The Case for a Taking: Apple and the Government's Mandated Law Enforcement Backdoor

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I. INTRODUCTION

The holidays had arrived, and on December 2, 2015, San Bernardino County threw a party for its staff.[1] The merriment turned to terror when a man and a woman stormed the building, carving through the attendees in a chaos of bullets.[2] Law enforcement arrived quickly, shooting and killing both attackers, Syed Farook and Tashfeen Malik.[3] The two shooters took fourteen lives and injured twenty-one people.[4]

Farook and Malik left little behind to help investigators identify potential motives for the attack.[5] Before the assault, they destroyed "mobile phones, hard drives, virtually anything with digital memory that was associated" with

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1. Camila Domonoske, *San Bernardino Shootings: What We Know, One Day After*, NPR (Dec. 3, 2015, 6:47 AM), https://www.npr.org/sections/thetwo-way/2015/12/03/458277103/san-bernardino-shootings-what-we-know-one-day-after [https://perma.cc/ZP2M-SGGB].

2. *See* Nathan Rott, *San Bernardino Shooting's Signs Have Faded, but Memories Remain Piercing*, NPR (Dec. 2, 2016, 4:47 AM), https://www.npr.org/2016/12/02/504025469/san-bernardino-shootings-signs-have-faded-but-memories-remain-piercing [https://perma.cc/C2XR-3NVT].

3. *See* Adam Nagourney, Ian Lovett & Richard Pérez-Peña, *San Bernardino Shooting Kills at Least 14; Two Suspects Dead*, N.Y. TIMES (Dec. 2, 2015), https://www.nytimes.com/2015/12/03/us/san-bernardino-shooting.html [https://perma.cc/25BF-NDUN].

4. Rory Carroll, Yvette Cabrera & Paul Lewis, *How San Bernardino Shooters Killed 14 People After Christmas Party 'Dispute,'* GUARDIAN (Dec. 3, 2015, 2:13 PM), https://www.theguardian.com/us-news/2015/dec/03/how-san-bernardino-shooters-killed-14-people-after-christmas-party-row [https://perma.cc/6SN3-LJSD].

5. *See* Pierre Thomas & Jack Date, *San Bernardino Shooters Tried To Destroy Phones, Hard Drives, Sources Say*, ABC NEWS (Dec. 3, 2015, 9:12 PM), https://abcnews.go.com/US/san-bernardino-shooters-destroy-phones-hard-drives-sources/story?id=35570286 [https://perma.cc/CU7A-KECK].

them.[6] However, for reasons unknown, Farook left his work iPhone intact and functioning in his car.[7] Unfortunately for investigators, Farook had enabled Apple's security feature that would erase the phone's data after ten unsuccessful attempts to enter the device's passcode.[8]

Hoping to avoid data destruction, the Federal Bureau of Investigation ("FBI") asked Apple to help them "circumvent the phone's security features."[9] Apple declined.[10] On February 16, 2016, the FBI sought a court order under the All Writs Act[11] to force Apple's assistance.[12] The order was issued that same day, requiring Apple to "assist in enabling the search" of Farook's phone.[13] "Assistance" under this order meant that Apple would provide the FBI with specially crafted software—to be loaded onto the target phone—that could perform three specific functions:

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6. *Id.*

7. *See* Sam Thielman, *Apple v the FBI: What's the Beef, How Did We Get Here and What's at Stake?*, GUARDIAN (Feb. 20, 2016, 7:00 AM), https://www.theguardian.com/technology/2016/feb/20/apple-fbi-iphone-explainer-san-bernardino [https://perma.cc/7RTR-K84N].

8. *See* Jack Date, *The FBI and the IPhone: How Apple's Security Features Have Locked Investigators Out*, ABC NEWS (Feb. 17, 2016, 6:20 AM), https://abcnews.go.com/US/fbi-iphone-apples-security-features-locked-investigators/story?id=36995221 [https://perma.cc/QKZ8-7SCU].

9. Alina Selyukh & Camila Domonoske, *Apple, the FBI and IPhone Encryption: A Look at What's at Stake*, NPR (Feb. 17, 2016, 4:18 PM), https://www.npr.org/sections/thetwo-way/2016/02/17/467096705/apple-the-fbi-and-iphone-encryption-a-look-at-whats-at-stake [https://perma.cc/H4AY-L3A4]. Essentially, the FBI asked Apple to create a "backdoor" in its operating system, "a flaw in a security system purposefully designed to help law enforcement break in for investigations." *Id.*

10. *Id.*

11. 28 U.S.C. § 1651 (2018) (providing that Article III Courts "may issue all writs necessary or appropriate in aid of their respective jurisdictions and agreeable to the usages and principles of law"). Historically, Courts have applied the All Writs Act "rather broadly." Stephen J. Otte, *Whether the Department of Justice Should Have the Authority To Compel Apple Inc. To Breach Its IPhone Security Measures*, 85 U. CIN. L. REV. 877, 882 (2017).

12. Application for Order To Compel, *In re* the Search of an Apple IPhone Seized During the Execution of a Search Warrant on a Black Lexus IS300, California License Plate 35KGD203, No. ED 15-0451M (C.D. Cal. Feb. 16, 2016), 2016 WL 680288. This fell in line with prior FBI stances under James Comey, favoring compelling companies to bake vulnerabilities into their products so that encryption did not hamper government investigation. *See* DANIELLE KEHL, ANDI WILSON & KEVIN BANKSTON, DOOMED TO REPEAT HISTORY? LESSONS FROM THE CRYPTO WARS OF THE 1990S 5–11 (2015), https://na-production.s3.amazonaws.com/documents/Doomed_To_Repeat_History.pdf [https://perma.cc/M7QY-2PAY] (describing historical drive by U.S. law enforcement and intelligence agencies to ensure backdoor access to encrypted contents of mobile devices).

13. Order Compelling Apple, Inc. To Assist Agents in Search, 2016 WL 618401 at *1 (C.D. Cal. Feb. 16, 2016) [hereinafter Order].

> (1) it will bypass or disable the auto-erase function whether or not it has been enabled; (2) it will enable the FBI to submit passcodes to the SUBJECT DEVICE for testing electronically via the physical device port, Bluetooth, Wi–Fi, or other protocol available on the SUBJECT DEVICE; and (3) it will ensure that when the FBI submits passcodes to the SUBJECT DEVICE, software running on the device will not purposefully introduce any additional delay between passcode attempts beyond what is incurred by Apple hardware.[14]

Essentially, the court asked Apple to create a special operating system without the ten-attempt passcode security feature[15] and load it on the phone, allowing the FBI to "brute-force" its way into Farook's iPhone.[16] Of course, the court noted, Apple could "comply with the order in [an alternate] way" so long as it achieved the same result.[17]

Tim Cook, Apple's Chief Executive Officer, opposed this order vehemently, calling the FBI's request "unprecedented" and the proposed operating system "something we consider too dangerous to create."[18] The requested operating system—which Apple dubbed "GovtOS"—would essentially "cripple[ ]" a secure product and "provide[ ] an avenue for criminals and foreign agents to access millions of iPhones."[19] Indeed, Apple

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14. *Id.*

15. A deliberately inserted vulnerability such as this is known as a "backdoor." *See* Selyukh & Domonoske, *supra* note 9.

16. As a hacking technique, "brute-force" is the traditional and tedious method of entering new passcodes one by one. *See* Peter Bright, *There Are Ways the FBI Can Crack the IPhone PIN Without Apple Doing It for Them*, ARS TECHNICA (Mar. 9, 2016, 12:05 PM), https://arstechnica.com/gadgets/2016/03/there-are-ways-the-fbi-can-crack-the-iphone-pin-without-apple-doing-it-for-them/ [https://perma.cc/4UN8-WMKH].

17. Order, *supra* note 13. The court order also provided that Apple would "advise the government of the reasonable cost of providing this service." *Id.*

18. Tim Cook, *A Message to Our Customers*, APPLE (Feb. 16, 2016), https://www.apple.com/customer-letter/ [https://perma.cc/ER4R-849Q]. Interestingly, James Comey, then-Director of the FBI, also took to the internet, arguing that the duty to survivors justified the "quite narrow" court order five days earlier. James Comey, *We Could Not Look the Survivors in the Eye if We Did Not Follow this Lead*, LAWFARE (Feb. 21, 2016, 9:03 PM), https://www.lawfareblog.com/we-could-not-look-survivors-eye-if-we-did-not-follow-lead [https://perma.cc/52K8-YYCE].

