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SPECIAL SECTION

NAVIGATING THE SKIES OF REGULATION AND INNOVATION: THE CASE OF CIVIL DRONES

Abstract

The deployment of Unmanned Aerial Vehicles (UAVs), colloquially known as civil drones, necessitates an in-depth analysis of regulatory frameworks to understand their impact on market competition and technological innovation. This study presents a comparative examination of the regulatory landscapes governing UAV operations in the European Union (EU) and the United States (US), focusing on the interplay between legal provisions and market dynamics within the drone industry.

In the EU, the imminent introduction of UAV-based package delivery systems exemplifies a regulatory environment conducive to drone technology advancement. Governed by the European Union Aviation Safety Agency (EASA), the EU's regulatory structure is characterised by its coherence and integrative nature, fostering a regulatory milieu that balances safety and privacy concerns with the promotion of technological development. The uniform regulatory guidelines across EU Member States serve as a catalyst for innovation, providing clarity and stability for UAV operators and manufacturers, thereby enhancing competitive dynamics within the market.

Conversely, the US regulatory context, as illustrated by the legal confrontation between SZ DJI Technology Co. Ltd. and Autel Robotics USA LLC, highlights a multifaceted and litigious approach. Central to this is the role of the Federal Aviation Administration (FAA) in navigating the intricate interplay between antitrust litigation and competitive practices in the UAV sector. The US framework's reactive nature, often mired in judicial proceedings, introduces a degree of uncertainty and complexity for industry stakeholders, potentially impeding technological innovation and market diversification.

The juxtaposition of the EU and US regulatory frameworks unveils contrasting methodologies in governing civil drone operations. The EU's unified and innovation-centric approach markedly diverges from the litigious and segmented regulatory landscape in the US. These disparities exert considerable influence on the UAV industry, shaping the contours of market competition, technological advancement, and regulatory industry equilibrium.

The disparate regulatory paradigms in the EU and US present distinct challenges and opportunities in the realm of UAV operations. The EU's streamlined and proactive regulatory approach encourages innovation and market growth; while the US's intricate and adversarial regulatory environment poses substantial

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hurdles for industry stakeholders. This comparative analysis is vital for policymakers, legal experts, and industry participants in navigating the complex and evolving domain of UAV technology and its regulatory governance.

JEL CLASSIFICATION: L40

SUMMARY

1 Introduction: The Market Dynamics of Competition for Civil Drones - 2 US Antitrust Cases in Drones: Regulation Through Litigation - 2.1 Ex-Post Regulation of Civil Drones: An Evolutionary Antitrust Approach - 2.2 Implications: Benefits and Limits of Antitrust - 3 EU Regulation of Civil Drones: Regulation Through Precaution - 3.1 Ex-ante Regulation of Civil Drones: A Precautionary Approach - 3.2 The Privacy Emphasis: Constant and Relevant - 4 Conclusion: A Comparative Analysis

1 Introduction: the market dynamics of competition for civil drones

The market for drones well illustrates the complex relationship between regulation and innovation.¹ While aerial activities remain one of the most regulated sectors of the economy in most countries, drones and the inherent innovations they bring about remain relatively less regulated, thereby allowing for innovation competition between market actors scattered all over the world.² However, the fine balance to be found between regulation and innovation in the development of drone technology, especially related with AI-embedded drones, will determine the competition in a nascent, yet rapidly growing, market³. Malicious use of civil drones force enforcers to have a “wake-up call” and force

¹ See, for instance, Steve Calandrillo, Jason Oh and Ari Webb, ‘Deadly Drones? Why FAA Regulations Miss the Mark on Drone Safety’ (2020) 23(1) *Stanford Technology Law Review*, 182; Timothy M Ravich, ‘Grounding Innovation: How Ex-Ante Prohibitions and Ex-Post Allowances Impede Commercial Drone Use’ (2018) 2 *Columbia Business Law Review* 495 (advocating for ‘permissionless innovation’ to civil drone regulations); Jake Nelson and Tim Gorichanaz, ‘Trusts as an Ethical Value in Emerging Technology Governance: The Case of Drone Regulation’ (2019) 59 *Technology in Society*; Abderahman Rejeb, Karim Rejeb, Steven J Simske and Horst Treiblmaier, ‘Drones for Supply Chain Management and Logistics: A Review and Research Agenda’ (2023) 26(6) *International Journal of Logistics: Research and Applications* 708 (reviewing the burgeoning literature on civil drones).

² See, more generally, Joseph Awange and John Kiema, *Environmental Geoinformatics: Extreme Hydro-Climatic and Food Security Challenges: Exploiting the Big Data* (2nd edn, Springer International Publishing 2019) 265, 289; Jackie Alkobi, ‘The Evolution of Drones: From Military to Hobby & Commercial’ (*Percepto*, 15 January 2019) <<https://percepto.co/the-evolution-of-drones-from-military-to-hobby-commercial/>> accessed 20 May 2024.; Larisa Kapustina and others, ‘The Global Drone Market: Main Development Trends’ (2021) 129 *SHS Web of Conferences*; David Streitfeld, ‘Look, Up in the Sky! It’s a Can of Soup!’ *The New York Times* (New York, 4 November 2023) mentioning that “Amazon said last month that drone deliveries would expand to Britain, Italy and another, unidentified U.S. city by the end of 2024”; Eleonora Bassi, ‘From Here to 2023: Civil Drones Operations and the Setting of New Legal Rules for the European Single Sky’ (2020) 100 *Journal of Intelligent & Robotic Systems* 493.

³ Whether the regulatory framework strikes a reasonable and correct balance is highly debated with opposite conclusion. See, for instance Patrick F Hubbard, “‘Sophisticated Robots’: Balancing Liability, Regulation, and Innovation” (2014) 66(5) *Florida Law Review* 1803 (arguing that “the legal system’s method of addressing physical injury from robotic machines that interact closely with humans provides an appropriate balance of innovation and liability for personal injury”). On the other hand, see Lavi M Ben Dor and Jonathan M Hoffman, ‘The Emerging Airspace Economy: A Framework for Airspace Rights in the Age of Drones’ [2022] *Wisconsin Law Review* 953 (concluding that “With the inevitable integration of drone delivery services and commercial UAS into society, our current legal and regulatory framework is ill-prepared for the opportunities and challenges that lie ahead.”); Sara M Smyth, ‘Keep Calm but Don’t Carry on: New Drone Regulations in the United States’ (2021) 25(2) *Journal of Law, Information and Science* 49.



legislature to change in regulations.⁴ In that regard, the regulation of drone competition is and should be of interest to antitrust authorities, alongside other regulatory authorities focused on safety, privacy, and AI regulation.

