The European Union's New USB-C Standardization Amendment: What Does it Mean for Innovation Within the Consumer Technology Industry?

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The European Union's New USB-C Standardization Amendment: What Does it Mean for Innovation Within the Consumer Technology Industry?

Cover Page Footnote
Adrien Fourneaux is a third-year law student at Northwestern Pritzker School of Law and will be joining Millbank LLP’s transactional group in New York after graduation and bar passage. Adrien was born in Guebwiller, France and has spent much of his life abroad in various countries. Ultimately, this has fostered a strong interest within him for international law and cross-border transactions. Adrien would like to express his love and gratitude towards his friends, family, and partner.
The European Union’s New USB-C Standardization Amendment: What Does it Mean for Innovation Within the Consumer Technology Industry?

Adrien Fourneaux*
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I. INTRODUCTION

In October of 2022, the European Union passed an amendment to the 2014 Radio Equipment Directive (RED). The amendment required all technology devices, including cellular devices, released in and after 2024 to be equipped with a Universal Serial Bus Type-C (USB-C) charging port. The amendment is not the first of its nature. In the past, the European Union has targeted big technology companies on behalf of consumers and their welfare through various regulations. For instance, the European Union has recently passed the Digital Service Act and Digital Markets Act, aiming to protect user data and curtail anticompetitive behavior within the technology industry. However, the RED amendment has gained notoriety within recent years. Large technology companies, such as Apple, believe that government bodies should not dictate the way their products are developed and sold. Despite this pushback, the European Commission believes that the amendment is inherently necessary due to today’s global climate. They believe it protects consumers by limiting any inconveniences associated with chargers, and it helps reduce electronic waste (“e-waste”). However, opponents of the amendment believe that it would curtail technological developments within the realm of cellular charging, and ultimately hurt consumers instead of protecting and bolstering their welfare. This note will: (1) explore how the European Union creates regulations, (2) look in depth at the rationale behind the RED amendment, (3) evaluate the arguments made by opponents of the regulation, (4) analyze various case studies to determine the general impact regulations have on innovation, and (5) argue that the new USB-C amendment will impede the development and improvement of current wired charging solutions but not that of wireless charging solutions.

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2 Id.
4 Id.
6 Id.
8 Weaver, supra note 5.
II. OVERVIEW OF THE EUROPEAN UNION’S REGULATORY FUNCTION, PRACTICE, AND HISTORY

In the first part of the note, we will explore the law-making process within the European Union (E.U.). This includes looking into the European Commission’s lawmaking function, the ratification procedure, and any applicable laws and guidelines that characterize the modern-day lawmaking procedure within the E.U. After establishing a general understanding of the E.U. regulatory procedure, we will examine three eras of the E.U.’s regulatory history and discuss their contributions to the modern regulatory landscape.

A. The European Commission’s Lawmaking Function and Ratification Procedure

The European Union’s decision making process follows three principles: conferral (the E.U. ’s authority comes from the treaties that formed and solidified the E.U., and thus it cannot go beyond the inherent authority outlined in those treaties), proportionality (the E.U. must create laws that adhere to the treaties), and subsidiarity (the E.U. should only act when its actions will better accomplish the goal compared to when a nation country acts).

If none of the principles conflict with the creation of a new law, then the law is able to be implemented. The lawmaking process is outlined in the following paragraphs.

The European Commission (Commission) is the E.U.’s governmental body responsible for planning, developing, and proposing laws to be implemented into the European Union. These proposed laws are confined within a framework which necessitates that the laws “adhere to the objectives of the E.U. treaties” and “defend the interests of the Union and its citizens as a whole.”

Furthermore, during the planning and developing phase, the Commission follows the “Better Regulation” agenda. The agenda aims to bolster transparency and efficiency, within the decision-making process, by outlining various guidelines the Commission must follow. Additionally, the agenda highlights political goals, such as “integrating strategic foresight into policy making,” which allows for the creation of policy that will promote regulatory flexibility.

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12 Id.
13 Id.
in, one out” approach, which aims to remove existing regulatory burdens on citizens and small-to-medium sized corporations.\textsuperscript{14} The agenda also implements tangible procedural alterations, such as an improved “Have Your Say” portal that streamlines the intake of public opinion during policymaking stage.\textsuperscript{15} The portal allows E.U. citizens and corporations to have easier access in voicing their opinions and concerns over a potential new policy.\textsuperscript{16} The European Commission aims to adhere to the agenda in order to ensure that modern regulations are created in a more fair, equitable and transparent manner.\textsuperscript{17}