19. Apple Inc's Motion To Vacate Order Compelling Apple Inc. To Assist Agents in Search, and Opposition to Government's Motion To Compel Assistance at 2, 4, *In re* Search of an Apple IPhone Seized During Execution of a Search Warrant on a Black Lexus IS300, California License Plate 35KGD203, No. ED 15-0451M, (C.D. Cal. Feb. 26, 2016), https://epic.org/amicus/crypto/apple/In-re-Apple-Motion-to-Vacate.pdf [https://perma.cc/FFD4-4XGE] [hereinafter Motion to Vacate].

worried that the requested software would create the "potential to unlock any iPhone in someone's physical possession."[20]

As it turned out, the FBI ultimately did not have to rely on Apple to access Farook's phone. Soon after the February 16, 2016 order, a third party discovered a vulnerability specific to the narrow set of iPhone 5Cs running iOS 9, iPhones just like Farook's.[21] The FBI withdrew its legal action against Apple in late March after it gained access to Farook's iPhone.[22]

Unfortunately for the FBI, the problem of a secured target device arises often.[23] Indeed, the FBI sought Apple's help to access information on twelve iPhones around the same time as the San Bernardino shooting.[24] The FBI could rely on private hackers, albeit at great expense.[25] Alternatively, the FBI could rely on court orders to conscript private companies in its investigation, but litigation may take too long.[26] The FBI will have to change tactics to access secured devices without the expense of private hackers or the delay of litigation.

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20. Cook, *supra* note 18.

21. *See* Ellen Nakashima, *FBI Paid Professional Hackers One-Time Fee To Crack San. Bernardino IPhone*, WASH. POST (Apr. 12, 2016), https://www.washingtonpost.com/world/national-security/fbi-paid-professional-hackers-one-time-fee-to-crack-san-bernardino-iphone/2016/04/12/5397814a-00de-11e6-9d36-33d198ea26c5_story.html?utm_term=.98b38c9d8041 [https://perma.cc/2QQS-REYT]. Originally, the FBI had worked with Cellebrite Mobile Synchronization, an Israeli tech firm that specializes in "mobile forensics." Nash Jenkins, *An Israeli Firm Is Reportedly Helping the FBI Unlock the San Bernardino Killer's Phone*, TIME (Mar. 23, 2016, 11:57 PM), http://time.com/4270151/cellebrite-israel-apple-iphone-fbi/ [https://perma.cc/TU7Z-89EM]. Public speculation implicated Cellebrite as the mysterious third-party hacker, but the firm ultimately dispelled those rumors. Kim Zetter, *When the FBI Has a Phone It Can't Crack, It Calls These Israeli Hackers*, INTERCEPT (Oct. 31, 2016, 8:12 AM), https://theintercept.com/2016/10/31/fbis-go-hackers/ [https://perma.cc/754Q-KUT6].

22. *See* Katie Benner & Eric Lichtblau, *U.S. Says It Has Unlocked IPhone Without Apple*, N.Y. TIMES, (Mar. 28, 2018), https://www.nytimes.com/2016/03/29/technology/apple-iphone-fbi-justice-department-case.html [https://perma.cc/MX55-KT2N].

23. *See* Kaveh Waddell, *Apple Is Right: The FBI Wants To Break into Lots of Phones*, ATLANTIC (Feb. 23, 2016), https://www.theatlantic.com/technology/archive/2016/02/apple-is-right-the-fbi-wants-to-break-into-lots-of-phones/470607/ [https://perma.cc/R9BK-CNK6].

24. *Id.*

25. The hack to access Farook's iPhone cost over one million dollars. Devlin Barrett, *FBI Paid More than $1 Million To Hack San Bernardino IPhone*, WALL STREET J. (Apr. 21, 2016, 4:07 PM), https://www.wsj.com/articles/comey-fbi-paid-more-than-1-million-to-hack-san-bernardino-iphone-1461266641 [https://perma.cc/3F4D-G77Q].

26. Apple never complied with the court order, instead resisting through litigation until the FBI found an alternative way to access the iPhone. Forty-two days had passed from the court order until the FBI gained access to Farook's iPhone. *See* Benner & Lichtblau, *supra* note 22. The iPhone could have contained time-sensitive information about an attack planned to occur during those forty-two days, information that the FBI, even armed with a court order, could not reach.

The February 21, 2016 court order indicates that the FBI had contemplated turning to the companies producing the target devices for assistance.[27] Further, then-FBI Director James Comey and President Barack Obama considered pushing for legislation "requiring companies to decode messages for law enforcement."[28] Given the February 21, 2016 court order and the legislative dimension examined by Director Comey and President Obama, there are grounds for Congress to pass a law requiring technology companies like Apple to create backdoors in mobile operating systems for federal investigators.

This scenario raises an interesting question about the power of the government over a private company's property. May the federal government, acting through Congress,[29] compel a private company—without compensation—to create a less secure version of its operating system to facilitate government access? It remains unknown whether the federal government has this power under the First (compelled speech) and Fifth (due process) Amendments.[30] But, assuming it does have that power, this Comment argues that a technology company like Apple[31] has a colorable argument that such legislation would amount to a regulatory taking under the Takings Clause of the Fifth Amendment of the Constitution.

Part II outlines takings jurisprudence in general. Part III discusses intellectual property in general and reviews cases in which the Supreme Court addressed intellectual property under the Takings Clause. Part IV details Apple's interest in maintaining the security of its mobile operating system. Part V introduces hypothetical legislation against which a technology company like Apple might bring a takings claim. Finally, Part VI argues that a company like Apple would have a valid Takings Clause claim under the *Penn Central* or *Loretto* tests if Congress passed a law mandating backdoor access to encrypted mobile devices without providing for compensation.

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27. *See* Order, *supra* note 13.

28. Ellen Nakashima & Andrea Peterson, *Obama Administration Opts Not To Force Firms To Decrypt Data—for Now*, WASH. POST (Oct. 8, 2015), https://www.washingtonpost.com/world/national-security/obama-administration-opts-not-to-force-firms-to-decrypt-data--for-now/2015/10/08/1d6a6012-6dca-11e5-aa5b-f78a98956699_story.html [https://perma.cc/7TXT-UPXM].

29. Although the Court may recognize judicial takings, that analysis is beyond the scope of this paper. *See generally* Stop the Beach Renourishment, Inc. v. Fla. Dep't of Envtl. Prot., 560 U.S. 702 (2010) (showing the willingness of four Justices to recognize judicial takings).

30. While Apple raised these arguments in its motion to dismiss the order, the FBI withdrew its request for the order before the court took any action. *See* Motion to Vacate, *supra* note 19, at 32–34; Benner & Lichtblau, *supra* note 22.

31. Although other companies might also be subject to such potential legislation, this Comment will address only Apple because of its public stance in opposition to such backdoors.

II. A HISTORY OF FIFTH AMENDMENT TAKINGS

This Part provides a history of Fifth Amendment takings of tangible, corporeal property. Section A discusses the Takings Clause generally, contrasting its traditional and modern variants. Section B addresses two of the required elements of a takings claim: public use and the taking itself.[32] Finally, Section C discusses the development of regulatory takings jurisprudence.

A. The Takings Clause of the Fifth Amendment

The Takings Clause of the Fifth Amendment to the Constitution states "nor shall private property be taken for public use, without just compensation."[33] Under this clause, the federal government or a state[34] may take private property—over the owner's objection—for public use so long as the government financially compensates the owner for the loss of his property.[35] Its brevity offers scant guidance on the kind of private property subject to a taking or satisfactory reasons the government may have for taking it.[36] However, it is clear that, to trigger the government's duty to compensate under the Takings Clause, a property owner must show that (1) the government took private property, (2) for public use, and (3) did not compensate the property owner for that taking.

Traditional takings jurisprudence does not resemble modern takings jurisprudence. The common-law tort of noxious use formed the backdrop against which the Takings Clause emerged.[37] As such, early courts analogized Fifth Amendment takings and noxious use law, reasoning that property owners whose unlawful land use causes injury to a community need not be compensated for the loss of their property.[38] Modern takings jurisprudence

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32. This Comment will not explore how much compensation would satisfy the Takings Clause.

33. U.S. CONST. amend. V.

34. *See* Chicago, B. & Q.R. Co. v. City of Chicago, 166 U.S. 226, 235 (1897) (incorporating the Takings Clause).

35. *See* Horne v. Dep't of Agric., 135 S. Ct. 2419, 2426 (2015) ("The Government has a categorical duty to pay just compensation when it takes [private property].").

36. *See* Justice John Paul Stevens (Ret.), Kelo*, Popularity, and Substantive Due Process*, 63 ALA. L. REV. 941, 946 (2012).

37. *See* Kelo v. City of New London, 545 U.S. 469, 510 (2005) (Thomas, J., dissenting).

38. *See, e.g.*, Hadacheck v. Sebastian, 239 U.S. 394, 410 (1915) (holding that an ordinance restricting landowners from using their land in such a way so as to not harm the public did not affect a taking despite causing the land value to plummet); Mugler v. Kansas, 123 U.S. 623, 669 (1887) ("[States need not] compensate . . . individual owners for the pecuniary losses [to property]

has deviated from this context, interpreting "public use" more broadly and recognizing regulatory takings.[39]

The policy support for the Takings Clause finds its deepest roots in fairness.[40] Its authors "viewed the provision as a bulwark against unfairness, rather than" as a buffer against loss in property value.[41] Indeed, the Takings Clause "was designed to bar Government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole."[42] Even if a regulation restricts property use, fairness considerations may weigh against finding a taking if the regulation also benefits the property. If, on average, everyone—including the landowner—benefits from the property restriction, the concern that the landowner "alone [would] bear public burdens" diminishes.[43] This is called the "average reciprocity of advantage."[44] For instance, the Court in *Plymouth Coal v. Pennsylvania* upheld a safety regulation preventing a mining company from extracting coal to which it had rights because the company's employees benefited from the regulation.[45] Accordingly, the degree of burden imposed on the property owner, not the absolute value of property at issue, guides the analysis.[46]

B. Public Use and the Taking Itself

Traditional takings jurisprudence conceived of "public use" narrowly, treating the phrase as implying literal "use by the public," as in a public park.[47] The traditional view still has current advocates like Justice Thomas, who argues that "[t]he most natural reading of the [Takings] Clause is that it allows the government to take property only if the government owns, or the

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they may sustain, by reason of their not being permitted, by a noxious use of their property, to inflict injury upon the community.").