Drones, often hailed as the pinnacle of contemporary technology, owe their lineage to an invention that dates to the waning days of 1783. It was then that the Montgolfier brothers, Joseph-Michel and Jacques-Étienne, pioneers hailing from France, embarked on a ground-breaking endeavour. They successfully launched the first unpowered aerial device, a hot-air balloon, marking a significant milestone in the annals of aviation.⁵ This early experiment laid the foundational stone for the development of unmanned flight, illustrating a remarkable journey from the simplicity of buoyant air to the complexity of today's sophisticated drones. This historical context enriches our understanding of drones, not merely as modern marvels but as a culmination of human curiosity and innovation that spans centuries. Thanks to considerable technological developments, drones are increasingly ubiquitous. Drone "invasion"⁶ is unavoidable: drone ownership and use have been on the rise, with registrations for recreational and commercial operators topping one million in the United States in 2018.⁷ Civil drones are used for unlimited number of purposes, including recreational purposes (ie photography), shopping delivery purposes,⁸

⁴ For instance, the US Congress passed the Protecting Emerging Threats Act of 2018 as codified in the FAA Reauthorization Act of 2018—that gives certain federal agencies, namely the DHS and the DOJ, important new authority to detect, identify, monitor, and track drones without prior consent; to warn the operator of a drone, including by passive or active and direct or indirect physical, electronic, radio, and electronic means; to disrupt or seize control of a potentially threatening drone; to seize or otherwise confiscate the drone; and if necessary to use reasonable force to damage or destroy a threatening drone. See US Department of Justice, *Drones: A Report on the Use of Drones by Public Safety Agencies - and a Wake-up Call about the Threat of Malicious Drone Attacks*, COPS, Police Executive Research Forum (2020) <<https://portal.cops.usdoj.gov/resourcecenter/RIC/Publications/cops-w0894-pub.pdf>> accessed 21 May 2024. See also Colin T Ross and Kevin M Jinks, 'DOJ and Drones: Protection, Policy, and Enforcement' (2021) 69(3) *Department of Justice Journal of Federal Law and Practice* 278, 288 ("Drones present tremendous potential for commerce, public safety, and transportation, yet this technology is no different than others in that it comes with unique challenges").

⁵ Paula Hohrova, Jakub Soviar, and Włodzimierz Sroka, 'Market Analysis of Drones for Civil Use' (2023) 14(1) *Scientific Journal on Transport and Logistics* 55.

⁶ Amanda Graham, Haylee Kutzli, Teresa C Kulig, and Francis T Cullen, "Invasion of Drones: A New Frontier for Victimization" (2021) 42(3) *Deviant Behavior* 386, 403 ("To protect privacy rights, federal and state legislative approaches provide insight into how law enforcement drones can be regulated." and exploring "the extent to which the public is being victimized by recreational drones (eg, spied on, followed, privacy invaded)").

⁷ US Department of Transportation, *FAA Drone Registry Tops One Million*, January 10, 2018, <<https://www.transportation.gov/briefing-room/faa-drone-registry-tops-one-million#:~:text=The%201%2C000%2C000%20total%20registration%20figure,drones%2C%20which%20are%20individually%20registered>> accessed 21 May 2024.

⁸ Azamat Seidakhmetov and Omid Fatahi-Valilai, 'Drone based Delivery System: Restrictions and Limitations' in Wolfgang Kersten, Carlos Jahn, Thorsten Blecker, and Christian M Ringle (eds), *Changing Tides* (Epubli 2022) (citing Amazon as one of the most successful e-commerce business and leading the way to drone delivery with Amazon Prime Air); Jean-Philippe Aurambout, Konstantinos Gkoumas, and Biagio Ciuffo, 'Last mile delivery by drones: an estimation of viable market potential and access to citizens across European cities' (2019) 11(30) *European Transport Research Review* 1; Khalid Aljohani and Russell G Thompson, 'An Examination of Last Mile Delivery Practices of Freight Carriers Servicing Business Receivers in Inner-City Areas' (2020) 12 *Sustainability MDPI* 1; Capgemini Research Institute, 'The Last-mile delivery challenge', *Research Institute Report* (2019) <<https://www.capgemini.com/wp-content/uploads/2019/01/Report-Digital-%E2%80%93-Last-Mile-Delivery-Challenge1.pdf>> accessed 21 May 2024 (considering Amazon as "a pioneer in this space" of last-mile delivery).

or agricultural purposes.⁹ Consumer increasingly perceive the usefulness of drone delivery for their shopping experience, and decreasingly perceive privacy risks related with drone delivery such as proposed by Amazon Prime Air who pioneered the sector.¹⁰

But not all drones are created equal. Drones are either UAVs (*Unmanned Aerial Vehicle Systems*) or UCAVs (*Unmanned Combat Aerial Vehicle Systems*).¹¹ While the former are commonly referred as “civil drones,” the latter partake to military drones. I will focus on this article exclusively on the market dynamics and regulatory implications, from a comparative approach to the US and EU, on the civil drones - or UAVs. Before delving into this comparative approach, it is critical to grasp the market dynamics of civil drones. For, the market for civil drones is characterised by unique features which illustrate the complex relationship between innovation, regulation, and other concerns such as national security, but also shed lights for any antitrust analysis of such market.

Within the civil drone category, many sub-categories can apply such as recreational drones versus commercial drones, or fixed-wing drones versus propeller drones. I shall take civil drone as a single category without further categorisation.¹² For, taken as a whole, the market for civil drone makers is highly asymmetric. For, one company - the Chinese drone maker DJI - accounts for 76% of the entire market. The other companies are Intel (4%), Yuneec (2%), and Parrot (2%):

⁹ Francisco Klauser and Dennis Pauschinger, ‘Entrepreneurs of the Air: Sprayer Drones as Mediators of Volumetric Agriculture’ (2021) 84 *Journal of Rural Studies* 55 (citing the European Commission that portrayed agriculture ‘one of the primary sectors expected to see sharp uptake of drone technology in the near future’ and citing the US-based Association for Unmanned Vehicle Systems International expects 80% of the future drone market to relate to agriculture.) See also Steve Calandrillo, Jason Oh, and Ari Webb, ‘Deadly Drones? Why FAA Regulations Miss the Mark on Drone Safety’ (2020) 23 *Stanford Technology Law Review* 182, who outline the use case of civil drones in commercial applications (journalism, construction, insurance), entertainment, real estate, tourism, rescue, medical delivery, scientific research, animal conservation, law enforcement, and recreational drone use.








¹⁰ Steven Leon, Charlie Chen, and Aaron Ratcliffe, ‘Consumers’ Perceptions of Last Mile Drone Delivery’ (2023) 26(3) *International Journal of Logistics: Research and Applications* 345 (finding “consumer acceptance of delivery by drone increases if they perceive drone delivery to be useful and if they trust the service provider.”). See also Wonsang Yoo, Eun Yu, and Jaemin Jung, ‘Drone Delivery: Factors affecting the public’s attitude and intention to adopt’ (2018) 35(6) *Telematics and Informatics* 1687.

¹¹ See *Dassault Aviation / Tsa / Thales* (Case COMP/M.5426) Commission Decision 2009/C81/03 [2009] OJ C81/2.

¹² Paula Hohrova, Jakub Soviar, and Włodzimierz Sroka (n 5) (“*Classification based on use can be divided into recreational drones and commercial drones [...] and noting that civil drones “can be divided into 4 categories: drones with fixed wings, multi-propeller drones, single-propeller helicopters, and hybrid helicopter”*”).