Once the Commission has finalized a proposal for a new law, the proposal is sent to the European Parliament (Parliament) and the Council of the European Union (Council) for what is called a “first reading.”\textsuperscript{18} During the first reading, the two bodies separately debate over the proposed law to determine whether it must be amended in any way.\textsuperscript{19} If the Council and Parliament agree on a finalized proposal, then it is ratified into law; however, the Commission can either object to any amendments made by both parties (the objection can be overruled with a unanimous vote on the part of the Council) or fully withdraw the proposal if it believes that any amendments made to it, by the Commission or Parliament, drastically changes the proposal (withdrawal of the proposal effectively kills any chance of it becoming law as there is nothing the Council or Parliament can do once the proposal has been withdrawn by the Commission).\textsuperscript{20} If there is no agreement found between the Council and Parliament during the first reading, or the Commission objects to any proposed amendments made to its proposal, then a “second reading” takes place.\textsuperscript{21} The second reading provides additional time for both the Council and Parliament to find an agreement, and if there is yet no agreement then a conciliation committee is created to help find a solution.\textsuperscript{22} If there is still no agreement, even after the conciliation committee is created, then the Commission withdraws the proposal to either kill it entirely or provide alterations that will lead to the Council and Parliament agreeing on the proposal.\textsuperscript{23} The process can vary in terms of length, and it is feasible that an initial proposal goes through various editing stages before

\textsuperscript{14} Id.
\textsuperscript{15} Id.
\textsuperscript{16} Id.
\textsuperscript{17} Id.
\textsuperscript{19} Id.
\textsuperscript{20} Id.
\textsuperscript{21} Id.
\textsuperscript{22} Id.
\textsuperscript{23} Id.
finally becoming E.U. law.\textsuperscript{24}

\textit{B. The Evolution of the European Union’s Regulatory Landscape}

The European Union’s regulatory landscape has shifted through three major eras: the advent of free trade pre-1993, the era of “non-aggressive” regulations between 1993 and 2004, and the modern era of “market impact” determinations. The E.U.’s early, pre-1993, regulatory schemes focused on ensuring free market trade between member states.\textsuperscript{25} This era saw two important developments.\textsuperscript{26} First, it spawned the first European economic coalition: the European Coal and Steel Community (ECSC).\textsuperscript{27} Second, it spurred new international agreements like the Treaties of Rome and the Single European Act; the latter of the two created a single economic market with strong political integration throughout member states.\textsuperscript{28} This era, including both important developments, ensured the creation of a strong and cohesive E.U. regime.\textsuperscript{29}

Next, in the period between 1993 and 2004, the E.U.’s regulatory goals shifted away from implementing rigid regulations to ensure free market trade among member states, towards ensuring market competition through “non-aggressive” regulations. Regulators used this non-aggressive form of regulations because they believed the E.U.’s markets were too young and fragile for implementing strong regulatory schemes.\textsuperscript{30} At the time, there was a fear that rigid regulations would curtail the growth of E.U. markets; thus, regulations were more lenient to ensure healthy growth.\textsuperscript{31}

Since 2004, regulators have prioritized assessing a regulation’s potential market impact.\textsuperscript{32} Regulations are now less desirable unless there is a strong cause or justification for having them.\textsuperscript{33} This is partly due to the Better Regulation Agenda that aims to create regulations in a more transparent manner compared to previous E.U. regulatory eras.\textsuperscript{34} Despite the overarching notion that regulators look to understand the market impact of a regulation, regulations have taken on a more front-footed approach in fighting the

\begin{itemize}
\item \textsuperscript{24} Id.
\item \textsuperscript{26} Id.
\item \textsuperscript{27} Id.
\item \textsuperscript{28} Id.
\item \textsuperscript{29} Id.
\item \textsuperscript{31} Id.
\item \textsuperscript{32} Id.
\item \textsuperscript{33} Id.
\item \textsuperscript{34} Id.
\end{itemize}
The EU’s USB-C Standardization and Innovation

44:149 (2024)

... growing concern regarding unfair competition and consumer vulnerability.\textsuperscript{35}

Ultimately, this growing concern has caused the E.U. to ratify stronger regulations aimed at protecting consumer welfare and ensuring healthy competition among companies. The 2018 General Data Protection Regulation (GDPR) is one example of this type of regulation.\textsuperscript{36} The GDPR implements strict restrictions and guidelines for companies collecting user data, thus bolstering consumer safety against data breaches.\textsuperscript{37} Additionally, the European Commission has submitted two proposals for two regulations that would directly impact “Big Tech” and the growing anti-competitive behavior within it.\textsuperscript{38} The newly proposed Digital Services Act aims to regulate the algorithms used by technology companies for consumer targeting, and the Digital Markets Act punishes anti-competitive behavior between technology companies.\textsuperscript{39} The amended provision of the Radio Equipment Directive falls perfectly within this new wave of E.U. regulations, aimed at protecting consumer welfare and curtailing anti-competitive behavior between corporations.

III. WHAT IS THE AMENDED PROVISION OF THE RADIO EQUIPMENT DIRECTIVE?

This portion of the note examines the historical origins of the Radio Equipment Directive’s amended provision and details the four guidelines the amendment aims to achieve with manufacturers. Then, it evaluates the E.U.’s reasoning for creating this amendment by examining past attempts to tackle the E.U.’s concerns.

A. The Origins of the Radio Equipment Directive’s Amended Provision

Starting in 2014, Members of the European Parliament (MEPs) requested that the European Commission issue a regulatory proposal that would require new radio devices (which includes cellular phones, tablets, e-readers, computers, and other similarly characterized consumer electronic devices) to share the same wired charging solution (“charging solution” refers to the entirety of a device’s charging format, which includes the internal charging port and the charging cable) format.\textsuperscript{40} However, the MEPs’ call went unanswered by the Commission.\textsuperscript{41} The European Parliament

\textsuperscript{35} Id.