39. *See infra* Sections B (public use), C (regulatory takings).

40. This sentiment continues to find support on the Supreme Court today, with Justice Sotomayor musing about the fairest mechanism for determining just compensation in a 2018 oral argument. *See* Transcript of Oral Argument at 22, Knick v. Twp. of Scott, 139 S. Ct. 2162 (2018) (No. 17-647), 2018 WL 4776176.

41. Joseph L. Sax, *Takings and the Police Power*, 74 YALE L.J. 36, 57 (1964).

42. Armstrong v. United States, 364 U.S. 40, 49 (1960).

43. *See id.*

44. Pa. Coal Co. v. Mahon, 260 U.S. 393, 415 (1922).

45. *See* Plymouth Coal Co. v. Pennsylvania, 232 U.S. 531, 540–47 (1914).

46. *See* Murr v. Wisconsin, 137 S. Ct. 1933, 1943–44 (2017) (citing Keystone Bituminous Coal Ass'n. v. DeBenedictis, 480 U.S. 470, 497 (1987)).

47. Kelo v. City of New London, 545 U.S. 469, 479 (2005).

public has a legal right to use, the property."[48] He supports his interpretation by relying on "founding-era" dictionaries and Blackstone's Commentaries.[49] Today, however, courts have largely departed from the narrow, traditional understanding of "public use."

Although earlier courts consistently applied a "use by the public" standard, modern courts broadened the standard starting with *Fallbrook Irrigation District v. Bradley*.[50] The federal government in that case condemned land to impose a comprehensive irrigation plan.[51] The *Bradley* Court held that "the irrigation of really arid lands is a public purpose."[52] It explained that "all [persons] who, by reason of their ownership of or connection with any portion of the lands, would . . . have the opportunity to use [the water] upon the same terms as all others similarly situated."[53] Further, the Court noted, if the State could not condemn land in this manner, "no general scheme of irrigation c[ould] be formed or carried into effect."[54]

The Court affirmed the public purpose standard in *Mt. Vernon-Woodberry Cotton Duck Co. v. Alabama Interstate Power Co.*, where an Alabama statute permitted condemnation of land to generate hydroelectric power and sell it to the public.[55] The majority found that the public benefited from such condemnation:

> [T]o gather the streams from waste and to draw from them energy, labor without brains, and so to save mankind from toil that it can be spared, is to supply what, next to intellect, is the very foundation of all our achievements and all our welfare. If that purpose is not public, we should be at a loss to say what is.[56]

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48. *Id.* at 508 (Thomas, J., dissenting) (emphasis added).
49. *Id.* at 515–18; *see also* 1 WILLIAM BLACKSTONE, COMMENTARIES 134–35 (1765).
50. 164 U.S. 112 (1896).
51. *See id.* at 158–59.
52. *Id.* at 164. The Court clarified its holding nine years later:

> [T]he question [in *Bradley*] was whether the use of the water was a public use when a corporation sought to take land by condemnation under a state statute, for the purpose of making reservoirs and digging ditches to supply landowners with the water the company proposed to obtain and save for such purpose.

Clark v. Nash, 198 U.S. 361, 369 (1905). Because the irrigation company had not yet taken the land, the Court looked to the company's purpose for taking the land to discover whether it would result in public use of the land. *Id.*

53. *Bradley*, 164 U.S. at 162–63.
54. *Id.* at 160–61.
55. *See* Mt. Vernon-Woodberry Cotton Duck Co. v. Ala. Interstate Power Co., 240 U.S. 30, 32 (1916).
56. *Id.*

The Court then dismissed the traditional "use by the general public" test, concluding that its "inadequacy . . . as a universal test is established."[57]

After *Bradley* and *Mt. Vernon-Woodberry Cotton Duck Co.*, courts accepted the public purpose standard, but only in specific instances when a private third party sought to condemn land for the purpose of providing a service or resource to others. The public purpose standard remained stable for several decades until *Kelo v. City of New London*, when the Supreme Court held that states could take private property and give it to a private entity to spur economic development.[58]

In *Kelo*, the City of New London approved an "integrated development plan designed to revitalize its ailing economy."[59] The plan required property, and the City of New London initiated condemnation proceedings when some landowners refused to sell their properties.[60] The landowners filed an action claiming that taking private property and giving it to a private entity for economic development would violate the "public use" restriction in the Fifth Amendment.[61] The majority relied largely on *Berman v. Parker*[62] and *Hawaii Housing Authority v. Midkiff*[63] to find that economic development plans "unquestionably serve[ ] a public purpose" and thus amounted to a public use under the Fifth Amendment.[64] Therefore, *Kelo* showed that a taking can serve a public purpose even if it entails conveying private property to another private entity.

The *Kelo* interpretation of "public use" received significant pushback from many scholars.[65] Justice Scalia ranked *Kelo* alongside *Dred Scott* as among the worst errors made by the Supreme Court.[66] Even Justice Stevens, the

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57. *Id.*

58. *See* Kelo v. City of New London, 545 U.S. 469, 469–71 (2005).

59. *Id.* at 469.

60. *See id.*

61. *See id.* at 475.

62. 348 U.S. 26, 32 (1954) (holding that the legislature articulates a public purpose sufficient for "public use" when it passes legislation).

63. 467 U.S. 229, 240 (1984) ("The 'public use' requirement is thus coterminous with the scope of a sovereign's police powers.").

64. *Kelo*, 545 U.S. at 484.

65. Abraham Bell & Gideon Parchomovsky, *The Uselessness of Public Use*, 106 COLUM. L. REV. 1412, 1413 (2006) ("Everyone hates *Kelo*.").

66. *See* Debra Cassens Weiss, *Scalia Lumps* Kelo *Decision with* Dred Scott *and* Roe v. Wade, ABA J. (Oct. 19, 2011, 1:05 PM), http://www.abajournal.com/news/article/scalia_lumps_kelo_decision_with_dred_scott_and_roe_v._wade [https://perma.cc/C9Z5-SRTW].

author of the majority opinion in *Kelo*, noticed its poor reception.[67] Some scholars worried that *Kelo* rendered the public use requirement nonfunctional because "public use now means almost any use."[68] Notwithstanding these criticisms, at least some scholars see in *Kelo* a useful weapon for states to wield against social ills.[69]

C. Regulatory Takings

In its most basic form, a "taking requiring just compensation is a direct government appropriation or physical invasion of private property."[70] The authors of the Fifth Amendment did not originally consider that regulations would trigger the Takings Clause,[71] and early court rulings did not recognize the regulation of private property as takings.[72] However, "regulations [have become] ubiquitous and most of them impact property values in some tangential way," raising the question of whether regulations can affect a taking.[73]

This Section shows the development of regulatory takings caselaw through three main cases. Part 1 discusses *Pennsylvania Coal v. Mahon*, in which the Supreme Court articulated the first test to determine whether a regulatory taking has occurred.[74] Part 2 discusses the balancing test laid out

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67. *See* Stevens, *supra* note 36 ("The opinion for the Court in Kelo v. City of New London, Connecticut is the most unpopular opinion that I [Justice John Paul Stevens] wrote during my thirty-four year tenure on the Supreme Court.").

68. Sara B. Falls, *Waking a Sleeping Giant: Revisiting the Public Use Debate Twenty-Five Years After* Hawaii Housing Authority v. Midkiff, 44 WASHBURN L.J. 355, 356 (2005).

69. *See, e.g.*, Harry P. Carroll, Esq., *Where To Go After* Kelo*? Back to the Future!*, 29 W. NEW ENG. L. REV. 75, 108 (2006) (concluding that *Kelo* gives states helpful tools to "mitigate the severity of, if not totally eradicate, the personal tragedies and systemic societal failures which poverty exacerbates").

70. Lingle v. Chevron U.S.A. Inc., 544 U.S. 528, 537 (2005).

71. *See* Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1014 (1992) (noting that historically, "the Takings Clause reached only a 'direct appropriation' of property, or the functional equivalent of a 'practical ouster of [the owner's] possession'") (citations omitted). *See generally* William M. Treanor, *The Original Understanding of the Takings Clause and the Political Process*, 95 COLUM. L. REV. 782 (1995).

72. *See, e.g.*, Hadacheck v. Sebastian, 239 U.S. 394 (1915) (preventing the construction of brickyards within a city and thus devaluing property currently already put to that use); Mugler v. Kansas, 123 U.S. 623 (1887) (preventing private property from being used as a brewery, thus substantially lowering its value).

73. Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency, 535 U.S. 302, 324 (2002).