TOP 10 DRONE MANUFACTURERS' MARKET SHARES IN THE US

Rank	Manufacturer ¹	HQ Location	Founding Date	US Market Share ²
1	 DJI	Shenzhen, China	2006	76,1%
2	 intel	Santa Clara, USA	1968	4,1% (+0,4%)
3	 YUNEEC	Hong Kong, China	1999	2,6% (-0,5%)
4	Parrot	Paris, France	1994	2,5% (+0,3%)
5	 3DR	Berkeley, USA	2009	0,6% (-0,8%)
6	 AUTEL ROBOTICS	Bothell, USA	2014	0,6% (-0,2%)
7	 Skydio	Redwood City, USA	2014	0,3% (+0,1%)
8	 senseFly	Lausanne, Switzerland	2009	0,2% (-0,1%)
9	 kespry Drones At Work	Menlo Park, USA	2013	0,1% (-0,2%)
10	 AV AeroVironment™	Simi Valley, USA	1971	0,1% (-)

Source: *Drone Industry Insights, March 2021*¹³

The supremacy of DJI is unparalleled, with a global market leadership that put its competitors to shame. This dominance is further reinforced by the fact that DJI is the only drone company in the world, together with MMC another Chinese drone manufacturer, of “fully designing and producing major industrial chains, including aircraft, power supply, flight control, video transmission and ground control”.¹⁴ In assessing the civil drones’ relative market shares, Hohrova and others conclude that DJI’s super-dominant position is uncontested:

“SZ DJI Technology Co., Ltd. (“DJI”) had a dominant position due to its market share of 76.8% [32]. The value of its relative market share is more than 20 times higher than the closest competitor, Intel Corporation. Thus, DJI’s leadership is clearly visible and the remaining 5 included competitors are at the very tail, reaching values not exceeding 0.05”.¹⁵

In the US, DJI Sciences and Technologies Ltd (“DJI”) has 90% of the US’s consumer drone market, 70% of the industrial drone market, and 92% of the first responder market.¹⁶ Not

¹³ Lukas Schroth, 'Drone Market Shares in the USA after China-US Disputes' (Drone Industry Insights, 2 March 2021) <<https://droneii.com/drone-market-shares-usa-after-china-usa-disputes>> accessed 21 May 2024

¹⁴ Larisa Kapustina and others (n 2) 3.

¹⁵ Paula Hohrova, Jakub Soviar, and Włodzimierz Sroka (n 5).

¹⁶ Eric Sayers and Klion Kitchen, 'DJI isn't the only Chinese drone threat to US security. Meet Autel' (DefenseNews, 15 September 2023) <<https://www.defensenews.com/opinion/2023/09/15/dji-isnt-the-only-chinese-drone-threat-to-us-security-meet-autel/>> accessed 21 May 2024. See also Association for Uncrewed Vehicle Systems International,

only is DJI the most famous and popular drone brand, but it also is the highest-growth company in the sector:



Source: Drone Industry Insights, November 2023¹⁷

This market structure asymmetry is even more relevant because of the dynamism of the market.¹⁸ For, the market is growing fast, hence amplifying the need for vigorous competition in the market, otherwise entrenched market positions may prove difficult to disrupt incumbents for the benefit of dynamic competition and innovation:

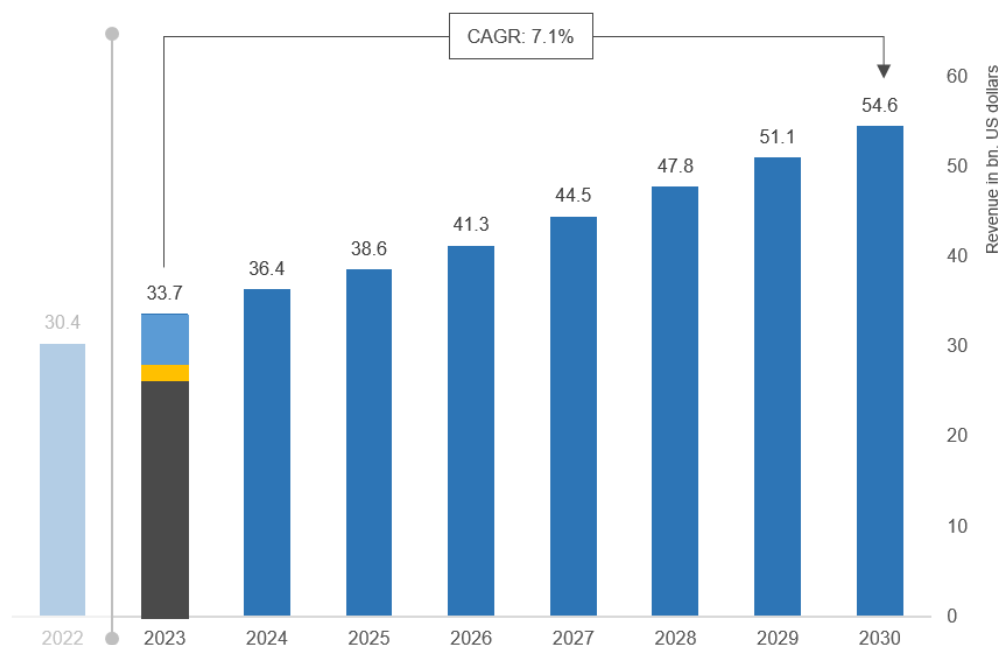
¹⁷ “Whitepaper: AUVSI Partnership for Drone Competitiveness, 18 January 2024, <<https://www.auvsi.org/sites/default/files/AUVSI-Partnership-for-Drone-Competitiveness-White-Paper.pdf>> accessed 21 May 2024.

¹⁸ Ed Alvarado, Ranking the Leading Drone Manufacturers (Drone Industry Insights, 28 November 2023) <<https://droneii.com/ranking-the-leading-drone-manufacturers>> accessed 21 May 2024.

¹⁹ Paula Hohrova, Jakub Soviar and Włodzimierz Sroka (n 5) - noting that “Drones have caught on in the market due to their advantage of operating virtually anywhere, allowing them to reach inaccessible terrain or health-threatening areas.”



GLOBAL MARKET SIZE AND GROWTH



Source: *Drone Industry Insights*, 3 August 2023¹⁹

Mass produced in Asia,²⁰ the civil drone market epitomises not only the imbalance toward one market actor - DJI - but more structurally toward one region for production - China. This dual dependency generates both antitrust concerns and national security concerns. This reliance is further intensified by the fact that the United States market leads the world in drone sales, accounting for 30% of civil drone purchases, significantly surpassing China, which ranks second in sales with 8% of global drone purchases.²¹ Surprisingly, both categories of concerns have remained so far timid, if not inexistent.

¹⁹ Esteban Zanelli and Hendrik Boedecker, *Global Drone Market Report 2023-2030* (Drone Industry Insights Report July 2023) <<https://droneii.com/product/drone-market-report>> accessed 21 May 2024.

²⁰ Paula Hohrova, Jakub Soviar and Włodzimierz Sroka (n 5) 61, 62 (“Mass production in Asia using standardized parts and procedures is very likely to contribute to the further spread of this technology. We can conclude that these are attractive products.”). See also Larisa Kapustina and others (n 2) 4 (“The main manufacturers of both unmanned aerial vehicles and their components are China, France and, to a lesser extent, America, while the software and service development industry is developed in Europe”).

²¹ Larisa Kapustina and others (n 2) 5 (largest markets for demand of civil drones are USA (31%), China (9%), Russia (8%), Great Britain (6%), Australia, France, Saudi Arabia, India and South Korea.)

