Reports 2018). See also, Case COMP/M.2220 *General Electric/Honeywell* [2001].

¹⁰⁶ TIM BRESNAHAN, SHANE GREENSTEIN, & REBECCA HENDERSON, ‘Schumpeterian competition and diseconomies of scope’ (2011) HBS WORKING PAPER NO. 11-077.

¹⁰⁷ JEFF JORDAN & D’ARCY COOLICAN, ‘Platforms vs Verticals and the Next Great Unbundling’ (*A16Z Blog*, 11 September 2019) <https://a16z.com/platforms-vs-verticals-and-the-next-great-unbundling/>.

underserved by Amazon’s generalist platform. As a result, competitors like Shein or Zalando may find an opening for entry.¹⁰⁸ Another example concerns app stores and generative AI. App stores include many applications, ranging from communications and entertainment to healthcare and finance. These segments can be targeted by dedicated app stores, which may present a threat to generalist stores. Digital Markets Act has made this scenario a real possibility. In terms of generative AI, applications like ChatGPT are unlikely to cater to every specific task. Instead, specialized applications are springing up. For example, Microsoft’s GitHub Copilot is an assistant powered by generative AI that helps developers write computer code more effectively.¹⁰⁹

Firms can also innovate in terms of business models, or how they make money. An emerging example concerns personal finance. The buy-now, pay-later (“BNPL”) schemes are short-term financing primarily used for online purchases, where consumers are loaned a small amount of money they pay back in instalments.¹¹⁰ BNPL differentiates from alternative payment methods, such as credit cards, through business model innovation. Unlike traditional payment methods, BNPL providers do not make money off interest. They also do not perform background checks on consumers, therefore catering to underserved populations. Consequently, BNPL targets nonconsumption by targeting consumers unable to obtain services from established financial institutions.

Case law encourages innovation competition. Many decisions acknowledge innovation as an important competitive parameter.¹¹¹ The law seems especially receptive toward new product introductions.¹¹² However, what constitutes a new product or market is not defined clearly. The law comes closest to a definition in refusal to supply cases. Cases like *Magill* and *IMS Health* associate new products with creating specific, constant, and regular demand. But this is not to say that new products must conjure an entirely novel market – they can attack incumbents in established markets as well. That said, identical products with slightly different features cannot constitute “new products”.¹¹³ A tentative conclusion to this (admittedly vague) line of cases could be that innovation

¹⁰⁸ JUOZAS KAZIUKENAS, ‘Shein Forces Amazon To Lower Seller Fees’ (*Marketplace Pulse*, 6 December 2023) <https://www.marketplacepulse.com/articles/shein-forces-amazon-to-lower-seller-fees>.

¹⁰⁹ GitHub Copilot has already reached profitability. See, REED ALBERGOTTI, ‘GitHub’s AI coding assistant Copilot is a moneymaker’ (*Semafor*, 8 November 2023) <https://www.semafor.com/article/11/08/2023/githubs-ai-coding-assistant-copilot-is-a-moneymaker>.

¹¹⁰ DAISY ORTIZ-BERGER, ‘Is Banking the Next Blockbuster? An Empirical Study of the Impact of Disruptive Technology in Banking’ (2022) 3 (9) *JOURNAL OF LIBERAL ARTS AND HUMANITIES* 27.

¹¹¹ See, e.g., Case C-680/20 *Unilever Italia* [2023].

¹¹²Case AT. 39846 *Dassault* [2015].

¹¹³ Case AT. 39899 *Topps Europe* [2014].

hinges on the capacity of a product to elicit new customer interest, thereby addressing non-consumption.

Although innovation competition can occur in many ways, it may be difficult for antitrust law to protect it. To be clear, the law is not the problem here. The “equally efficient competitor” criterion of the AEC principle encompasses not only efficiency but also innovation.¹¹⁴ The problems are practical. Some indicators of innovation competition, such as market unbundling, can be observed easily. This is not the case for others. For example, understanding a firm’s capacity to innovate requires analyzing their businesses.¹¹⁵ Evidence is qualitative and subjective, reflecting the uncertain nature of innovation competition. Since the law cannot deal with hypotheticals, enforcers must be wary of “thinking a thought before it has been thought”.¹¹⁶ Nonetheless, methodically assessing firms’ potential to innovate can be a first step.