74. Pa. Coal Co. v. Mahon, 260 U.S. 393, 415 (1922).

by *Penn Central*.[75] Finally, Part 3 details *Loretto*'s permanent physical occupation test, a companion test to *Penn Central*.[76]

1. *Pennsylvania Coal*: The Backdrop of Regulatory Takings

Pennsylvania Coal Co. v. Mahon initiated regulatory takings jurisprudence, holding that a taking occurs when a regulation "goes too far."[77] In 1878, a mining company conveyed surface land to a buyer who intended to build a home on it.[78] In the deed, however, the coal company "reserve[d] the right to remove all the coal" underneath the surface, and the buyer waived all damages to the property caused by mining coal below it.[79] Forty years later, the Pennsylvania Legislature passed the Kohler Act,[80] prohibiting anthracite mining that causes the "subsidence of . . . any structure used as a human habitation."[81] Relying on the Kohler Act, the buyer enjoined the mining company from mining beneath his home.[82] The mining company countered that the Kohler Act violated its property rights to extract coal from its property.[83]

On review, the Supreme Court held that the Kohler Act was a taking.[84] The Court explained that the Act made anthracite mining prohibitively expensive, having "very nearly the same [Constitutional] effect . . . as appropriating or destroying it."[85] The Court qualified that not all government regulations are takings, but regulations like the Kohler Act that go "too far"

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75. Penn Cent. Transp. Co. v. City of New York, 438 U.S. 104 (1978).

76. Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419 (1982).

77. *See Mahon*, 260 U.S. at 415–16; *see also* Murr v. Wisconsin, 137 S. Ct. 1933, 1942 (2017) ("*Mahon* . . . initiated this Court's regulatory takings jurisprudence . . . ."); Carol M. Rose, Mahon *Reconstructed: Why the Takings Issue Is Still a Muddle*, 57 S. CAL. L. REV. 561, 562 (1984).

78. *Mahon*, 260 U.S. at 412–13.

79. *Id.* at 412.

80. 52 PA. STAT. AND CONS. STAT. ANN. § 661 (West 2011).

81. *Mahon*, 260 U.S. at 412–13.

82. *See id.*

83. *See id.* at 412.

84. *See id.* at 414.

85. *Id.* at 414–15. In dissent, Justice Brandeis focused on the traditional notion of police power, declaring that a "restriction imposed to protect the public health, safety or morals from dangers threatened is not a taking." *Id.* at 417 (Brandeis, J., dissenting); *see also* Evan B. Brandes, *Legal Theory and Property Jurisprudence of Oliver Wendell Holmes, Jr., and Louis D. Brandeis: An Analysis of* Pennsylvania Coal Company v. Mahon, 38 CREIGHTON L. REV. 1179, 1194 (2005) ("Brandeis [argued] that a regulation that is a valid exercise of the police power is . . . constitutional . . . .").

are takings.[86] Had the Kohler Act conferred an "average reciprocity of advantage" to the mining company, the Court may have not found that the regulation went "too far."[87]

In the decades following *Mahon*, courts struggled to consistently apply this "amorphous" "too far" test.[88] Although decisions like *Penn Central*[89] and *Loretto*[90] sharpened *Mahon*'s "too far" test, courts sometimes treat it as the "foundational general rule" for a takings claim.[91] Indeed, the Court seems to appreciate the rule's vagueness, declining to articulate "general propositions" because the problem for regulatory takings is one of "degree."[92] Courts waited fifty years for *Penn Central* to offer some clarity on the *Mahon* test.

2. *Penn Central* Balancing Test

The Supreme Court first offered guidance on the *Mahon* test in *Penn Central Transportation Company v. City of New York*.[93] In that case, New York City enacted the Landmarks Preservation Law, empowering the Landmarks Preservation Commission ("Commission") to designate buildings as landmarks.[94] Owners of these landmarks could not modify the exterior of

86. *Mahon*, 260 U.S. at 415. The Court echoes this sentiment eighty years later in *Tahoe-Sierra*, noting that interpreting all regulations as takings would "transform government regulation into a luxury few governments could afford." Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency, 535 U.S. 302, 324 (2002).

87. *Mahon*, 260 U.S. at 415.

88. *See* Murr v. Wisconsin, 137 S. Ct. 1933, 1942 (2017) (noting an absence of guidance in applying the ad-hoc rule); *Tahoe-Sierra*, 535 U.S. at 326 ("Justice Holmes did not provide a standard for determining when a regulation goes 'too far' . . . ."); Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1015 (1992) ("*Mahon* offered little insight into when, and under what circumstances, a given regulation would be seen as going 'too far' for purposes of the Fifth Amendment."); Penn Cent. Transp. Co. v. City of New York, 438 U.S. 104, 124 (1978) ("[T]his Court, quite simply, has been unable to develop any 'set formula' for determining when 'justice and fairness' require that economic injuries caused by public action be compensated by the government . . . ."); Calvert G. Chipchase, *From Grand Central to the Sierras: What Do We Do with Investment-Backed Expectations in Partial Regulatory Takings?*, 23 VA. ENVTL. L.J. 43, 44–45 (2004) (describing the ad-hoc *Mahon* test as "opaque" and "elusive for lower courts and commentators alike"); Stephen Durden, *Unprincipled Principles: The Takings Clause Exemplar*, 3 ALA. C.R. & C.L.L. REV. 25, 39–40 (2013); R.S. Radford & Luke A. Wake, *Deciphering and Extrapolating: Searching for Sense in* Penn Central, 38 ECOLOGY L.Q. 731, 733 (2011) (criticizing Justice Holmes for his ambiguous standard).

89. *Penn Cent.*, 438 U.S. at 104.

90. Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419 (1982).

91. Durden, *supra* note 88, at 39.

92. *Mahon*, 260 U.S. at 416.

93. 438 U.S. at 104.

94. *See id.*

their buildings without approval from the Commission, and Grand Central Station, owned by Penn Central Transportation Company ("Penn Central"), received a landmark designation.[95] Penn Central unsuccessfully sought approval from the Commission to construct a "multistory office building" atop of the station.[96] A string of appeals eventually brought the matter before the Supreme Court, under the theory that the Landmarks Preservation Law's restrictions on development amounted to a taking.[97] Relying on a new balancing test, the Court found that no taking had occurred.[98]

Writing for the six-member majority, Justice Brennan first identified three factors courts must balance when considering whether a regulatory taking has occurred: "[t]he economic impact of the regulation on the claimant . . . the extent to which the regulation has interfered with distinct investment-backed expectations . . . [and,] . . . the character of the governmental action."[99] With regard to the first factor, the economic impact of the regulation must be significant.[100] Earlier courts refused to find takings when owners lost up to 75%[101] and 87.5%[102] of their property value because of governmental regulation. The *Penn Central* Court found that this factor weighed against finding a taking because Penn Central benefited from its landmark designation, and the alleged loss of value did not approach amounts in earlier cases where courts had found a taking.[103]

Regarding the second factor, investment-backed expectations, claimants alleging a taking have quite a hurdle to clear. First, any investment-backed expectation must be distinct; a "mere unilateral expectation or an abstract need" will not suffice.[104] Second, the expectation must also be "reasonable," and constructive notice of a regulation frustrating that expectation may render

95. *See id.* at 104, 115. The landmark designation reflected Grand Central Station's "ingenious" solution to urban transit and "magnificent . . . French beaux-arts style." *Id.* at 115.

96. *Id.* at 116.

97. *See id.* at 122.

98. *See id.* at 138.

99. *Id.* at 124. Some scholars interpret *Penn Central* as having two factors, not three. *See, e.g.*, Adam R. Pomeroy, Penn Central *After 35 Years: A Three Part Balancing Test or a One Strike Rule?*, 22 FED. CIR. B.J. 677, 679 (2013). At least one interpretation folds the "investment-backed expectations" factor into "diminution of value" as a subset. *See* Paradissiotis v. United States, 49 Fed. Cl. 16, 20 (2001), *aff'd*, 304 F.3d 1271 (Fed. Cir. 2002). *But see* Murr v. Wisconsin, 137 S. Ct. 1933, 1937 (2017) (enumerating the *Penn Central* balancing test as three distinct factors). This Comment will apply the widely accepted three-part *Penn Central* balancing test.

100. *Penn Cent.*, 438 U.S. at 131.

101. Vill. of Euclid v. Ambler Realty Co., 272 U.S. 365, 384 (1926).

102. Hadacheck v. Sebastian, 239 U.S. 394, 405 (1915).

103. *Penn Cent.*, 438 U.S. at 131, 134–35.