Regarding delivery drones, some speculate that 2024 will be a “breakout year”²² with leading companies such as Amazon (who expects 500 million drone deliveries by the end of the decade), Zipline and Alphabet’s Wing having obtained the necessary regulatory approvals. And the market structure of delivery drones differs from the one portrayed in civil drone makers. For, when it comes to drone delivery service providers, the market looks more fragmented and balanced:



Source: *Drone Industry Insights, October 2023*²³

The regulation of civil drones predominantly take place in the US via ex-post litigation whereas Europe characteristically favors ex-ante precautionary regulations. I study each approach successively, before providing a comparative assessment.

2 US antitrust cases in drones: regulation through litigation

Antitrust laws in both the United States and the European Union aim to promote competition and prevent abusive monopolistic practices. However, their application to the drone industry reflects the unique regulatory and market dynamics within each region. This analysis explores how antitrust laws apply to the drone industry in the US and EU, drawing on specific cases and regulatory proposals.

²² Joann Muller, “2024 will be a breakout year for delivery drones” (Axios, 2 January 2024) <<https://www.axios.com/2024/01/02/delivery-drones-2024-amazon-zipline-wing>> (announcing among other introductions, Amazon’s introduction of a “smaller, quieter delivery drone, which will be fully integrated into Amazon’s delivery network this year”).

²³ El Alvarado, Drone Services: The Top Companies in 2023 (Drone Industry Insights, 24 October 2023) <<https://droneii.com/top-drone-service-companies-in-2023>> accessed 21 May 2024.



Initially, the US experienced years of an ex-ante ban on civil drones.²⁴ This unfortunate ban stifled drone innovation.²⁵ The FAA Modernization and Reform Act of 2012²⁶ (FMRA) directed the FAA to produce a comprehensive set of regulations to "safely accelerate the integration of civil unmanned aircraft systems into the national airspace system". Section 336 of the FMRA for "model aircraft ... flown strictly for hobby or recreational use". Following this regulatory change, the FAA "imposed stringent permitting requirements on would-be commercial UAV operators [...]"²⁷ But, the FAA's "ex-ante, one-size-fits-all ban on commercial drones was ineffective and sometimes flouted"²⁸ - a change was necessary to provide for legal clarity and technological innovation by mass adoption. In 2018, the adoption of Part 107 of the relevant regulations laid down the principles for ex-ante permissions subject to ex-post enforcement.²⁹ Such approach not only allows for broader scope for technological innovation without regulatory overreach, but also is more consistent with a Common law, evolutionary approach that characterise antitrust enforcement. Nevertheless, criticisms persist as the new rules allegedly stifle innovation still.³⁰ This is certainly demonstrated by the fact that Amazon has to test its drone outside the US due to regulatory obstacles inside the US.³¹

More generally, the Federal Aviation Administration (FAA) oversees drone regulations with a focus on safety and integration into the national airspace. Privacy concerns related to drones are addressed through a more fragmented approach, with significant involvement from state legislatures. The FAA has been cautious in regulating privacy broadly, leaving room for states to experiment with regulations that balance First Amendment rights and privacy concerns.³² The US approach to drone regulation - beside a traditional antitrust enforcement that has its limits as discussed above - remains focused

²⁴ Timothy M Ravich, 'Grounding Innovation: How Ex-Ante Prohibitions and Ex-Post Allowances Impede Commercial Drone Use' (2018) 2 Columbia Business Law Review 495, 531.

²⁵ Mehboob Jeelani, Is the FAA limiting drone innovation? (Fortune, 28 August 2014) <<https://fortune.com/2014/08/28/faa-limiting-drone-innovation/>> accessed 21 May 2024.

²⁶ See, FAA Modernization and Reform Act of 2012, Pub. L. 112- 95, § 332(a)(1), 126 Stat. 11 (2012).

²⁷ Timothy M Ravich (n 24) 528.

²⁸ *ibid* 531.

²⁹ Small Unmanned Aircraft Systems, 14 C.F.R. pt. 107 (2018).

³⁰ Steve Calandrillo, Jason Oh, and Ari Webb, 'Deadly Drones? Why FAA Regulations Miss the Mark on Drone Safety' (2020) 23 Stanford Technology Law Review 182.

³¹ Amazon Says It May Take Drone Testing Outside U.S. (BBC, 9 December 2014) <<https://perma.cc/KS45-839F>> accessed 21 May 2024; Jack Nicas, Amazon Says FAA Approval To Test Delivery Drones Already Obsolete (WALL STREET JOURNAL, 24 March 2015) <<https://perma.cc/85LY-ZQRF>> accessed 21 May 2024; UAS Test Sites (FED. AVIATION ADMIN., 23 October 2018) <<https://perma.cc/V24B-L45K>> accessed 21 May 2024. See also Steve Calandrillo, Jason Oh, and Ari Webb (n 30) 235 ("Without regulatory flexibility from the FAA, major American companies (eg, Google and Amazon) are investing in drone technology outside the United States' borders. [...] The United States cannot reap these benefits until the FAA removes its line-of-sight regulation.")

³² Dasom Lee, David J Hess, and Michiel A Heldeweg, "Safety and privacy regulations for unmanned aerial vehicles: A multiple comparative analysis" (2022) 71 Technology in Society 1.

on safety over privacy concerns. Indeed, “Congress has not been as productive in the field and has yet to address privacy, focusing instead on safety”.³³

2.1 Ex-post regulation of civil drones: an evolutionary antitrust approach

Antitrust enforcement of ex-ante permissions subject to ex-post enforcement is best illustrated with the DJI case whereby the super-dominant Chinese company was challenged for allegedly having competed unfairly by using predatory pricing. The drone industry in the US has seen its share of antitrust scrutiny, as evidenced by the legal battle between DJI, the market leader, and Autel, a competitor. Interestingly, both drone makers - DJI and Autel - are “threats to US security”.³⁴

Autel accused DJI of predatory pricing and monopolising the market on prosumer drones, violating both federal and state antitrust laws. However, a federal judge in Delaware dismissed Autel's counterclaims, stating that Autel had failed to provide sufficient evidence that DJI sold drones below cost in a predatory manner. DJI filed a lawsuit on 11 August 2016, against Autel for patent infringement related to drone technology.

In response, Autel filed antitrust counterclaims on 23 May 2018 against DJI, counterclaiming for monopolisation in violation of the Sherman Act, attempted monopolisation in violation of the Sherman Act, predatory pricing in violation of sections 17043 and 17044 of the California Unfair Practices Act, and predatory pricing in violation of section 481-3 of the Hawaii Unfair Practices Act. Autel described its antitrust counterclaims as focused on the “prosumer” drone market, defined as products that are advanced beyond mere toys yet not as complex as fully equipped professional models. These drones are highlighted for their user-friendly design and are equipped with professional-grade features, such as enhanced cameras, sophisticated navigation software, and increased smart capabilities. Autel claimed that DJI engaged in predatory pricing strategies to maintain and extend its market dominance by selling drones below cost to undercut competitors and drive them out of the market. Autel argued that DJI's practices harmed competition by preventing new and potentially better drones from entering the market, citing instances where DJI lowered its prices below cost in response to new competitive threats. Autel contended that DJI has significantly dominated this segment's growth, thereby bolstering its monopoly influence in the industry. Arguably, Judge Stark sums up Autel's predatory pricing claims as:

³³ Jacob Montgomery, ‘Protecting Reasonable Expectation of Privacy in an Age of Drones: A Framework for Balancing Privacy Interests with the Utility of Drones in Law Enforcement’ (2023) *Gonzaga Law Review* 485, 517 (advocating that “Any approach taken must balance the interests of law enforcement to apply drones with the individual's interest in privacy. A system capable of balancing these interests would recognize the expectation of privacy that existed before the introduction of drones into the national airspace and legislate to protect those privacy interests covered explicitly by the Fourth Amendment.”)