IV. MEASURING EFFICIENCY AND INNOVATION POTENTIAL

The preceding analysis shows that supporting competitiveness is an evidential problem. Enforcers need tools to approximate which firms show a potential to innovate or become efficient in the future. Put differently, an observer must identify which firms can increase productivity by bringing down costs or by introducing new products and entering new markets. Protecting such firms would be a counterweight to the “quiet life” that lazy monopolists prefer.¹¹⁷

Before exploring the question of measurement, a reminder is in order. While conducting these measurements, observers need to remember three overarching principles. First, the analysis should not be static. Rather than taking a snapshot of competition metrics, one must observe their *tendency*. For instance, cost analysis should be conducted on a year-on-year basis. Second, context is king. As explored earlier, the same practice can produce different legal outcomes in different contexts. Enforcers must pay attention to legal, economic, and technical context in which they make the assessment. For example, technological context can help enforcers compare cost curves by

¹¹⁴ See, e.g., *Unilever Italia* (n 111), para. 39.

¹¹⁵ This necessity is acknowledged by US enforcers. See, FIONA SCOTT MORTON, ‘Antitrust Enforcement In High-Technology Industries: Protecting Innovation And Competition’ (NYSBA Annual Antitrust Forum, New York City, 7 December 2012) <https://www.justice.gov/atr/speech/antitrust-enforcement-high-technology-industries-protecting-innovation-and-competition>. See also, MICHAEL KATZ & HOWARD SHELANSKI, ‘Schumpeterian Competition and Antitrust Policy in High-Technology Markets’ (2005) 14 COMPETITION 47.

¹¹⁶ CLAYTON M. CHRISTENSEN, ‘The Ongoing Process of Building a Theory of Disruption’ (2006) 23 JOURNAL OF PRODUCT INNOVATION MANAGEMENT 39.

¹¹⁷ STEPHEN A. RHOADES & ROGER D. RUTZ, ‘Market power and firm risk: A test of the “quiet life” hypothesis’ (1982) 9 JOURNAL OF MONETARY ECONOMICS 73.

outlining performance trajectories in specific industries.¹¹⁸ Finally, procedure remains crucial. Antitrust law operates by a totality of the evidence standard. The exact calibration of standard of proof, decided by judges, will be determinative. In this way, judicial review ensures that, all things considered, the available evidence reasonably supports a claim of harm to competitiveness.

1. Efficiency competition

Analyzing efficiency is simple. As explained, efficiency competition selects firms that can reduce future prices by improving productivity quickly. Hence, determining efficiency relies on a few metrics. Enforcers need to calculate firm costs to understand the prevailing cost structures of an industry. However, while cost curves supply important information, they must be interpreted carefully. Enforcers should not take current cost data as conclusive evidence that a firm is efficient (or not). The development of the cost curve over time should take precedence to avoid static interpretations.

Justice Brandeis once said: “There is, in every line of business, a unit of greatest efficiency. What the size of that unit is cannot be determined in advance by a general rule. It will vary with the same concern at different times because of different conditions. What the most efficient size is can be learned definitely only by experience.”¹¹⁹ What Brandeis alludes to is that firms can be efficient at different scales. A firm capable of bringing about “different conditions”, such as better production technology or organizational method, can achieve efficiency at lower scales. Based on this intuition, an enforcer can assess whether a rival can achieve minimum efficient scale at a lower threshold of market penetration compared to incumbents.¹²⁰ In a market that supports three competitors at scale, an entrant whose cost curve exhausts returns to scale at 25% market share has bigger efficiency than an incumbent who had to capture 30% of the market. Cost curves can be evaluated by sector-specific regulators or a competition authority.¹²¹

Cost data are often readily available via firms’ compliance and forecasting activities. But enforcers can also use additional evidence to demonstrate a firm’s potential to achieve cost leadership. An obvious metric to consider is direct productivity information.¹²² Firms with higher productivity

¹¹⁸ This could be the rate of increase in storage capacity for computer memory, the growth of the number of transistors for microprocessors, or the rate of reduction of the treatment dosage for medical drugs. See, BORIS MURMANN, ‘The Race for the Extra Decibel: A Brief Review of Current ADC Performance Trajectories’ (2015) 7 (3) IEEE SOLID-STATE CIRCUITS MAGAZINE 58.

¹¹⁹ LOUIS D. BRANDEIS, *Business – A Profession* (Small & Maynard 1914).