\textsuperscript{37} Id.

\textsuperscript{38} Perrigo, \textit{supra} note 3.

\textsuperscript{39} Id.


\textsuperscript{41} Id.
renewed efforts to urge the Commission to propose a law for a common charging standard in a resolution on January 30, 2020; this also went unanswered.\textsuperscript{42} Then again on February 10, 2021, the Parliament sent another request that the Commission finally answered.\textsuperscript{43} On September 23, 2021, the Commission released a regulatory proposal that outlined its proposed amendment to the Radio Equipment Directive, which standardized the wired charging technology for all consumer electronics.\textsuperscript{44} The proposal aimed to establish a common charging interface and charging protocol for all consumer electronics by requiring a USB-C charging interface. Additionally, the Commission’s proposal hoped to ensure the same charging performance across all electronics, regardless of the make or model of the device, and the type of USB-C charging interface the respective device uses.\textsuperscript{45}

To achieve these goals, the proposal requires manufacturers to adhere to four guidelines.\textsuperscript{46} First, manufacturers must use the USB-C charger as the standard charger for all electronic devices.\textsuperscript{47} This aims to allow consumers to charge their devices regardless of the device brand and not feel cornered by a charging ecosystem.\textsuperscript{48} Second, manufacturers must harmonize “fast charging technology” so that they do not “unjustifiably limit the charging speed” through the device or charger.\textsuperscript{49} This curtails a predatory practice of coercing consumers to charge their devices with chargers from the same brand as their devices, by slowing the charging speed of devices when being charged with chargers from other brands.\textsuperscript{50} Third, manufacturers must permit customers to purchase new devices with or without the USB-C charger.\textsuperscript{51} This guideline reduces the amount of unwanted and unused chargers that consumers get when buying a new device, reducing the amount of e-waste that is produced by such unwanted and unused chargers.\textsuperscript{52} Finally,

\begin{thebibliography}{9}
\end{thebibliography}
manufacturers must provide consumers with better knowledge, in a more transparent manner, regarding a device’s charging requirements.\textsuperscript{53} This includes whether the device supports fast charging and what level of power is required for adequate charging speeds.\textsuperscript{54} Adherence to all four guidelines, outlined within the proposed amendment, ensures that consumer devices use the same charging interface, and limits a manufacturers ability to implement discriminatory practices.

B. The E.U.’s Rationale for Implementing the USB-C Charging Standard

The E.U. created the USB-C regulation, like its other post-2004 regulations, after conducting numerous surveys and assessments to determine whether there were relevant needs and strong justifiable reasons to aggressively regulate consumer electronics manufacturers.\textsuperscript{55} In 2018, the European Commission conducted an impact assessment study to determine the best approach to address the market fragmentation concerning electronic devices and their chargers.\textsuperscript{56} The assessment found that the initial 2009 Memorandum of Understanding (MoU), a voluntary, non-binding agreement facilitated by the European Commission (and signed by large technology companies such as Apple, LG, Samsung and others) had aided in harmonizing charging interfaces and communication protocols, but had no significant impact on the E.U.’s desire for manufacturers to unbundle the sale of new devices from chargers.\textsuperscript{57} Additionally, the assessment found that 63%, of “E.U. citizens, who participated in the Commission’s public consultation on mobile phone chargers,” were at least dissatisfied or very dissatisfied with the current state of mobile phone chargers; 76% agreed or strongly agreed that the current state of phone chargers inconveniences consumers; and 63% of the participants favored the European Union creating a regulation to impose a common charging standard on electronic devices such as mobile phones.\textsuperscript{58} This same assessment found that the current situation is causing significant environmental damage and is contributing to the growth of e-waste: mobile phone chargers were responsible for 11,000 tons of e-waste in 2018, and they emit around 600 ktCO2e within a life-cycle.\textsuperscript{59} These numbers are expected to grow every year as newly released chargers require more materials for construction due to them being designed to exert higher data transfer and charging speeds.\textsuperscript{60}

The European Commission conducted a second assessment to

\begin{footnotesize}
\begin{itemize}
\item[] \textsuperscript{53} Id.
\item[] \textsuperscript{54} Id.
\item[] \textsuperscript{55} 2021 European Commission Proposed Amendment, supra note 44, at 1.
\item[] \textsuperscript{56} Id.
\item[] \textsuperscript{57} Id.
\item[] \textsuperscript{58} Id. at 6.
\item[] \textsuperscript{59} Id.
\item[] \textsuperscript{60} Id.
\end{itemize}
\end{footnotesize}
determine the current state of unbundling the sale of new devices and their chargers from one another. The unbundling assessment found that 30% to 40% of manufacturers had begun unbundling the sale of new devices and new chargers, with more manufacturers considering pursuing the strategy within the near future. However, the assessment found that manufacturers who developed their own proprietary charging interface seemed less keen to unbundle; and those same manufacturers failed to show that their proprietary charging interfaces were superior to the other, more common charging interfaces. Thus, they had little reason to sell new devices bundled with their proprietary chargers. Instead, these manufacturers’ refusal to unbundle seemed to simply be another form of anti-competitive behavior. Moreover, the assessment found that unbundling could not only lead to a reduction in e-waste but it could also aid the European Union in achieving its environmental goals and benefit consumers by being more convenient and cost friendly.