³⁴ Eric Sayers and Klion Kitchen (n 16).



“DJI has repeatedly engaged in predatory pricing to blunt the advance of new competitors and ultimately drive them out of the prosumer drone market entirely or, at a minimum, to its fringes.” “[N]early a dozen companies have attempted to bring new and better ‘prosumer’ drones to American consumers . . . [b]ut each time DJI has perceived a new threat, DJI has used its dominant market share to maintain and extend its monopoly by predatorily cutting its prices, below cost, to undercut the advent of the competitor drone.” “[There is] a continuing pattern of DJI’s anti-competitive conduct,” whereby DJI tactically lowers its price below cost to drive out each new competitor that enters.”³⁵

In response, DJI contended that its success in the drone market was due to its significant investments in research and development, as well as its efficient manufacturing capabilities. DJI disputed having monopoly power, pointing out that multiple companies had entered the market with competitive pricing. Also, DJI argued that Autel’s allegations of predatory pricing were speculative and not based on concrete evidence of below-cost pricing. DJI highlighted that Autel did not provide specifics on the prices DJI charged or demonstrate that those prices were below DJI’s costs.

On the 18 March 2019,³⁶ Judge Leonard P Stark of the United States District Court for the District of Delaware delivered a judgment dismissing the accusations against DJI. The judge first outlined the legal framework for predatory pricing under the Sherman Act, requiring proof that prices were below an appropriate measure of costs and that there was a reasonable prospect of recouping investments in below-cost prices. The ruling favoured DJI, who, despite being the plaintiffs in the initial lawsuit, found themselves defending against antitrust counterclaims brought forth by Autel. Judge Stark considered that Autel’s allegations were insufficient to plausibly support a claim of predatory pricing. Specifically, Autel failed to demonstrate that DJI’s pricing was below cost. The legal standard for proving predatory pricing was not met.³⁷

The court noted that Autel’s calculations, based on dividing DJI’s revenue by the quantity sold to determine monthly prices, were speculative and did not accurately reflect DJI’s actual pricing strategies. Judge Leonard P Stark dismissed Autel’s antitrust counterclaims, ruling in favour of DJI. The court emphasised the importance of not chilling competitive conduct that the antitrust laws are designed to protect, underscoring that competitive price cutting is often the essence of competition. Overall, Judge Stark found “robust competition” rather than “unfair competition”:

³⁵ *SZ DJI Tech. Co. v. Autel Robotics*, [2019] USDC Del, 3.

³⁶ *ibid*

³⁷ See, for instances, *Brooke Grp. Ltd. v. Brown & Williamson Tobacco Corp.*, [1993] USSC 44, 509 U.S. 209, 222-24 (*United States Supreme Court*, 1993); see also *Broadcom Corp. v. Qualcomm Inc.*, 501 F.3d 297, 317 (3d Cir. 2007). See also *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 594 (*United States Supreme Court*, 1986) 106 S. Ct. 1348, 89 L. Ed. 2d 538 (1986) where the Supreme Court warned that “[C]utting prices in order to increase business often is the very essence of competition. Thus, mistaken inferences in cases such as this one are especially costly, because they chill the very conduct the antitrust laws are designed to protect.”

"[A]ll of the facts alleged in the Counterclaim (as opposed to Autel's conclusory assertions) are fully consistent with robust competition in a growing market, including allegedly declining prices, increasing output, product innovation, and repeated new entry. Because there is no plausibly alleged anticompetitive conduct, Autel cannot satisfy the requirements for stating a predatory pricing claim under federal or state antitrust law".³⁸

The court's decision hinged on the inability of Autel to convincingly argue that DJI had engaged in predatory pricing tactics. Specifically, the allegations fell short as Autel did not manage to adequately demonstrate that DJI's pricing strategies resulted in prices being set below cost—a critical element required establishing a claim of predatory pricing. Judge Stark's dismissal of the allegations underscores the high evidentiary bar required to prove such antitrust claims, marking a clear victory for DJI in this legal battle over competitive practices in the drone market.

The *SZ DJI Technology Co. Ltd. v. Autel Robotics USA LLC* case shows antitrust laws' limits: the judicial rationale highlights several reasons why antitrust mechanisms were inadequate in this case. First, Autel's claims of predatory pricing were rejected by the court due to a lack of evidence that DJI sold its drones below their production costs, a key antitrust requirement. The court's insistence on exact and detailed evidence of pricing below the cost shows that plaintiffs in antitrust cases have a high burden of proof, making it difficult for competitors to challenge dominant firms' bold or unfair pricing strategies.

Second, the court's reasoning shows an understanding of the prosumer drone market's constant change and competition. DJI's success is due to their pricing strategies, large R&D team, and efficient manufacturing processes. These factors suggest that antitrust laws may not cover situations where a company's dominant position is due to inherent competitive advantages and innovation rather than anticompetitive behaviour. Antitrust laws require not only pricing below cost but also the intent to eliminate competition and a chance of recovering losses. Autel's claims failed to prove that DJI's pricing strategy intentionally damaged competition and that DJI could recover its losses, the court ruled. Creating predatory pricing and using antitrust laws to limit market dominance are difficult.

Third, the court advised against incorrect conclusions that discourage competition. It stressed that courts prefer to let competitive market forces play out rather than enforce antitrust laws. This cautious approach to antitrust enforcement reflects concerns about overregulation hindering innovation and competition. Overall, the case shows the challenges of using antitrust law to address market control concerns, especially in fast-changing, innovation-driven markets like prosumer drones. Rivals seeking to challenge dominant market participants through antitrust litigation may face challenges due to the

³⁸ *SZ DJI Tech. Co. v. Autel Robotics* (n 35) 10.



courts' strict criteria for anticompetitive conduct and their focus on market dynamics and innovation.

2.2 Implications: benefits and limits of antitrust

One of the advantages of using antitrust enforcement as an ex-post regulation of civil drones is that it provides sufficient room for technological innovation to take place, as well as the opportunity for interventions to take place on a limited number of highly targeted matters and subjects. In fact, the default rule in antitrust law continues to be that innovations and market actors' strategies are permitted, unless ex-post antitrust interventions provide a different outcome.

In addition to the primary limitations of antitrust, which include the requirement that anticompetitive behaviour be supported by evidence, antitrust is unable to effectively sanction predatory pricing and is unable to effectively incorporate concerns regarding national security. The case of DJI exemplifies both limitations in a particularly severe and compelling manner.

The national security concerns regarding DJI, and more generally Chinese drone makers, are real. It is said that "the Pentagon is worried that DJI shares data with the Chinese government -the same claim the U.S. government makes about Huawei and one DJI denies".³⁹ China-based technology companies ought to turn over, by law and on demand, data they have collected through their business operations, to the Chinese government.⁴⁰

To address this problem of a super-dominant company controlling the drone market while generating national security risks through data-sharing with the Chinese Communist Party requires change of policies and regulations⁴¹ - something that antitrust cannot address at all. This took place in 2020 when Congress prohibited the Department of Defense from purchasing drones made by Chinese companies.⁴² Also, in 2020, the Department of Justice banned the use of agency grants for purchasing Chinese drones due to national security concerns.⁴³

³⁹ Lara Seligman, "Pentagon Seeks to Counter China's Drone Edge" (*Foreign Policy*, 27 August 2019) <<https://foreignpolicy.com/2019/08/27/pentagon-seeks-to-counter-chinas-drone-edge/>> accessed 21 May 2024.