104. Webb's Fabulous Pharmacies, Inc. v. Beckwith, 449 U.S. 155, 161 (1980).

an expectation unreasonable.[105] The Court found that Penn Central's expectation to use all of the superadjacent airspace was unreasonable, and thus this factor weighed against finding a taking.[106]

Finally, with regard to the third factor, claimants must also show that the character of the government regulation weighs in favor of finding a taking.[107] When characterized as an invasion, government action favors finding a taking.[108] Furthermore, courts are more likely to find a taking if the government action absolutely restricts a "pre-existing property interest" rather than requiring a property owner to obtain approval from a governmental body before developing or using his land in a particular way.[109] Because Penn Central had the opportunity to appeal the landmark designation, and because the government did not invade any property by imposing a landmark designation, the Court determined that this factor also weighed against finding a taking.[110] Therefore, with all three factors weighing against finding a taking, the Court found that the Landmark Preservation Law's development restrictions had not taken Penn Central's property.[111]

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105. *Penn Cent.*, 438 U.S. at 121; *see, e.g.*, Sucn. Suarez v. Gelabert, 541 F. Supp. 1253, 1260 (D.P.R. 1982), *aff'd sub nom.* Sucesion Suarez v. Gelabert, 701 F.2d 231 (1st Cir. 1983) (finding that an expectation was unreasonable because claimant "should have known that . . . that the operations they chose to conduct were subject to constant regulation, supervision and were intertwined with matters of public policy that at some time might not be balanced in their favor.").

106. *See Penn Cent.*, 438 U.S. at 130.

107. *See id.* at 124.

108. *See, e.g.*, United States v. Causby, 328 U.S. 256, 265–66 (1946). In *Causby*, United States fighter and bomber planes regularly approached an airport by flying low over an established chicken farm, causing most of the chickens to kill themselves by "fly[ing] into the walls from fright." *Id.* at 258–59. The Supreme Court found that regular, low government overflights interfered with the farmer's right to enjoy his property—in this case, run a chicken farm—to the same degree as would a physical invasion on the surface of the land. *See id.* at 265. Thus, the flights amounted to a taking. *See id.* at 266. *But see* United States v. Cress, 243 U.S. 316, 328 (1917) (emphasizing that the invasion of property must be direct to affect a taking).

109. Nollan v. Cal. Coastal Comm'n, 483 U.S. 825, 855 (1987) (Brennan, J., dissenting).

110. *See Penn Cent.*, 438 U.S. at 132–33.

111. *See id.* at 138. Although the *Penn Central* Court did not identify its test as a balancing test, courts have applied it as one. *See* Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency, 535 U.S. 302, 302 (2002) (referring to the *Penn Central* test as a "balancing" test); *see also* Chipchase, *supra* note 88, at 66–72 (arguing that the *Penn Central* test is a balancing test). For example, in *Hodel v. Irving*, three claimants alleged that § 207 of the Indian Land Consolidation Act affected a taking because it imposed restrictions that prevented them from inheriting land willed to them. Hodel v. Irving, 481 U.S. 704, 709 (1987). Section 207 provided that

> [n]o undivided fractional interest in any tract of trust or restricted land within a tribe's reservation or otherwise subjected to a tribe's jurisdiction shall descedent [sic] by intestacy or devise but shall escheat to that tribe if such

The *Penn Central* test remains good law, applied most recently by the Supreme Court in *Murr v. Wisconsin*.[112] Nevertheless, the Court restricted the application of *Penn Central* by identifying "two discrete categories of regulatory" takings that did not require an ad-hoc inquiry in the tradition of *Mahon*.[113] The first category of a per se taking is any "regulation [that] denies all economically beneficial or productive use of land" is a taking.[114] The next Part addresses the second *Lucas* category, first articulated by *Loretto v. Teleprompter Manhattan CATV Corp.*[115]

3. *Loretto*'s Permanent Physical Occupation

A short four years after *Penn Central*, *Loretto* carved out an exception to the default ad-hoc inquiry imposed by *Mahon* and its progeny. In *Loretto*, New York had passed a statute requiring landlords to allow cable television companies to install one-half inch diameter cables on their properties.[116] The cables themselves measured "slightly less than one-half inch in diameter."[117] Landlords could request a one-time payment—not to exceed one dollar—from the cable company for the installation.[118] One landlord, Loretto, sued a

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> interest represents 2 per centum or less of the total acreage in such tract and has earned to its owner less than $100 in the preceding year before it is due to escheat.

Id. (quoting Indian Land Consolidation Act, Pub. L. 97–459, § 207, 96 Stat 2515). The claimants had all been willed property falling within the escheat provision of Section 207. *See id.*

On review, the Supreme Court found that two factors—the economic impact of the regulation and the claimant's reasonable investment-backed expectations—weighed against requiring just compensation under the statute. *See id.* at 714–16. However, the third factor—the character of the government's action—weighed in favor of the claimants' request for just compensation. *See id.* at 716–18. Balancing the relative weights of the factors, the Supreme Court held that a taking had occurred, explaining that the "extraordinary" character of the government's action outweighed the other factors. *See id.* at 716, 718.

112. 137 S. Ct. 1933, 1939 (2017).

113. Lucas v. S.C. Coast Council, 505 U.S. 1003, 1015 (1992); *see also* Chipchase, *supra* note 88, at 45 (concluding that the aftermath of *Lucas* restricted *Penn Central* to government regulations that only partially diminished the property's value).

114. *Lucas*, 505 U.S. at 1015. Because no backdoor law would "den[y] all economically beneficial or productive use" of a mobile operating system, this Comment will not spend time on the *Lucas* test. *Id.*

115. 458 U.S. 419 (1982).

116. *Id.* at 421–22 (citing Loretto v. Teleprompter Manhattan CATV Corp., 53 N.Y.2d 124, 135 (1981)).

117. *Id.* at 422.

118. *See id.* at 423.

cable company, alleging that the installation of cables on her property with the meager one-dollar compensation amounted to a taking.[119]

The Supreme Court concluded that the cable installations amounted to a taking, explaining that "a permanent physical occupation authorized by government is a taking without regard to the public interests that it may serve."[120] The majority cautioned that only *permanent* physical occupations are per se takings, and temporary occupations still require courts to apply the *Penn Central* balancing test.[121] The Court later extended *Loretto*'s protections to apply when a regulation affords third parties the "permanent and continuous right" to access private property, even if no third party may remain there permanently. [122] In other words, what matters is the property owner's right to exclude, not whether a third party occupies the property permanently.[123]

III. INTELLECTUAL PROPERTY

Having addressed takings of corporeal property, this Comment now examines intellectual property, the class of property that encompasses mobile operating systems. The Constitution provides the legal grounds to protect intellectual property, authorizing Congress to "promote the progress of science and useful arts, by securing for limited time to authors and inventors the exclusive right to their respective writings and discoveries."[124] Although the common law—absent a contract or fiduciary relationship—does not

119. *See id.* at 423–24.

120. *Id.* at 426, 441. The Court remanded the case without disturbing the New York Court of Appeal's finding that the statute at issue fell within the ambit of the state's police power. *Id.* at 441. However, the High Court noted that whether the statute so "frustrates property rights" that compensation was owed was a "separate question." *Id.* at 425.

121. *See id.* at 434–35; *see, e.g.*, PruneYard Shopping Ctr. v. Robins, 447 U.S. 74, 84 (1980) (finding that a physical invasion was not "determinative" when it was not permanent). Justice Blackmun, dissenting in *Loretto*, derided the majority's weak physicality requirement, suggesting that the Loretto majority would have found a taking "even if [the property owner] herself owned the cable, [s]o long as [a third party] continuously passed its electronic signal through the cable." *Loretto*, 458 U.S. at 450 (Blackmun, J., dissenting). Under this theory, courts could even apply *Loretto* to electronic networks. *See* Daniel A. Lyons, *Virtual Takings: The Coming Fifth Amendment Challenge to Net Neutrality Regulation*, 86 NOTRE DAME L. REV. 65, 96–101 (2011). This could have far-reaching effects, especially with respect to net neutrality and similar regulations that "deprive[ ] broadband providers of the right to exclude others from their networks." *Id.* at 68.

122. *See* Nollan v. Cal. Coastal Comm'n, 483 U.S. 825, 832 (1987).

123. *Id.*

124. U.S. CONST. art. I, § 8, cl. 8.

protect intellectual property, statutes provide protections to certain kinds of intellectual property.[125] To present, Congress has recognized four classes of protected intellectual property: copyrights,[126] patents,[127] trademarks,[128] and trade secrets.[129] As an operating system, Apple's iOS falls in the copyright category.[130] Section A will outline what qualifies for copyright protections and what rights copyright holders enjoy. Section B will review caselaw addressing whether the Takings Clause protects intellectual property.

A. Copyright

Title 17 of the United States Code addresses copyrights, protecting "original works of authorship fixed in any tangible medium of expression."[131] Thus, the concepts at play are (1) originality, (2) a work of authorship, and (3) fixation of that work of authorship. First, originality means creativity, "even a slight amount [of creativity] will suffice" for copyright protections to attach.[132] Second, there are eight kinds of works of authorship, and mobile operating systems—fall into the literary works category because they are computer programs.[133] Finally, copyright protections attach only to those

125. *See* Cheney Bros. v. Doris Silk Corp., 35 F.2d 279, 280 (2d Cir. 1929) (noting that absent statutory protections, "a man's property is limited to the chattels which embody his invention").

126. 17 U.S.C. §§ 101–1332, 1401 (2018).

127. 35 U.S.C. §§ 1–390 (2018).

128. 15 U.S.C. §§ 1051–1141n (2018).