Finally, the Commission estimated that both harmonizing the charging interface and communication protocol, and unbundling the sale of new devices and chargers would reduce consumer spending on unnecessary and unused chargers by 250 million euros per year. Additionally, the unbundling requirement “is expected to improve the economic operators’ turnover” by 105 million euros per year. Manufacturers will make more money by having consumers purchase the charger separately, reduce their shipping costs by using smaller packages for new devices, and overall save money by not having to bundle the charger and device together. The results concluded that harmonizing the charging interface and charging communication protocol and unbundling the purchase of new devices with their chargers would have two effects. It would both contribute to consumer convenience and welfare and reduce the amount of e-waste that chargers create on a yearly basis. Overall, the Commission believes that its proposed RED amendment will stop the growing market fragmentation regarding device chargers, boost consumer welfare, and reduce e-waste.

IV. TECHNOLOGY COMPANIES ARE GROWING WEARY

61 Id. at 7.
62 Id.
63 Id.
64 Id.
65 Id.
66 Id.
67 Id.
68 Id at 8.
69 See id.
70 See id.
OF SUCH A REGULATION

The third part of this note will focus on understanding the arguments opposing the adoption of the amendment. Their arguments include the following: the amendment will (1) place an economic burden on manufacturers, (2) contribute to e-waste instead of curtailing it, (3) prove to be less successful than intended regarding the unbundling guideline, (4) derail innovation, and (5) trigger large economic ramifications.

A. Economic Burden on Manufacturers

First, opponents, primarily composed of large technology companies such as Apple, argue that the amendment will impose an economic burden on manufacturers.71 More specifically, they argue that the amendment would stifle the development of new charging technologies that aim to be more cost efficient in the long run.72 Additionally, all present day investments in non-USB-C charging solutions would have to be abandoned, thus resulting in a financial loss to the manufacturer.73 Furthermore, manufacturers would have to spend millions of dollars on changing their production lines so that they can implement the USB-C charging interface into their devices.74 Overall, these additional economic burdens would be costly to corporations who would likely not internalize the burden, but instead would pass them off to consumers through higher device prices—ultimately harming consumers.75

B. Contribute to E-waste Instead of Curtailing it

Furthermore, opponents of the amendment believe that a mandatory shift to the USB-C port for all electronic devices would increase e-waste.76 They state that the E.U.’s assessment, in which the E.U. concluded that e-waste could be reduced through a mandatory shift to the USB-C port, is flawed because it uses data from 2009.77 At the time of the assessment, there were more than 30 types of charging ports in use.78 Today, the market has consolidated significantly, and the three most common types are the micro-USB, USB-C and Apple’s lightning port.79 It is uncontested that the data from

72 See id.
73 See id.
74 See id.
75 Id.
77 Id.
78 Id.
79 Id.
2009 makes a strong case that reducing thirty different charger types to uniquely one would eliminate a significant portion of the e-waste associated with charging devices.\(^80\) However, today, the amendment would only reduce three charger types to one.\(^81\) Therefore, there is a significantly smaller opportunity to achieve waste reduction presently, compared to 2009.\(^82\) Instead, the amendment may increase e-waste; in fact, as of 2019, only 29% of phones sold in the European Union used USB-C chargers.\(^83\) Thus, forcing a shift to USB-C would lead nearly 71% of chargers to become useless to consumers, as consumers who purchase newer USB-C devices would not be able to reuse their older, non-USB-C chargers.\(^84\) Instead consumers would be forced to purchase a new USB-C charger and throw away their older, non-USB-C charger, contributing to the growth of e-waste.\(^85\)

### C. Unbundling Will Prove to Be Less Successful than Intended

Additionally, opponents of the amendment believe that the lack of data supporting the viability and benefits of unbundling the sale of new devices and their chargers should signal to regulators that such an activity could pose a significant burden to consumers and manufacturers.\(^86\) Opponents assume that if unbundling were to save manufacturers money, then market economics and competition from competitors would already have caused it to happen without regulatory involvement.\(^87\) Since such an activity is not common market practice, then it should signal to regulators that unbundling should not be forced onto manufacturers.\(^88\) However, a handful of companies have already begun to unbundle the sale of new devices and chargers, making an amendment that forces an activity that is already beginning to gain traction redundant to pursue by regulators.\(^89\) Overall, opponents of the amendment believe market factors should dictate the activities a manufacturer should and should not carry out, including whether or not unbundling should be a common market practice in the sale of new electronic devices.\(^90\)