⁴⁰ Jim Magill, 'Controversy Surrounding Data Security of Chinese-made Drone Sparks Intense Debate' (*DroneLife*, 1 March 2024) <<https://dronelife.com/2024/03/01/controversy-surrounding-data-security-of-chinese-made-drones-sparks-intense-debate/>> accessed 22 May 2024.

⁴¹ *ibid.* (the U.S. government also needs to update policies and regulations governing sales and operations of drones across the country.)

⁴² Section 848, Fiscal Year 2020 National Defense Authorization Act (NDAA) <<https://www.congress.gov/bill/116th-congress/senate-bill/1790/text>> accessed 22 May 2024.

⁴³ See Department of Justice, Policy on Funding Unmanned Aircraft Systems, 5 October 2020, <<https://www.ojp.gov/sites/g/files/xyckuh241/files/media/document/ojpporderfundingdrones.pdf>> accessed 22 May 2024.

Nevertheless, the purchase of drones from Chinese makers for the consumer market remains untouched despite data leakage risks. Not only DJI's dominance threatens US's national security but it also undermines leadership in aviation sector:

*“The U.S. must recognize that, in addition to national security concerns, China’s subsidized drone market is harming the U.S. workforce, and ultimately our standing as the global leader in aviation. Drones are already playing an important role in the economy, and that role will continue to grow as drones become indispensable tools used for industrial inspection, lifesaving operations by first responders, and the delivery of products and services. Drones are also critically important to U.S. leadership in a new era of aviation defined by uncrewed and autonomous systems”.*⁴⁴

The absence of actions for the drone consumer market is striking due to the fact that, in October 2022, the Department of Defense identified DJI as a “Chinese military company” operating in the US⁴⁵. In 2023, President Biden signed the National Defense Authorization Act of 2024 which contained restrictive provisions originally proposed in the American Security Drone Act (ASDA) of 2023 which restricts government agencies from the use of drones manufactured in China.⁴⁶

Antitrust actions cannot remedy or address the DJI's market dominance and its related national security issues because these data matters mostly remain outside the reach of antitrust. Hence, outside military regulation and public procurement or public funding rules, the regulation of civil drones in the US is primarily limited to antitrust actions which are highly limited themselves. This is in contrast with the European approach which embraces on more proactive approach to regulatory interventions on the civil drone market, through both competition law actions and ex-ante regulations.

3 EU regulation of civil drones: regulation through precaution

The European Union's approach to antitrust enforcement in the drone industry is part of its broader regulatory framework for digital and emerging technologies. The EU has proposed rules making it easier for individuals and companies to sue makers of drones, robots, and other AI-enabled products for compensation for harm caused by these technologies. This AI Liability Directive aims to address the increasing use of AI-enabled products and services and the patchwork of national rules across the EU. While not an

⁴⁴ Association for Uncrewed Vehicle Systems International, Whitepaper: AUVSI Partnership for Drone Competitiveness, 18 January 2024 <<https://www.auvsi.org/sites/default/files/AUVSI-Partnership-for-Drone-Competitiveness-White-Paper.pdf>> para 8 accessed 22 May 2024.

⁴⁵ Section 1260H of the Fiscal Year 2021 NDAA <<https://www.defense.gov/News/Releases/Release/Article/3180636/dod-releases-list-of-peoples-republic-of-china-prc-military-companies-in-accord/>> accessed 22 May 2024.

⁴⁶ White House, ‘Statement from President Joe Biden on H.R. 2670, National Defense Authorization Act for Fiscal Year 2024’ (22 December 2023). See S. 473, American Security Drone Act of 2023, 118th Congress. Some pending bills would ban DJI from operating on US communications infrastructure by adding the company to the Federal Communications Commissions’ Covered List of prohibited companies. See H.R., Countering CCP Drones Act, 118th Congress (2023).



antitrust regulation per se, this directive reflects the EU's proactive stance on regulating the digital economy, including the drone industry, to ensure consumer protection and fair competition.

3.1 Ex-ante regulation of civil drones: a precautionary approach

Interestingly, in the European Union, there is not a single case regarding the regulation of drones, let alone civil drones.⁴⁷ However, there are several merger decisions involving drone technology.⁴⁸

The EU refers to drone regulation as part of the “U-space” regulation for “Unmanned” aircrafts⁴⁹. The EU’s “Drone Strategy 2.0”, unveiled in November 2022, envisions drones playing a significant role in infrastructure, emergency services, and transportation, such as delivering medicines and serving as air taxis.⁵⁰ The EU drone market is expected to achieve a value of €14.5 billion and generate 145,000 employment opportunities by the year 2030.⁵¹ The strategy outlines 19 specific operational, technical, and financial measures to create a favourable legal and commercial environment for drone operations⁵². The strategy promotes the use of standardised scenarios that are advantageous for both civil and military purposes and suggests a unified approach by the European Union in terms of drone technology and certification standards. This comprehensive strategy aligns with the current EU legal framework and the U-Space

⁴⁷ Indeed, the only cases cursorily mention “drones” as part of asylum or foreign policy matters. See, comprehensively, Case C-901/19 *CF and DN v Bundesrepublik Deutschland* [2022] ECLI:EU:C:2021:472. The case deals with the question of whether secondary protection against a genuine risk of suffering serious harm can be contingent upon a minimum number of civilian fatalities and injuries in the nation of origin, and mentioning “*misguided US drone attack*” (para.19); Case T-182/21 *Kurdistan Workers’ Party (PKK) v Council of the European Union* [2022] ECLI:EU:T:2022:807, regarding the EU’s classification of the PKK as a terrorist group after a drone attack in Iraq.

⁴⁸ *Dassault Aviation / TSA / Thales* (Case Comp/M.5426) Commission Decision C(2009) 1947 [2009] *Matra / Aerospatiale* (Case IV/M.1309) Commission Decision IV/M.1309 [1999] *EADS* (Case Comp/M.1745) Commission Decision Comp/M.1745 [2000] *Sagem / Snecma* (Case Comp/M.3621) Commission Decision C(2004) 5084 [2004] *EADS / STA / Elbe Flugzeugwerke JV* (Case Comp/M.6554) Commission Decision C(2012) 6355 [2012] *Safran / MBDA / Compagnie Industrielle Des Lasers Cilas* (Case M.10640) Commission Decision C(2022) 7405 [2022] *EADS / Astrium* (Case Comp/M.2924) Commission Decision Comp/M.2924 [2002] *EADS / Astrium (II)* (Case Comp/M.3156) Commission Decision Comp/M.3156 [2003] *Thales / DCN* (Case Comp/M.4191) Commission Decision C(2007) 563 [2007] *Safran / Zodiac Aerospace* (Case M.8425) Commission Decision C(2017) 8782 [2017] *EADS / Israel Aerospace Industries / JV* (Case Comp/M.6490) Commission Decision C(2012) 4977 [2012] *MBDA / Bayern-Chemie* (Case Comp/M.4653) Commission Decision C(2007) 3776 [2007] *Faurecia / Michelin / Symbio / JV* (Case M.9474) Commission Decision C(2019) 8382 [2019] *Qualcomm / NXP Semiconductors* (Case M.8306) Commission Decision C(2018) 438 [2018] *Parker / Meggitt* (Case M.10506) Commission Decision C(2022) 2287 [2022] *Harris Corporation / L3 Technologies* (Case M.9234) Commission Decision C(2019) 4634 [2019] *UTC / Rockwell Collins* (Case M.8658) Commission Decision C(2018) 3052 [2018].