129. Defend Trade Secrets Act of 2016, Pub. L. No. 114-153, 130 Stat. 376 (codified at 18 U.S.C. §§ 1832, 1833, 1835, 1836, 1838, 1839, 1961 (2018) and 29 U.S.C. § 620 (2018)). State law also offers protection to trade secrets, with nearly all states having adopted the Uniform Trade Secrets Act in some form or another. *See* Andrew B. Campbell, *The Federal Defend Trade Secrets Act: Keeping Secrets a Secret*, 53 TENN. B.J. 12, 14 (2017).

130. Apple's iOS may also receive trade secret protection. However, harming a trade secret requires disclosure or use of the trade secret by a party without the permission of the trade secret owner. *See* 18 U.S.C. § 1839(5); Uniform Trade Secrets Act, 18 U.S.C. § 1905 (2018). Compelling Apple to code a backdoor into its operating system does not amount to disclosure or use; therefore, a backdoor law would likely not amount to trade secret misappropriation. As such, this Comment will not address iOS's protections as a trade secret.

131. 17 U.S.C. § 102(a).

132. Situation Mgmt. Sys., Inc. v. ASP. Consulting LLC, 560 F.3d 53, 60 (1st Cir. 2009) (quoting Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 345 (1991)). Although a copyright necessarily entails originality, it does not require novelty like a patent. *See* Sheldon v. Metro-Goldwyn Pictures Corp., 81 F.2d 49, 54 (2d Cir. 1936). For instance, a person may compose and copyright a poem that is an exact character-for-character match to a famous ode, so long as that person had no knowledge of the pre-existing poem. *See id.*

133. *See* Apple Comput., Inc. v. Franklin Comput. Corp., 714 F.2d 1240, 1249 (3d Cir. 1983). The eight kinds of works of authorship include (1) literary works; (2) musical works, including

original creations embodied in a tangible medium.[134] This is known as fixation, meaning "any physical rendering of the fruits of creative intellectual or aesthetic labor."[135] Therefore, whether the code for an operating system is embodied in a document or in a silicon chip, it has been fixed in a tangible medium under 17 U.S.C. § 102(a).[136]

Title 17 excludes from protection certain aspects of a work of authorship that might be associated with it, like its "method of operation."[137] This exception implicates computer operating systems because operating systems appear to be a method of operation.[138] But an operating system is also a set of instructions for how a computer processes certain tasks.[139] Given that the instructions directing a process and the process itself are distinct, operating systems are not per se excluded from copyright protections.[140] Indeed, several courts have come to the same conclusion or granted copyright protection to operating systems without discussing whether operating systems are per se excluded from copyright protections.[141]

A copyright holder enjoys the right to exclusively reproduce the work, create derivative works, distribute or sell the work, perform or record the work, and display the work.[142] These exclusive rights exist for the duration of the creator's life and seventy years thereafter.[143] There are, however, some exceptions to the exclusive rights that copyright holders enjoy. For instance, third parties do not infringe on a copyright holder's copyright when using the

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any accompanying words; (3) dramatic works, including any accompanying music; (4) pantomimes and choreographic works; (5) pictorial, graphic, and sculptural works; (6) motion pictures and other audiovisual works; (7) sound recordings; and (8) architectural works. *See* 17 U.S.C. § 102(a).

134. *See* 17 U.S.C. § 102(a).

135. Goldstein v. California, 412 U.S. 546, 561 (1973).

136. *See* Tandy Corp. v. Pers. Micro Computs., Inc., 524 F. Supp. 171, 173 (N.D. Cal. 1981).

137. 17 U.S.C. § 102(b) ("[C]opyright protection for an original work of authorship [does not] extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.").

138. *See* Apple Comput., Inc. v. Franklin Comput. Corp., 714 F.2d 1240, 1251 (3d Cir. 1983), *cert denied*, 464 U.S. 1033 (1984).

139. *Id.* (supplying an example of one computer program task: translating "a high level language program from source code into its binary language object code form").

140. *See id.* at 1252.

141. *See* Apple Comput., Inc. v. Formula Int'l, Inc., 562 F. Supp. 775, 780 (C.D. Cal.1983); GCA Corp. v. Chance, No. C-82-1063-MHP, 1982 WL 1281, at *2 (N.D. Cal. Aug. 31, 1982); *Tandy Corp.*, 524 F. Supp. at 173.

142. *See* 17 U.S.C. § 106 (2018).

143. *See id.* § 302.

copyrighted work to teach, research, or report the news.[144] Another exception permits third parties to copy the computer program when (1) copying is "an essential step in the utilization of the computer program" and (2) for solely archival or backup purposes.[145] The owner of a computer program may sell or lease the copies created under these exemptions "along with the copy from which such copies were prepared."[146] Any violation of the exclusive rights held by the owner of a computer program that does not fall into any of the exemptions thus amounts to copyright infringement.[147]

B. Intellectual Property Under the Takings Clause

If corporeal property takings jurisprudence is murky, intellectual property takings jurisprudence is downright opaque. Although "private property has been read to encompass both real and personal property," the extent to which intellectual property is compensable property under the Fifth Amendment is less clear.[148] As early as 1848, courts have suggested that the Takings Clause might protect intellectual property,[149] but no court had explicitly considered intellectual property under a takings claim until *Ruckelshaus v. Monsanto Co.*[150]

The *Ruckelshaus* Court entertained for the first time whether intellectual property—in this case a trade secret—might receive protection under the Takings Clause.[151] There, Monsanto alleged that the Environmental Protection Agency ("EPA") had taken Monsanto's trade secrets by disclosing those trade secrets under the Federal Insecticide, Fungicide, and Rodenticide

144. *See id.* § 107.

145. *Id.* § 117(a), (c).

146. *Id.* § 117(b).

147. *See id.* § 501. Congress explicitly waived sovereign immunity for the federal government. *See* 28 U.S.C. § 1498(a)–(b). This liability has not stopped the federal government from using copyrighted material, however. By their own records, federal agencies use copyrighted material all the time without compensating the copyright holder. *See* Roberta Rosenthal Kwall, *Governmental Use of Copyrighted Property: The Sovereign's Prerogative*, 67 TEX. L. REV. 685, 687 (1989). Finally, states retain sovereign immunity against copyright infringement suits. *See* Nat'l Ass'n of Bds. of Pharmacy v. Bd. of Regents, 633 F.3d 1297, 1315 (11th Cir. 2011) ("Congress may not abrogate the States' sovereign immunity.").

148. Shubha Ghosh, *Toward a Theory of Regulatory Takings for Intellectual Property: The Path Left Open After* College Savings v. Florida Prepaid, 37 SAN DIEGO L. REV. 637, 667 (2000).

149. W. River Bridge Co. v. Dix, 47 U.S. 507, 534 (1848) (noting in dicta that non-corporeal property like a franchise or a patent received the same constitutional protections as corporeal property).

150. 467 U.S. 986 (1984).

151. *See id.* at 1001.

Act.[152] The Court first had to determine whether trade secrets even receive protection under the Takings Clause, and the Court held that trade secrets receive Takings Clause protection if a party has a "cognizable" interest in a trade secret as defined by state law.[153] The Court explained that trade secrets have characteristics similar to tangible property—assignable, capable of forming the res in trust[154]—and that other courts had recognized that intangible property in general receives Fifth Amendment protection.[155]

The Court considered it irrelevant that Monsanto might still glean value from its former trade secret after the government's disclosure.[156] The crux of a trade secret, the Court underscored, is in the owner's right to keep it secret from others, that is, the right to exclude.[157] Once the holder of a trade secret can no longer exercise the absolute right to exclude, "[he] has lost his property interest in the data."[158] Having determined that a regulation infringed upon a property interest with a class of intellectual property, the Court found that the regulation had caused a taking.[159] Thus, *Ruckelshaus* showed that the takings clause protects at least one form of intellectual property.

IV. APPLE'S CONCERN FOR ENCRYPTION AND SECURITY

As a company, Apple has considerable interest in maintaining or improving the security of its devices.[160] Baking backdoor access into iOS increases the chance that a black hat hacker[161] will find and exploit the vulnerability, causing costly data breaches. For instance, the first two decades

152. *See id.* at 998–99; Federal Insecticide, Fungicide, and Rodenticide Act, Pub. L. 92-516, 86 Stat. 973 (1972).

153. *Ruckelshaus*, 467 U.S. at 1003–04.

154. *See id.* at 1002.

155. *See id.* at 1003; *see, e.g.*, Armstrong v. United States, 364 U.S. 40, 44, 46 (1960) (protecting a materialman's lien); Louisville Joint Stock Land Bank v. Radford, 295 U.S. 555, 596–602 (1935) (protecting a real estate lien); Lynch v. United States, 292 U.S. 571, 579 (1934) (protecting a contract).

156. *See Ruckelshaus*, 467 U.S. at 1011–12.

157. *See id.* at 1011.

158. *Id.*

159. *See id.* at 1004.

160. *See* Cook, *supra* note 18.