### D. Derail Innovation

Furthermore, there is strong opposition in relation to the amendment due to the belief that it will derail potential technological innovations within the
The overall realm of charging, and more specifically charging ports.\textsuperscript{91} Opponents believe that if the 2009 voluntary agreement among companies, requiring signatories to offer micro-USB devices (USB-C was non-existent at the time), would have instead required all companies to use micro-USB, then it would have derailed the development of the USB-C charger.\textsuperscript{92} Additionally, technological innovations partly rely on the belief that goods can consistently be improved vis-a-vis their predecessors, and such transformations can fuel further innovations.\textsuperscript{93} For instance in 2012, Apple introduced the “lightning” charger which aimed to replace the “30 pin” charger that it was using at the time in a handful of its devices.\textsuperscript{94} The lightning charger was smaller in size due to its more compact form, had a flip-able design that made it more convenient for consumer usage, allowed for more versatility, and was overall considered superior to the outdated 30 pin charger.\textsuperscript{95} Releasing the lightning charger ultimately gave Apple a competitive edge vis-a-vis its competitors, as consumers desired to have a better and more user-friendly charger.\textsuperscript{96} A company’s desire to gain a competitive edge over its rivals drives companies, such as Apple, to invest in research and in the development of new potential charging solutions.\textsuperscript{97} In this case, it was the creation of the lightning charger.\textsuperscript{98}

Apple’s creation of the lightning charger allowed a handful of electronics firms to use the lightning charger as a blueprint for developing the next successor to the micro-USB charger: the USB-C charger.\textsuperscript{99} The USB-C charger was released in 2015, three years after the release of the lightning charger.\textsuperscript{100} It is safe to say that without the creation of the lightning charger, the USB-C charger could have taken much longer to arrive into the hands of consumers.\textsuperscript{101} In addition, Apple willingly aided in the development of the USB-C after releasing the lightning charger.\textsuperscript{102} Even though Apple had already launched a new product, it continued investing in R&D to remain ahead of the curve.\textsuperscript{103} However, a regulation that mandates a single type of charging solution will stifle this competitive drive and inhibit the research

\textsuperscript{91} Id.
\textsuperscript{92} Id.
\textsuperscript{93} Id.
\textsuperscript{94} Id.
\textsuperscript{96} Id.
\textsuperscript{97} Id. at 26.
\textsuperscript{98} Id.
\textsuperscript{99} Id. at 36.
\textsuperscript{100} Id.
\textsuperscript{101} Id.
\textsuperscript{102} Id.
\textsuperscript{103} Id.
and development of future generations of charging solutions.

E. Trigger Large Economic Ramifications

Finally, Copenhagen Economics released a study that analyzed the potential economic ramifications that may result from a delay in the development of new charging solutions because of the proposed amendment.\textsuperscript{104} Copenhagen Economics calculated that each innovative phase of the charging solution, which lasts roughly seven years, brings about a raise of 18\% in consumer value: this translates to a raise of roughly 13.2 billion euros in consumer welfare over the seven years.\textsuperscript{105} With this information, they forecasted that a delay of only three years in developing the next generation of charging solutions could lead to a consumer welfare loss of around 1.5 billion euros.\textsuperscript{106} Thus, adopting the amendment would curtail the growth of consumer value and welfare.

V. CASE STUDIES ON DIFFERENT REGULATIONS’ IMPACTS ON INNOVATION

In the fourth part of this note we will look at various case studies that provide an illustration to the debate surrounding whether regulations impact or hinder innovation. The first subsection examines two examples of regulations that aided innovation: the E.U.’s regulations requiring more energy efficient consumer products, and the End-Of-Life Vehicles Directive which aimed to create more recyclable vehicles. The second subsection will evaluate two regulations that hindered innovation: the E.U.’s Registration Evaluation Authorization and Restriction of Chemical regulation, which placed strict guidelines on the development of fine chemicals, and the E.U.’s strict guidelines revolving around the usage of GMOs. The third subsection will examine an edge case that shows how a regulation can temporarily boost innovation before hindering it in the long-term; this will be illustrated through the E.U.’s GSM standard.

A. Some Regulations Can Foster and Benefit Innovation

The E.U.’s regulations have often facilitated technological advancement. Two examples of this phenomenon are the E.U.’s energy efficiency regulations regarding consumer equipment and vehicles and the End-Of-Life Vehicles Directive. The E.U.’s energy efficiency regulations were introduced during the 1990’s in order to reduce the growing concern associated with the energy consumption of consumer equipment and vehicles.\textsuperscript{107} The E.U. introduced a consumer-friendly labeling system that

\textsuperscript{104} Id. at 45.
\textsuperscript{105} Id.
\textsuperscript{106} Id.
better informed consumers on whether the equipment, or vehicle, they were buying was considered to be efficient (marked by a green label) or inefficient (marked by a yellow, orange, or red label) vis-a-vis energy consumption. The labeling system helped incentivize consumers to purchase greener, more efficient products. By creating a desire on the part of consumers to purchase energy efficient goods, this then incentivized companies to meet consumer demands for greener products by researching, developing and selling more efficient goods. Additionally, the labeling regulations (considered to be “soft” regulations as they did not force manufacturers to meet strict energy efficiency standards) were also accompanied by much stricter regulations which set “hard” energy targets that consumer goods needed to comply with. Regulators consistently updated these regulations to foster consistent innovation. The combination of both “soft” and “hard” regulations pushed manufacturers to not only meet regulation standards and goals regularly, but also incentivized manufacturers to innovate beyond the requirements to remain ahead of the shifting regulatory requirements. Ultimately, the regulated products analyzed by the European Commission, throughout the 90’s, declined in price by about 10% to 45% and increased in energy efficiency by about 10% to 60%. The regulations incentivized manufacturers to create and sell greener products at a lower cost in order to meet consumer demand. The E.U.’s energy efficiency regulations perfectly demonstrate the ability of regulations being able to boost innovation.