¹²⁰ The same conclusion applies when the entrant obtains lower costs while serving the same market share as the incumbent.

¹²¹ A rich toolbox is available in economics. For a discussion, see PETER DAVIS & ELLIANA GARCES, *Quantitative Techniques for Competition and Antitrust Analysis* (Princeton 2010).

¹²² ALFREDO M. BOBILLO & RODRIGUEZ SANS, & TEJERINA GAITE, ‘Innovation investment, competitiveness, and performance in industrial firms’ (2006) 48 (6) INTERNATIONAL BUSINESS REVIEW 867.

levels and steeper productivity curves are more likely to be efficient. Similar to the prioritization exercise above, productivity can be determined in many ways, including multi-factor productivity. Lastly, enforcers can also look at how efficient a firm is in developing production technology. Firms undertake research and development to improve their production techniques. Therefore, firms that are efficient in R&D must be more likely to improve efficiency in the long run. R&D efficiency can thus be a third component of efficiency analysis.

2. Innovation competition

Analyzing innovation competition is more difficult. It requires evidence on a firm's potential to introduce new products or enter new markets. In such a task, a certain degree of subjectivity becomes inevitable, and a greater tolerance for uncertainty becomes needed. Nevertheless, one can still develop qualitative and quantitative metrics to understand which firms are likely to succeed in innovation competition.

Enforcers can evaluate firm capabilities to understand whether innovation competition is forthcoming. "Capabilities" is a technical concept used mainly in strategic management. There are many definitions for it. Earlier studies define capabilities as being able to rapidly enter developing markets whilst abandoning declining markets faster than rivals.¹²³ Others define them as organizational processes firms use to create and capture value.¹²⁴ A comprehensive survey of the literature defines capabilities as "the abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by its principal decision-makers".¹²⁵ For its part, the EC correlates capabilities with competitiveness and growth as capabilities enable firms to transform scientific inventions to profitable innovations.¹²⁶

This is not the place to fully engage with strategic management literature on how to define capabilities. The scholarship is vast. Instead, it is useful to adopt an existing definition. While many options are available, we choose a seminal definition by David Teece.¹²⁷ This is for three reasons. First, Teece's definition is considered a seminal contribution to strategic management, and the

¹²³ RICHARD LANGLOIS, 'The Capabilities of Industrial Capitalism' (1991) 5 (4) CRITICAL REVIEW 513.

¹²⁴ KATHLEEN M. EISENHARDT & JEFFREY A. MARTIN, 'Dynamic Capabilities: What Are They?' (2000) 21 (10) STRATEGIC MANAGEMENT JOURNAL 1105.

¹²⁵ SHAKER A. ZAHRA, HARRY J. SAPIENZA, & PER DAVIDSSON, 'Entrepreneurship and Dynamic Capabilities: A Review, Model and Research Agenda' (2006) 43 (4) JOURNAL OF MANAGEMENT STUDIES 917.

¹²⁶ The EC also identifies the inability of European firms to proceed from invention to innovation as "the European paradox". See, EUROPEAN COMMISSION, 'A European Information Society for growth and employment' COM(2005) 229 final.

¹²⁷ DAVID J. TEECE, 'Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance' (2007) 28 (13) STRATEGIC MANAGEMENT JOURNAL 1319.

author is considered the originator of the concept of (dynamic) capabilities.¹²⁸ Second, Teece's definition constructs a methodical framework that can be operationalized in antitrust law. Third, subsequent studies also build on the paper, thereby making it commensurate with contemporary thought.¹²⁹

Teece's theory starts with a sensible assumption. Innovation, by definition, implies change. In a changing setting, firms cannot possess sustainable competitive advantages. Rather, they must work to achieve a series of temporary, short-term advantages.¹³⁰ Accordingly, Teece argues that recognizing opportunities on which markets to enter and what products to develop is crucial for outmanoeuvring competition. Indeed, no resource possesses intrinsic value for businesses unless recognized and utilized as such.¹³¹

Teece defines capabilities by breaking them down into "micro-foundations". Micro-foundations of capabilities comprise sensing, seizing, and transforming. Sensing refers to a recognition of business opportunities and threats. It requires gathering and interpreting information on a firm's business and competitive environment. Firms can facilitate sensing by keeping management up-to-date with the daily activities of the firm, broadening the exploration of business opportunities, and by allocating the scarce resource of attention inside the firm to better use.¹³²