161. In the lexicon of hacking, black hats hack for criminal purposes, white hats hack to help tech companies identify vulnerabilities (and with the company's permission), and grey hats hack like white hats but sans permission. Kim Zetter, *Hacker Lexicon: What Are White Hat, Gray Hat, and Black Hat Hackers?*, WIRED (Apr. 13, 2016, 5:03 PM), https://www.wired.com/2016/04/hacker-lexicon-white-hat-gray-hat-black-hat-hackers/ [https://perma.cc/9UN6-KN4N].

of the 2000s saw companies like Target, Home Depot, Epsilon, and Sony pay out hundreds of millions of dollars as a result of data breaches.[162] Epsilon paid the most for its data breach, shelling out a staggering four billion dollars in 2011.[163] Government agencies are not immune from data breaches either. In 2006, one data breach cost the Veterans Administration half a billion dollars.[164] While not every data breach costs a company hundreds of millions of dollars, the average data breach in the United States costs a company nearly eight million dollars.[165]

Apple responded to digital vulnerability, introducing new security features on iPhones and advertising iPhones as more secure than other phones.[166] For instance, iOS 7 brought fingerprint access[167] and a lockout feature that deleted all data on an iPhone after ten unsuccessful passcode attempts.[168] Later, iOS 9—the same version on Farook's iPhone—introduced the six-digit passcode, increasing passcode complexity by 100-fold.[169] Most recently, in iOS 11, Apple now permits users to unlock their phones using facial recognition.[170]

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162. *The 10 Most Expensive Data Breaches in Corporate History*, FIRMEX (Aug. 24, 2016), https://www.firmex.com/thedealroom/the-10-most-expensive-data-breaches-in-corporate-history/ [https://perma.cc/S2D5-Y2FZ].

163. *Id.*

164. *Id.*

165. *See* Niall McCarthy, *The Average Cost of a Data Breach Is Highest in the U.S. [Infographic]*, FORBES (July 13, 2018, 7:30 AM), https://www.forbes.com/sites/niallmccarthy/2018/07/13/the-average-cost-of-a-data-breach-is-highest-in-the-u-s-infographic/#340b54c02f37 [https://perma.cc/6YEE-NYQ7].

166. *See* Emily Bary, *Android Vs. iOS: Are IPhones Really Safer?*, BARRON'S (May 31, 2017, 2:14 PM), https://www.barrons.com/articles/android-vs-ios-are-iphones-really-safer-1496254475 [https://perma.cc/59VF-VN26]. Industry leaders have recognized this, with insurance company Allianz offering discounts for its cyber insurance to those businesses that use Apple products. Benjamin Mayo, *Apple and Cisco Partner with Insurance Companies To Offer Discounts for Cyber-Crime Insurance*, 9TO5MAC (Feb. 5, 2018, 5:10 AM), https://9to5mac.com/2018/02/05/apple-cisco-insurance-partnership/ [https://perma.cc/T8C2-NE4M].

167. *See* Rich Mogull, *The IPhone 5s Fingerprint Reader: What You Need To Know*, MACWORLD (Sept. 10, 2013, 2:30 PM), https://www.macworld.com/article/2048514/the-iphone-5s-fingerprint-reader-what-you-need-to-know.html [https://perma.cc/U7RR-3RXC].

168. *See* Neil Gonzales, *Disable Security Lockouts from Too Many Failed Passcode Attempts on Your IPhone*, GADGETHACKS (Feb. 10, 2014, 5:49 PM), https://ios.gadgethacks.com/how-to/disable-security-lockouts-from-too-many-failed-passcode-attempts-your-iphone-0150884/ [https://perma.cc/E33F-C4J3].

169. *See* Glenn Fleishman, *Switch to Six Digits for Your iOS Passcode*, MACWORLD (Jan. 22, 2016, 5:00 AM), https://www.macworld.com/article/3018152/security/switch-to-six-digits-for-your-ios-passcode.html [https://perma.cc/P5Z3-TMH9].

170. *See* David Kravets, *What You Should Know About Privacy and Apple's FaceID on iOS 11*, ARS TECHNICA (Sept. 13, 2017, 12:15 PM), https://arstechnica.com/tech-

That Apple advertises these security features suggests that its customers respond positively to improved security features.[171]

Although not a simple random survey of consumers, Apple's stock price can offer circumstantial evidence about the value of iOS's security features. On the morning of February 16, when the district court ordered Apple to assist the FBI in unlocking Syed's iPhone,[172] Apple stock ("AAPL") opened at $95.02.[173] That same day, Tim Cook wrote a public letter to Apple's customers, signaling Apple's intent to defy the court order.[174] Forty-two days later, when the FBI withdrew its request for Apple's assistance,[175] AAPL closed at $105.19, having risen almost ten percent.[176] By contrast, Apple competitors Alphabet, Inc. and Microsoft Corp. saw their stock prices rise by only five percent over the same period.[177] That Apple stock outperformed its competitors suggests that investors valued Apple's security features more than compliance with a court order.

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policy/2017/09/what-you-should-know-about-privacy-and-apples-faceid-on-ios-11/ [https://perma.cc/8AMM-6X8E].

171. *See, e.g.*, Press Release, Apple Inc., Apple Previews iOS 9 (June 8, 2015), https://www.apple.com/newsroom/2015/06/08Apple-Previews-iOS-9/ [https://perma.cc/6PMB-Q2KX] ("Enhanced security features in iOS 9 keep your devices and Apple ID secure by strengthening the passcode that protects your devices and improving two-factor authentication by building it directly into iOS, making it harder for others to gain unauthorized access to your Apple ID."); Press Release, Apple Inc., iOS 9 Available as a Free Update for IPhone, IPad & IPod Touch Users September 16 (Sept. 9, 2015), https://www.apple.com/newsroom/2015/09/09iOS-9-Available-as-a-Free-Update-for-iPhone-iPad-iPod-touch-Users-September-16/ [https://perma.cc/G5BJ-KUBJ] ("iOS 9 makes iOS devices more intelligent and proactive with powerful search and improved Siri® features, all while protecting users' privacy."); Press Release, Apple Inc., Previews iOS 12 (June 4, 2018), https://www.apple.com/newsroom/2018/06/apple-previews-ios-12/ [https://perma.cc/29Q6-2GFN] ("As with all Apple software updates, enhanced privacy and security remain a top priority in iOS 12.").

172. *See* Order, *supra* note 13, at *1.

173. AAPL Stock Price from 02/16/2016 to 3/28/2016, YAHOO FINANCE, https://finance.yahoo.com/quote/AAPL/history [https://perma.cc/SW4W-XEJS] (click dropdown menu for "Time Period" and enter 02/16/2016 as the start date and 03/28/2016 as the end date).

174. *See* Cook, *supra* note 18.

175. *See* Benner & Lichtblau, *supra* note 22.

176. AAPL Stock Price from 02/16/2016 to 3/28/2016, *supra* note 173. A year after the court order, APPL closed even higher, at $135.35, and two years later, it traded at $172.43. *Id.*

177. *See* GOOGL Stock Price from 02/16/2016 to 3/28/2016, YAHOO FINANCE, https://finance.yahoo.com/quote/GOOGL/history [https://perma.cc/RZ3V-NTJF] (click dropdown menu for "Time Period" and enter 02/16/2016 as the start date and 03/28/2016 as the end date); MSFT Stock Price from 02/16/2016 to 3/28/2016, YAHOO FINANCE, https://finance.yahoo.com/quote/MSFT/history [https://perma.cc/Y6Y3-LR8N] (click drop down menu for "Time Period" and enter 02/16/2016 as the start date and 03/28/2016 as the end date).

V. HYPOTHETICAL LEGISLATION

Although both Presidents Barack Obama and Donald Trump toyed with mandating tech companies to provide backdoor workarounds to encrypted devices, nothing has come of it.[178] In the absence of legislation, the best framework for potential legislation comes from the 2016 court order.[179] The order called for Apple to create a new operating system, loadable only on the target device, that would permit investigators to bypass the ten-attempt passcode erase function.[180] Moreover, the Magistrate Judge called for the modified operating system to accept passcode attempts via "physical device port, Bluetooth, Wi–Fi, or other protocol."[181]

If the courts already have the power to compel Apple to create such an operating system in specific instances, then the legislature is unlikely to pass a law restricted in the same case-by-case manner. More likely, such legislation would require that Apple encode a vulnerability in *all* of its mobile operating systems—not just the versions subject to a warrant—that investigators can exploit directly or indirectly by using a securely held "key."[182] For the purposes of this analysis, the fictitious legislation will look something like this:

> THE BACKDOOR LAW
>
> A. Any company putting into interstate commerce mobile devices with security features under subsection (B) must, through the operating system of the mobile device, provide access to the device in a manner described under section (C).
>
> B. Security features sufficient to obligate a company under subsection (A) include features that modify or erase device data

178. *See* Andrew Blake, *Encryption Legislation May Be Needed if 'Going Dark' Problems Persist Says FBI Chief Wray*, WASH. TIMES (July 19, 2018), https://www.washingtontimes.com/news/2018/jul/19/christopher-wray-fbi-director-says-encryption-legi/ [https://perma.cc/ABZ5-EZCY].