Another example of a regulation aiding innovation comes from the End-Of-Life Vehicles Directive that was issued in 2003. This regulation aimed to reduce the amount of waste that came from end-of-life vehicles (vehicles that could no longer be repaired and reused for consumer purposes but instead would need to be broken down and trashed). The regulation led to the creation of ten staple innovations within the car manufacturing industry that all aimed to reduce end-of-life waste. These innovations included the development of recycling recovery machines (machines used to specifically recover recyclable materials during the breaking-down of vehicles), new car designs that enhanced a vehicle’s dismantling and recyclability (contributing to the overall efficiency relating to carrying out such an activity), and cooperation between large manufacturers to develop new “greener” materials.

\[\text{Id.}\]
\[\text{Id.}\]
\[\text{Id.}\]
\[\text{Id.}\]
\[\text{Id. at 32.}\]
\[\text{Id.}\]
\[\text{Id.}\]
\[\text{Id.}\]
\[\text{Id.}\]
\[\text{Id. at 34.}\]
\[\text{Id.}\]
for use in vehicles.\textsuperscript{118} As seen with the energy efficiency regulations and the End-Of-Life Vehicles Directive, regulations can stimulate innovation on a wide level through various different measures.

**B. Other Regulations Can Derail Innovation**

Despite the previous case studies which demonstrated a regulation’s positive impact on innovation, other examples show the opposite effect: regulations can have a negative impact on innovation. A prime example that demonstrates this comes from the 2006 Registration Evaluation Authorization and Restriction of Chemical regulation (REACH).\textsuperscript{119} The regulation aimed to curtail the dangers that fine chemicals pose to human health and the environment when in usage; the goal was to better regulate the standards used when testing fine chemicals to ensure consumer and environment safety vis-a-vis the chemicals introduced on the market.\textsuperscript{120} The regulation created strict testing requirements that applied to all new and pre-existing chemicals (including those already present on the consumer market), and the overall testing could take no less than eleven years.\textsuperscript{121} Due to the enormous burden the REACH regulation placed on manufacturers, manufacturers naturally shifted funds away from R&D and instead funneled them towards meeting the requirements.\textsuperscript{122} Companies did not see an incentive to create new chemicals, as they needed to test chemicals that they had been selling already on the market for years.\textsuperscript{123} Non-compliance could cost manufacturers significant revenue as their chemicals would be pulled off shelves.\textsuperscript{124} Ultimately, the regulation impacts the ability of manufacturers to create new and innovative chemicals, and the extra costs associated with testing have reduced their profitability and competitiveness within the market.\textsuperscript{125}

On a similar note, regulations can not only hinder innovation within a field but they can also negatively impact the economic growth of a market sector within a region.\textsuperscript{126} The European Union has passed strict regulations relating to the usage of GMOs in the growth of crops for consumer and agricultural purposes.\textsuperscript{127} This has led certain companies that specialize in the manufacturing of GMOs to turn away from seeking regulatory approval within the E.U. and instead turn to other markets for the approval and sale of

\textsuperscript{118} Id. at 35.
\textsuperscript{120} Pelkmans & Renda, supra note 30, at p. 35.
\textsuperscript{121} Id. at 36.
\textsuperscript{122} Id.
\textsuperscript{123} Id.
\textsuperscript{124} Id.
\textsuperscript{125} Id.
\textsuperscript{126} Id.
\textsuperscript{127} Id.
their GMOs. An example of this comes from Amflora, which sought regulatory approval for the distribution and usage of BASF in Europe. After thirteen years of waiting for regulatory approval in the E.U., Amflora gave up on its application and sought approval in the United States. The European Union’s strict regulations on GMO distribution and usage have led to only two GMO products being approved in recent history. This has stifled innovation on the part of European based biotechnology companies within the sector compared to non-European based biotechnology companies. European based biotechnology companies refuse to specialize in GMOs due to the strict anti-GMO regulations that are at play in the E.U. As we can see from these case studies regarding fine chemicals and GMOs, it is possible for regulations to negatively impact innovation due to their burdensome and strict nature.

C. A Regulation Can Both Spur and Hinder Innovation

Regulations can have a positive or negative impact on innovation. However, some regulations created to spur innovation might hinder future innovation after achieving their initial goal. The first example of this comes from the European Union’s “2G digital mobile telephony standard GSM” (global system for mobile communication) which was highly effective at boosting innovation, but such impact was only temporary. The standard came about through multiple E.U. and national regulations, and an industry-wide cooperation between communication monopolies. Once the regulations’ goal had been achieved, the widespread cooperation in developing the 2G GSM standard led to multiple drawbacks that were not envisioned when creating the regulations.