Seizing is addressing identified opportunities and threats by new products or business lines. Successful seizing requires creating new value for customers. Some authors provide the example of entering a platform market dominated by closed ecosystems with an open ecosystem, like how Google entered the smartphone operating system market.¹³³ Although seizing is the next step from sensing, firms may fail to seize opportunities. An example is the failure of AT&T to develop a communications network similar to the internet. Known as Advanced Communications System (ACS), the project failed despite superior foresight displayed by the firm.¹³⁴

¹²⁸ CATHERINE L. WANG & PERVAIZ K. AHMED, 'Dynamic capabilities: A review and research agenda' (2007) 9 INTERNATIONAL JOURNAL OF MANAGEMENT REVIEWS 31.

¹²⁹ See, e.g., NIKLAUS LEEMANN & DOMINIK K. KANBACH, 'Toward a taxonomy of dynamic capabilities – a systematic literature review' (2022) 45 (4) MANAGEMENT RESEARCH REVIEW 486.

¹³⁰ See also, RICHARD SCHMALENSSEE, 'Antitrust Issues in Schumpeterian Industries' (2000) 90 (2) AMERICAN ECONOMIC REVIEW 192.

¹³¹ JULIAN L. SIMON, *The Ultimate Resource* (Princeton 1983).

¹³² G. HOOLEY, A BRODERICK, & K. MÖLLER, 'Competitive Positioning and the Resource-Based View of the Firm' (1998) 6 (2) JOURNAL OF STRATEGIC MARKETING 97.

¹³³ KENNY CHING, JOSHUA GANS, & SCOTT STERN, 'Control versus execution: endogenous appropriability and entrepreneurial strategy' (2019) 28 (2) INDUSTRIAL AND CORPORATE CHANGE 389.

¹³⁴ JON GERTNER, *The Idea Factory: Bell Labs and the Great Age of American Innovation* (Penguin 2012).

Lastly, transforming refers to reconfiguring existing capabilities to sense and seize. Teece likens transforming to “internal creative destruction”.¹³⁵ Existing resources or skills can only provide temporary advantages in dynamic markets. Resources have life-cycles, techniques can be imitated, and products once innovative can become obsolete over time. Therefore, remaining successful relies on chasing serial temporary advantages through willingly recreating firm capabilities.¹³⁶ Or in other words, firms with transforming capabilities commit to an “unremitting pursuit of change”.¹³⁷ We can develop practical methods to assess firm capabilities empirically based on these definitions. If sensing refers to recognizing business opportunities and threats, an observer can track sensing capability by looking at a firm’s tendency to detect market developments and rival strategies. Likewise, as seizing means addressing business opportunities through new products or business lines, we can count new market entries or new products as indicators of seizing capability. These measurements will be somewhat subjective and therefore imperfect.¹³⁸ But the general intuition enjoys legal support. Sensing is a key component of competition in antitrust law. For example, “perception” of rivals plays a key role in forward-looking competition assessments.¹³⁹ Seizing is also important for antitrust law. In potential competition cases, only firms with “concrete possibilities” to enter a market are deemed capable of exerting pressure on established rivals.¹⁴⁰

Operationalizing transforming capabilities is more difficult. However, we can leverage a quantitative method to alleviate this difficulty. Teece frequently associates transforming with what economists call “Schumpeterian competition”.¹⁴¹ This type of competition is innovation-based. One way of economically measuring Schumpeterian competition is examining productivity over time. If one can observe large spikes in firm productivity, this may suggest the firm is increasing its technical prowess rapidly.¹⁴² By contrast, a steadier productivity development suggests the firm is focused more on efficiency. Analyzing firm-level productivity can thus be a useful proxy for assessing transforming capabilities.

¹³⁵ TEECE (n X) 1341.

¹³⁶ CONSTANCE HELFAT & MARGARET PETERAF, ‘Understanding dynamic capabilities: progress along a developmental path’ (2009) 7 STRATEGIC ORGANIZATION 91.

¹³⁷ RICHARD A. D’AVENI, GIOVANNI B. DAGNINO, & KEN G. SMITH, ‘The age of temporary advantage’ (2010) 31 (13) STRATEGIC MANAGEMENT JOURNAL 1371.