⁴⁹ Commission Implementing Regulation (EU) 2019/347 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft [2019] OJ L152/45 (categorising drone operations into ‘open’, ‘specific’, and ‘certified’ categories, each with varying levels of regulatory requirements based on the risk they pose and stipulating that existing national certificates for drone operators and remote pilots must be recognized until they are harmonized with EU standards by July 2021.)

⁵⁰ European Commission, ‘A Drone Strategy 2.0 for a Smart and Sustainable Unmanned Aircraft Eco-System in Europe’ COM (2022) 652 final, 29 November 2022.

⁵¹ *ibid.*

⁵² *ibid.*

Package,⁵³ with the goal of streamlining regulations and encouraging the widespread and responsible use of drones.⁵⁴

On 26 January 2023, the European Commission (EC) has for example introduced new rules on dedicated airspace for drones.⁵⁵ The Implementing Regulation of 22 April 2021, on a regulatory framework for the U-space provides, beyond safety objectives, some provisions regarding data use and sharing. For instance, a ‘common information service’ for the purpose of the Regulation is defined as a “service consisting in the dissemination of static and dynamic data to enable the provision of U-space services for the management of traffic of unmanned aircraft”.⁵⁶ The providers of common information service of each U-space ought to comply “with the necessary data quality, latency and protection requirements” established in the Regulation’s Annex, according to Article 5.4(b) of the Regulation. Such Annex details the data quality requirements which include, among others, the need for the service providers to ensure that “the transfer of data is subject to a suitable authentication process such that recipients are able to confirm that the data or information has been transmitted by an authorised source”.⁵⁷ In addition, service providers are required to “implement security policies, including data encryption and protection of critical data”, “identify, assess, and mitigate, as necessary, the security risks and vulnerabilities” and to “adhere to security standards and regulations regarding where data can be stored and ensure that third-party providers agree to follow security practices”.⁵⁸ This emphasis on risks, vulnerabilities, and requirements for a high data quality differs ensures that security risks related to data transfers to foreign powers are minimised.

This type of ex-ante regulation seems to better apprehend the complexity and diversity of threats and vulnerabilities associated with drones, especially when AI-embedded technology underpins such drones.⁵⁹

⁵³ Commission Implementing Regulation (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space [2021] OJ L139/161; Commission Implementing Regulation (EU) 2021/665 of 22 April 2021 amending Regulation (EU) 2017/373 as regards requirements for providers of air traffic management/air navigation services and other air traffic management network functions in the U-space airspace designated in controlled airspace [2021] OJ L139/184 as regards requirements for providers of air traffic management/air navigation services and other air traffic management network functions in the U-space airspace designated in controlled airspace, L 139/184, April 23, 2021; Commission Implementing Regulation (EU) 2021/666 of 22 April 2021 amending Regulation (EU) No 923/2012 as regards requirements for manned aviation operating in U-space airspace [2021] OJ L139/187 as regards requirements for manned aviation operating in U-space airspace, L 139/187, April 23, 2021.

⁵⁴ See also European Commission, “A Drone Strategy 2.0 for Europe,” Ref. Ares (2021)3664195, June 3, 2021.

⁵⁵ European Commission, ‘New EU Rules on Dedicated Airspace for Drones Enter into Force’ (26 January 2023).

⁵⁶ Commission Implementing Regulation (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space [2021] OJ L139/161, art 2(4).

⁵⁷ Commission Implementing Regulation (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space [2021] OJ L139/161, Annex III.A.4.

⁵⁸ Commission Implementing Regulation (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space [2021] OJ L139/161, Annex III.B.4.

⁵⁹ See, for discussion, Ozmen Mustafa Meliksah, Aksoy Bekir, “An Example Application for An Identification of Friend and Foe (IFF) System Appropriate for Unmanned Aerial Vehicles (UAV) Based on Deep Learning” (2023) 107(3) Journal of



3.2 The privacy emphasis: constant and relevant

The European approach to drone regulation is characterised by two main aspects. First, drone regulation fits within the European Sky Strategy which is a strategy aimed at achieving a “European Single Sky” as part of the existential achievement of the European Single Market.⁶⁰ The removal of barriers to trade, the minimisation of the European market fragmentation as general principles of European regulation apply to drone regulation.

Second, in contrast to the conventional focus on the physical safety aspects of aerial activities, the European model expands the scope to encompass concerns about security and privacy.⁶¹ Considering the global civil drone market’s significant Chinese manufacturer dominance, this expanded perspective is imperative. This dominance, which is justified by the integration of military and civilian drone technologies, brings up relevant concerns about data exploitation and threats to national security. The GDPR requires that any activity involving the processing of personal data must guarantee transparency, limitation of purpose, minimal data usage, accuracy, integrity, and confidentiality. Unregulated drones, which are frequently equipped with cameras, sensors, and other data-gathering devices, have the potential to violate individual privacy rights.

One crucial element of GDPR compliance for drone operations is the necessity of conducting Data Protection Impact Assessments (DPIAs) in cases where there is a significant threat to individual privacy. Data Protection Impact Assessments (DPIAs) aid in the identification and mitigation of risks linked to data processing activities. Drone operations have the potential to collect substantial amounts of unauthorized personal data through video recordings and other surveillance activities, making this issue of utmost importance.

Drones filming in areas where individuals have a reasonable expectation of privacy in the European Union must adhere to the regulations set forth by the GDPR. Although GDPR provides extensive coverage, it poses various challenges for the implementation of drone technology. Initially, the regulation can be perceived as an obstacle that hinders the wider acceptance and implementation of drone technology in fields such as agriculture, emergency services, and urban planning, where the gathering of extensive data is crucial. The need to comply with regulations can result in higher operational expenses and intricacy, which may hinder the progress of innovation and technological development. Furthermore, the diverse interpretations of GDPR among EU member states can result in inconsistencies in the implementation and adherence to enforcement and compliance obligations. This not only adds complexity to the regulatory environment for drone operators but also impedes the progress of establishing a cohesive market for drone technologies across Europe.

Intelligent & Robotic Systems 36; Mateusz Osiecki, Agnieszka Fortonska, Matylda Berus, Marta Włodarczyk, “Drone as a Target of Terrorist Attack and a Weapon Against Terrorism - Analysis in the Light of International Law” (2022) 106(6) Journal of Intelligent & Robotics System.

⁶⁰ Eleonora Bassi (n 2) 493.

⁶¹ EU privacy rules predominantly remain dictated by the “GDPR”, Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) [2016] OJ L119/1.

Although GDPR imposes restrictions on the utilisation of drones, it also stimulates advancements in technologies that protect privacy. For example, the focus on ‘privacy by design’ promotes the development of drones by manufacturers that aim to reduce data collection or anonymize data to prevent identification. Geofencing technologies improve compliance by preventing drones from entering restricted areas, thereby reducing the likelihood of privacy violations. The implementation of GDPR has stimulated advancements in secure methods of transmitting and storing data, guaranteeing that the information collected by drones is safeguarded against unauthorised access and breaches. These advancements not only comply with GDPR regulations but also improve the overall security and effectiveness of drone operations.