First, although regulators intended for the GSM standard to promote open competition, the standard was far less open. The free cross-licensing market allowed a handful of companies to flood the market with patents. This prevented “analogue” markets and Japanese technology suppliers from entering the market and effectively competing. Second, the regulation

128 Id.
129 Id.
130 Id.
131 Id.
132 Id.
133 Id. at 37.
134 Id. at 33.
135 Id.
136 Id.
137 Id.
138 Id.
139 Id.
140 Id.
suppressed more affordable and simpler digital mobile systems.\textsuperscript{141} This protected the large cost associated with market entrance.\textsuperscript{142} The third drawback was the “lock-in effect for 3G” (meaning it was impossible for there to be an upgrade to 4G due to 3G being the only network to function with the system in place).\textsuperscript{143} The “lock-in effect” made it difficult for equipment suppliers to update the overall system to stay up to date with newer software applications, such as Android and 4G.\textsuperscript{144}

Overall, the growth of the GSM standard was initially highly beneficial for E.U. citizens, as it gave them access to popular new technology at a lower rate and the possibility to use it throughout the E.U.\textsuperscript{145} Plus, many of the companies who financed the early stages of development financially benefited thanks to the popularity of the service among consumers, and the ability to take advantage of new business models.\textsuperscript{146} However, over time it became clear that the GSM standard caused the E.U.’s adoptions of Android and 4G to lag behind other countries and regions who did not heavily push for the GSM standard through government regulations.\textsuperscript{147}

VI. WHAT DOES THE FUTURE ENTAIL FOR THE DEVELOPMENT AND INNOVATION OF CHARGERS?

In the fifth and final part of this note we will look at how the amended provision will impact the future of chargers. The first subsection will argue that the new USB-C standardization will curtail future innovations relating to wired charging solutions, as the amendment will disincentivize manufacturers in researching and developing a better version of the USB-C charger. However, the second subsection will argue that the amendment will not hinder innovation within the wireless charging realm as it does not directly implicate wireless chargers, and companies still have room to improve wireless chargers. Finally, the third subsection will examine alternative regulation styles that could help foster innovation within the wired charging realm while still achieving the goals that the E.U. set out to achieve with the amended provision.

A. The Amendment Will Curtail Future Innovations Regarding Wired Charging Solutions

In a competitive consumer goods market, consumers act fast to purchase what they believe to be the best product that is available to them at the time

\textsuperscript{141} Id.
\textsuperscript{142} Id.
\textsuperscript{143} Id.
\textsuperscript{144} Id.
\textsuperscript{145} Id.
\textsuperscript{146} Id.
\textsuperscript{147} Id.
of making their purchase. Naturally, this pushes manufacturers to compete with one another by creating the most innovative product they can at the time, thus ensuring that manufacturers are able to control a certain share of the market they are competing within. For example, when the USB-C charger was introduced in 2015, it was considered to be a significant step up from its predecessor, the micro-USB charger which launched in 2007. The superiority of the USB-C charger comes from its port allowing for the charger to be flip-able (no matter the upward facing side of the plug-in, it will fit into the port), to transfer energy more efficiently (USB-C chargers allow for fast-charging which was not possible with micro-USB chargers), and to require less material for production thanks to its slimmer and more compact size. Additionally, the USB-C charger is superior in some regards to Apple’s widely used lightning charger. The USB-C charger has a higher data transfer rate compared to the lightning charger. It can transfer data at 40 gigabytes per second compared to the lightning charger’s 480 megabits per second. Plus, unlike the lightning charger, the USB-C charger supports “fast-charging” technology thanks to its higher voltage conduction and current capacity limit. Apple tried to sidestep such a downfall of the lightning charger by selling a USB-C to lightning charger cable, which allows the consumer to take advantage of the USB-C’s “fast-charging” capabilities for Apple’s devices that are equipped with a lightning port.

Despite the USB-C charger’s superiority to the micro-USB charger (the previous generation of USB charging interface) and certain aspects of the lightning charger, it is not the perfect charging solution. The USB-C charger falls short in some respects compared to Apple’s, older, lightning charger that was released three years before the USB-C charger. For instance, the lightning charger’s solution (this includes the components of the port that are located within the internal framework of a device’s electronics and exterior entry way of the port) is 69% smaller than that of the USB-C’s solution. This size difference means that the usage of the USB-C solution greatly

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149 Id.
150 Id.
151 Id. at 27.
153 Id.
154 Id.
155 Id.
156 Id.
157 Basalisco, supra note 95, at 14.
158 Id. at 27.
restricts a device’s features.159 A larger charging solution jeopardizes a device’s slimness and reduces the available amount of internal space that can be used for other internal components such as a larger battery pack (a smaller charging solution allows for a larger battery pack and, therefore, longer battery life for consumers).160 The USB-C charging solution is nowhere near perfect, as there is clearly room for improvement regarding the speed of data transfer and the physical size of the charger’s components, which both fall short to Apple’s older lightning charging solution.161 Furthermore, the USB-C charger still lacks resistance to water and dust, which is becoming a more trendy feature in newer electronics.162 Thus, an E.U. regulation that forces manufacturers to implement the USB-C charging solution may disincentivize manufacturers from researching and developing a better wired charging solution that could replace both the USB-C and lightning chargers.163