¹³⁸ For example, sensing rival strategies is difficult; MICHAEL SPENCE, ‘Tacit co-ordination and imperfect information’ (1978) 11 (3) THE CANADIAN JOURNAL OF ECONOMICS 490.

¹³⁹ Case T-112/07 *Hitachi v Commission* [2011] ECLI:EU:T:2011:342, para. 90.

¹⁴⁰ Case T-461/07 *Visa v Commission* [2011] ECLI:EU:T:2011:181, para. 189.

¹⁴¹ For an example, see David J. Teece, *Dynamic Capabilities & Strategic Management: Organizing for Innovation and Growth* (OUP 2009).

¹⁴² SOTIRIOS GEORGIOUSIS, NICOLAS PETTIT, & BOWMAN HEIDEN, ‘Gatekeepers, landlords, or superstars? An empirical study of rents in the digital economy’ (2023) DCI WORKING PAPER NO. 6.

One additional test can be used to solidify our qualitative and quantitative tests on capabilities. Capabilities are difficult to track because they are intangible, firm-specific, and tacit, making them difficult to even articulate.¹⁴³ But the literature agrees that capabilities are the link between resources and successful results, such as competitive advantage and profitability.¹⁴⁴ In other words, capabilities contribute to making a firm larger than the sum of its parts. If this logic follows, we can calculate the ratio between a firm's market capitalization and assets as a proxy for capabilities. In corporate finance, this figure is known as "Tobin's q ".¹⁴⁵ Tobin's q has been utilized to measure firm performance in general.¹⁴⁶ A greater value would indicate that a firm is viewed as more capable. Now, it is likely that more than capabilities factor into Tobin's q .¹⁴⁷ This reduces the concept's explanatory potential as we cannot isolate capabilities on a per-firm basis. However, this is unlikely to be a problem for the purposes of this study. The tests we develop are meant to be interpreted as a whole and not individually. This is in line with the standard of proof applicable in antitrust law, which takes into account the preponderance of evidence and how coherent a "story" the evidence pictures. Hence, Tobin's q can supplement earlier findings on capabilities and support them with testable figures.

V. CONCLUSION

In a recent OECD submission, the EC highlighted that protecting competitiveness through antitrust law requires it to "continuously assess and seek to improve its analytical framework and investigative tools".¹⁴⁸ This study attempted to develop such an analytical framework. We tried to articulate how enforcers can determine when to employ antitrust law and when to opt for alternative measures to best protect competitiveness. The chapter also provided concrete ways in which firms can foster competitiveness through efficiency and innovation. As the answer to that question turns on practical issues, the last section was dedicated to measuring a firm's potential to lower costs or create new products.

¹⁴³ RICHARD NELSON & SIDNEY WINTER, 'Toward an Evolutionary Theory of Economic Capabilities' (1973) 63 (2) THE AMERICAN ECONOMIC REVIEW 440.

¹⁴⁴ STEPHEN TALLMAN, 'Dynamic Capabilities' in VODOSEK & DEN HARTOG (eds), *Wiley Encyclopaedia of Management: Volume 6* (Wiley 2014).

¹⁴⁵ Antitrust scholars have used Tobin's q to determine which firms earn efficiency rents. See, MICHAEL SMIRLOCK, THOMAS GILLIGAN, & WILLIAM MARSHALL, 'Tobin's q and the Structure-Performance Relationship' (1984) 74 (5) THE AMERICAN ECONOMIC REVIEW 1051.

¹⁴⁶ SATWINDER SINGH, NAEEM TABASSUM, TAMER DARWISH, & GEORGIOS BATSAKIS, 'Corporate Governance and Tobin's Q as a Measure of Organizational Performance' (2018) 29 BRITISH JOURNAL OF MANAGEMENT 171.

¹⁴⁷ Nonetheless, many elements attributed to Tobin's q can be associated with capabilities. For example, researchers view managerial performance as a core component. See, e.g., LARRY H. LANG, RENE M. STULZ, & RALPH WALKLING, 'Managerial Performance, Tobin's Q , and the Gains from Successful Tender Offers' (1989) 24 JOURNAL OF FINANCIAL ECONOMICS 137.

¹⁴⁸ EUROPEAN COMMISSION, 'The Concept of Potential Competition – Note by the European Union' (2021) DAF/COMP/WD(2021)21.