The EU faces a dynamic challenge in maintaining a balance between innovation and strict compliance with privacy regulations. As the advancement of drone technology progresses, it is necessary to update the regulatory frameworks that govern its usage. These frameworks should promote innovation while also safeguarding individual privacy rights. Hence, the European approach to regulation tackles the possibility of privacy infringement and unapproved data collection in addition to reducing the physical risks associated with drones, such as collisions or mechanical failures. Drones with sophisticated sensors and cameras have the potential to gather substantial amounts of data, which raises concerns about potential misuse and privacy violations. It may even make it easier to obtain sensitive information without authorisation.

Furthermore, the technological similarities between military and civilian drones highlight the possible threats to national security, such as the potential for civilian drones to be modified for use in the military or the leakage of cutting-edge technology that could jeopardise national security. In that context, the promotion of a “large-scale European drone market” promotes technological sovereignty and minimise reliance on external suppliers.⁶² Such market is envisioned as part of the “European Drone Strategy 2.0” which aims at “setting out possible ways to guide the further development of this technology and its regulatory and commercial environment”.⁶³

Europe is safeguarding its citizens against threats to national security and privacy, in addition to preventing immediate harm, by incorporating security and privacy considerations into drone regulations. Interestingly, characteristic to the precautionary approach, the EU has approached drone regulation is not the result of a harmonisation process from national rules to the European level but, instead, a proactive action from the European institutions to regulate in absence of national rules:

“Developing Union rules for drones has been all the more important as there were very few regulatory national frameworks in place in the EU Member States, or at the global level. Unlike in other sectors, where the EU regulatory harmonisation process started after the adoption at national level of sometimes diverging regulation, here, it has been

⁶² European Commission, “Drone Strategy 2.0: Creating a large-scale European drone market” (29 November 2022) <https://ec.europa.eu/commission/presscorner/detail/en/ip_22_7076> accessed 22 May 2024.

⁶³ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, ‘A Drone Strategy 2.0 for a Smart and Sustainable Unmanned Aircraft Eco-System in Europe’ COM/2022/652, 29 November 2022.



*possible to start from the outset with a truly common set of rules. This continues to present a unique opportunity not to be missed*⁶⁴.

Embracing a “forward-looking vision for the future holistic development” of the drone market,⁶⁵ the EU has updated drone rules to boost the commercial drone market while planning measures against malicious use. These regulatory updates, although primarily focused on safety and security, indirectly influence market competition by setting standards that all drone manufacturers and operators must meet.

4 Conclusion: a comparative analysis

The application of antitrust laws to the drone industry in the US and EU reflects broader differences in regulatory philosophies between the two regions. The US legal battle between DJI and Autel demonstrates the challenges of applying traditional antitrust laws to a high-tech industry characterised by rapid innovation and global competition. In contrast, the EU's regulatory proposals, including the AI Liability Directive, indicate a more proactive approach to addressing the complexities of the digital economy, including potential antitrust issues, through comprehensive legislation. Both regions recognise the importance of fostering competition and innovation in the drone industry while ensuring consumer protection and national security. However, the mechanisms and focus of their regulatory efforts differ, with the US emphasising legal enforcement of antitrust laws and the EU adopting a more holistic regulatory approach that includes aspects of competition, consumer protection, and liability.

From a comparative perspective, safety is a more significant concern than privacy for UAV regulations.⁶⁶ In that regard, the US approach best resemble the overall global approach. More generally, the EU and US drone regulation approaches greatly impact market competition, technological advancement, and regulatory industry equilibrium. These differences help explain how legal frameworks can promote or hinder technological advancement and market dynamics in civil drones.

Technology development and market entry are safe in the EU due to its harmonised and precautionary regulatory framework. EASA-regulated EU regulations promote consistency and lower market entry barriers, fostering competition and innovation. The coherent regulatory landscape across EU Member States allows UAV manufacturers to scale operations without having to navigate regional laws, improving competitive dynamics and market innovation.

However, the US regulatory environment is more fragmented and litigious, as shown by the SZ DJI Technology Co. Ltd. and Autel Robotics USA LLC case. The reactive US framework prioritises safety over privacy, which can lead to judicial proceedings that

⁶⁴ COM/2022/652, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, ‘A Drone Strategy 2.0 for a Smart and Sustainable Unmanned Aircraft Eco-System in Europe’, 29 November 2022, para 6.

⁶⁵ *ibid* para 17.

⁶⁶ Dasom Lee, David J Hess, Michiel A Heldeweg (n 32).

create uncertainty and slow technological and market change. This may hinder drone industry innovation and new entrants.

EU regulations like the GDPR's strict privacy and data protection requirements for drone operations spur privacy-enhancing technology innovation. Drones must have geofencing to comply with privacy laws, pushing the industry to develop privacy-conscious technology. In contrast, the US emphasis on safety and integration into the national airspace has led to advanced detect-and-avoid systems to reduce drone flight risks. The US's piecemeal privacy approach through state legislatures creates a heterogeneous regulatory landscape that could stymie unified technological advancements. For, the United States has a more fragmented approach to privacy concerning drones, with significant involvement from state legislatures. The FAA has been reluctant to regulate privacy broadly, leaving room for states to experiment with drone regulations that address privacy concern. This results in a patchwork of state laws that may offer varying degrees of privacy protection, potentially leading to inconsistencies and challenges for interstate drone operations.

Which regulatory approach is more conducive to innovation gains and increased consumer welfare? The more evolutionary approach adopted in the US may seem to give more prospect for trial-and-error approach which is inherent to the innovation process. In contrast, the regulatory standards preventively adopted in the EU may deter innovation and incentivize drone makers to shift production in laxer regulatory environments. Policymakers can use these methods to combine the strengths of both regulatory approaches:

1. *Harmonisation of Regulations:* The US could benefit from harmonising drone privacy regulations like the EU's GDPR to reduce interstate regulatory burdens and create a more consistent market environment;
2. *Balanced Regulatory Frameworks:* Both regions should prioritise safety, privacy, and innovation. Like the US, the EU could consider more flexible frameworks that allow technological experimentation to spur innovation while protecting fundamental rights;
3. *Stakeholder Engagement:* Drone manufacturers, operators, and civil society must be engaged continuously. This engagement can help make regulations practical and promote innovation and competition;
4. *International Collaboration:* EU-US collaboration on standards and best practices could improve global standards, lower international market entry barriers, and set a global drone safety and privacy benchmark;



5. *Drone market competition:* Policymakers can ensure drone regulations support robust market competition and safe, privacy-respecting, and innovative drone technology use by addressing these recommendations. The drone industry is changing everything from package delivery to emergency services, so this balanced approach is essential.

In conclusion, as the drone industry continues to evolve, both the US and EU may need to adapt their antitrust and regulatory frameworks to address new challenges and ensure a competitive and innovative market landscape. The regulatory approaches to civil drones by the United States and the European Union reflect their distinct legal, cultural, and operational perspectives, leading to various implications for drone manufacturers, operators, and the broader society. These differences impact areas such as privacy, safety, market access, and innovation within the drone industry.