B. The Amendment Will Not Hinder Innovation Regarding Wireless Charging Solutions

The European Commission is aware of the steady growth in popularity of wireless chargers.164 However, the Commission believes that wireless chargers are still in their early stages of development.165 Wireless chargers currently represent a small portion of the broader charging market, representing only 28% of total charger sales in 2018.166 Additionally, wireless chargers are not yet an adequate replacement for wired chargers because of their lower efficiency relative to their wired counterparts, including slower data transfer speeds and voltage conduction and more limited technological capabilities.167 Moreover, due to their inherently larger size, wireless chargers require significantly more raw material for production.168 Thus, the overall effects of reducing e-waste through regulating wireless chargers is much less impactful than for wired chargers.169

The Commission has further determined through its market research that, unlike wired chargers, wireless chargers have a low level of market

159 Id.
160 Id.
161 Id.
162 Id.
163 Id.
165 Id.
166 Id.
167 Id.
168 Id.
169 Id.
fragmentation.\textsuperscript{170} Since manufacturers have yet to create “different charging interfaces and charging communication protocols,” wireless chargers have a healthy level of interoperability.\textsuperscript{171} For instance, Apple’s wireless charging system can charge non-Apple devices (such as Android devices), and Apple’s devices can be charged with non-Apple wireless chargers.\textsuperscript{172} Unlike wired chargers, there is no danger of customers being “locked into” a particular manufacturer’s wireless charging ecosystem.\textsuperscript{173} Therefore, wireless chargers do not corner consumers to the same level as wired charging solutions, and do not pose the same danger to consumer welfare.\textsuperscript{174} The Commission has thus determined that regulation of wireless chargers would be premature at this time, although the topic may need revisiting at a future date given the plausibility of market fragmentation in the near future.\textsuperscript{175}

C. Alternative Regulation Strategies to Foster Innovation of Wired Charging Solutions

Regulation of new technologies can be tricky. Oftentimes, strict regulations are imperfect as they allow for loopholes that enable entities to circumvent the regulation in part or in whole.\textsuperscript{176} Such regulations often also face strong opposition on behalf of regulated entities, and can potentially stifle innovation.\textsuperscript{177} A management-based regulation system is one potential solution to addressing these issues.\textsuperscript{178} A management-based regulation system is a regulation that places a burden on entities (in this case, manufacturers of wired chargers) to locate, analyze and resolve their own problems.\textsuperscript{179} This system replaces the need for regulators to tell entities what issues need resolving and how those solutions should be carried out.\textsuperscript{180} Such a regulation strategy recognizes that regulators may not be the best at

\begin{itemize}
\item \textsuperscript{170} Id. at 7.
\item \textsuperscript{171} Id.
\item \textsuperscript{174} Id.
\item \textsuperscript{175} Id.
\item \textsuperscript{177} Id.
\item \textsuperscript{179} Id.
\item \textsuperscript{180} Id.
\end{itemize}
foreseeing potential issues related to new technologies, as new technologies are constantly evolving and creating new issues within themselves. Regulators often spend enormous resources in understanding a novel issue and building a suitable solution. However, existing entities within that space, with their extensive knowledge and field experience, are much better equipped to address issues emerging from the creation of new technology. Using such a regulatory strategy would allow manufacturers to focus on resolving issues as they appear, while enabling regulators to remain at arm’s length and spend their resources on ensuring that the entities involved stay within regulation.

A prime example of a management-based regulation is that of the National Highway Traffic Safety Administration, in which manufacturers of automated driving systems (ADS) must have “safety assessments” in place when developing new technology for consumers. This form of regulation allows regulators—at arm’s length—to force manufacturers to focus on accident avoidance when developing ADS technology, without imposing restrictions that may hinder future innovation within ADS development. It is feasible to implement such a regulation for wired chargers. Regulators could require manufacturers to consider the issues of e-waste and consumer convenience without burdening them with restraints which may hinder innovation vis-a-vis wired chargers.

VII. CONCLUSION

The newly adopted E.U. regulation, standardizing USB-C chargers for all electronics, aims to curtail the growing rate of e-waste and consumer inconvenience vis-a-vis chargers. There is strong opposition to the amendment from manufacturers that believe the amendment will hinder innovation, lead to more e-waste as the USB-C is not a widely used charging solution, and ultimately handicap consumer welfare. Case studies have shown that regulations can contribute to innovation just as easily as they can hinder it. This regulation will hinder future innovations of wired chargers as it disincentivizes manufacturers to research and develop better forms of wired charging. On the other hand, it does not impact wireless chargers as regulators believe the market for wireless chargers is too young and unfragmented to necessitate the application of a similar regulation. Management-based regulations represent a possible solution to the issues revolving around regulating wired chargers, which could also be implemented for future wireless charger regulations. A management-based

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181 Id.
182 Id.
183 Id.
184 Id.
185 Id. at 9.
186 Id.
regulation would place the burden to solve issues on manufacturers while allowing regulators to stay at arm’s length and ensure compliance with the regulation. Regulating new technologies is tough, because new technologies are constantly changing and regulators struggle to envisage all the potential issues that need resolving. Therefore, it is best to nurture innovation through regulations that force manufacturers to solve the issues as they arise while allowing them to continue to do what is best: innovate.