179. At the time of writing, Australia recently enacted a law requiring tech companies "to create tools that would circumvent encryption built into their products." Nellie Bowles, *Did Australia Hurt Phone Security Around the World?*, N.Y. TIMES (Jan. 22, 2019), https://www.nytimes.com/2019/01/22/technology/australia-cellphone-encryption-security.html [https://perma.cc/U4KU-UJJR]. Because a comparison between the protections for private property in Australia's Constitution and those protections under the Constitution of the United States is beyond the scope of this Comment, the newly enacted law will not serve as a basis for fictitious legislation in this Comment. *Compare* U.S. CONST. amend V., *with Australian Constitution* s 51(xxxi).

180. *See* Order, *supra* note 13, at *1.

181. *Id.*

182. *See* KEHL ET AL., *supra* note 12, at 3.

> after ten or fewer failed attempts at accessing the device using a pin, passcode, or other entry of information.
>
> C. To bypass the security features enumerated in (B), the company will encode into the operating system of any mobile device it puts into the stream of commerce an option to bypass or disable the security features under section (B) so law enforcement officers under authority of a warrant may submit an unlimited number of pin, passcode, or other information attempts.
>
> D. The company may not encode:
>
> 1. Any delay beyond what is incurred by the existing hardware;
>
> 2. A security alert that informs by telephone, electronic messaging, or other medium of communication the owner of the device or his designee that the security features of the target device have been disabled.[183]

This legislation parallels the court order in Apple's case. First, it burdens a qualifying company to create a mobile operating system with a feature that circumvents its customary security features.[184] Second, after disabling the security feature, the device must accept a wide range of inputs as part of a brute force attempt at accessing the device.[185] Third, it prohibits a company from introducing a mechanism that might delay or inhibit an investigation after triggering the circumvention process.[186]

The fictitious legislation also has some differences. First, the legislation references commerce, a power under which Congress might pass such legislation.[187] Second, it includes more general "catch-all" terms at the end of series (e.g., "pin, passcode, or other entry of information") to accommodate for developments in technology. Third, it mandates that all devices contain this operating system vulnerability, not just target devices as in Apple's case.[188]

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183. Although legislation such as this would likely include a provision for compensation—if Congress believed the law might trigger the Takings Clause—this Comment will not deal with the question of what amounts to adequate compensation. The fictional legislation also does not include a penalty for noncompliance, which drafters might include, depending on their assessment of liability under the Fifth Amendment.

184. *See* Order, *supra* note 13, at *1.

185. *See id.*

186. *See id.*

187. *See* U.S. CONST art. I, § 8, cl. 3 (declaring that Congress may "regulate commerce with foreign nations, and among the several states, and with the Indian tribes").

188. *See* Order, *supra* note 13, at *1.

VI. ANALYSIS

Considering the current tension between strong device encryption and national security, Congress may well pass a law compelling Apple—and other qualifying tech companies—to create backdoor access to its devices for the government by including specific vulnerabilities in mobile operating systems. If Congress fails to compensate Apple for that backdoor, it could run afoul of the Takings Clause in the Fifth Amendment. To sustain such a claim, Apple would first have to show that it has a property interest in iOS that falls within the protection of the Takings Clause. Second, Apple would have to show that the law affects a taking. Third, Apple would have to show that the taking satisfies the public use requirement.

Section A argues that the Fifth Amendment recognizes Apple's iOS as property subject to a taking. Section B discusses how the hypothetical "backdoor" legislation would affect a taking, applying the *Penn Central* and *Loretto* tests. Section C proposes that the FBI should develop its in-house cryptography prowess rather than deputize private companies to break device encryption.

A. Whether Apple's iOS Is Private Property Subject to a Taking

As noted above, operating systems—to the extent that they are original—fall within the literary works category of works of authorship.[189] Apple's iOS is intellectual property subject to copyright protections. The question remains as to whether the federal government may take copyrighted work for a public use without compensating the copyright holder for that use. Courts have not considered whether copyrights receive the same protections as other forms of intellectual property (like trade secrets) under the Takings Clause. But, maybe they should, because the federal government uses copyrighted property all the time.[190]

Just as the Supreme Court recognized the Takings Clause protects trade secrets, so too should it recognize that the Takings Clause protects copyrights. The *Ruckelshaus* Court emphasized that the exclusive property rights in a trade secret—the right to exclude others from using or disclosing the trade secret—had been stripped from the trade secret owner by government action.[191] It did not matter, the Court explained, if trade secret owners could still generate revenue on their trade secret after the government

189. *See supra* note 133 and accompanying text.
190. *See* Kwall, *supra* note 147, at 687.
191. *See* Ruckelshaus v. Monsanto Co., 467 U.S. 986, 1001 (1984).

disclosed it; what mattered was the government's unilateral taking of an exclusive stick in the bundle of property rights.[192]

Copyrights should enjoy similar protections under the Takings Clause as trade secrets because copyright owners have exclusive rights in their original works of authorship just like trade secret owners have exclusive rights in their trade secrets. Rights arising from a copyright include the right to exclude others from selling a copyrighted work and the exclusive right to prepare derivative works based on the original work of authorship.[193] Both of these rights relate to the extent to which third parties may use the property, just like trade secrets confer exclusive rights on their owners as against third parties. Accordingly, copyrights deserve protection under the Takings Clause because copyright owners enjoy exclusive rights in their copyrights, just like trade secret owners have exclusive right in their trade secrets.

Moreover, the *Ruckelshaus* Court found it convincing that trade secrets shared attributes with tangible property, namely that they are assignable and capable of forming the res in trust.[194] Copyrights also have attributes analogous to tangible property. One can sell a copyright or grant a security interest in a copyright just as easily as one might do in tangible equipment or inventory. Practically, from a property perspective, there are strong reasons for treating copyrights and trade secrets the same with respect to the Takings Clause.

However, requiring compensation may be unworkable. The federal government may lack the financial reserves to accommodate the cost of compensating copyright holders for the use of their copyrights. Although the Federal Government has waived sovereign immunity for copyright infringement claims,[195] it is unlikely that every holder of a copyright used without permission by the U.S. government has sued in the Court of Federal Claims. Thus, if the federal government were to open itself to additional litigation, this might encourage a cottage industry to spring up, giving copyright holders two bites at the apple—copyright infringement and a takings claim—to win compensation for the government's unlawful use of a copyright.

On balance, the risk that requiring compensation would be unworkable does not outweigh considerations of fairness: the government ought not "force[ ] some people alone to bear public burdens which, in all fairness and

192. *See id.*
193. *See* 17 U.S.C § 106 (2018).
194. *See Ruckelshaus*, 467 U.S. at 1002.
195. *See* 28 U.S.C. § 1498 (2018).

justice, should be borne by the public as a whole."[196] If the court fairly applies its *Ruckelshaus* reasoning and finds that the Takings Clause protects copyrights, then the Takings Clause protects Apple's copyrighted mobile operating system.

B. Whether the "Backdoor" Law Would Affect a Taking

If, as Section A suggests, the Takings Clause protects copyrights, the next question is whether the fictitious legislation would affect a taking. Takings jurisprudence provides two tests that may find a taking: *Penn Central* and *Loretto*. For *Penn Central*, the focus is the impact on the claimant's present and future interests, as well as the nature of the government action.[197] For *Loretto*, the focus is purely on whether the government action constitutes an invasion, or conversely, whether the law has the effect of torching the claimant's right to exclude.[198] This section will address *Loretto* first and then proceed to *Penn Central*.

1. *Loretto* Test

Under *Loretto*, a taking has occurred if a law makes private property the subject of a "permanent physical occupation."[199] But with such a low bar for what constitutes a physical invasion, courts may apply *Loretto* in instances of de minimus physicality.[200] Here, with the Backdoor Law, Congress restricts Apple's right to exclude third parties from its operating system. The law does not require that Apple stop using sophisticated security features; it requires that those features cannot prevent investigators from accessing a target device.

These vulnerabilities are like a hairline crack in a levy. Over time, water leaks through these holes, degrading the levy until it ultimately breaks, flooding the town it was built to protect. A black hat hacker is like the water, and the levy is like the security features on a mobile device. Once a black hat hacker exploits the baked-in vulnerability, the hacker can hack all devices running that operating system. The required backdoor access decreases the effectiveness of iOS's security features, infringing on Apple's right to

196. Armstrong v. United States, 364 U.S. 40, 49 (1960).
197. *See supra* Part II.C.2.
198. *See supra* Part II.C.3.
199. Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419, 419 (1982).
200. *See id.* at 450 (Blackmun, J., dissenting).

exclude, one of the most important property rights.[201] Furthermore, the Backdoor Law harms the right to exclude permanently, not temporarily. Even if the same hacker does not actually penetrate the iOS permanently and continuously, *Loretto* still applies if the property owner's right to exclude is permanently disabled.[202]

On the other hand, the Court in *Loretto* also emphasized that the regulation at issue had given third parties the right to access private property.[203] Here, although Apple would lose some power to exclude others from its operating system, the regulation confers no new rights to third parties to access the contents of the device. The parties who may access the device remain the owner and law enforcement officers in possession of a warrant. Because the regulation does not confer rights of access to third parties, this law may not implicate *Loretto*.

Nevertheless, when a law places barriers to the free enjoyment of a right already conferred, courts have found those barriers impermissible, despite not directly eliminating the right itself.[204] Congress cannot hamstring Apple's security features and then claim that the law has not impaired Apple's right to exclude. Imagine if an old west city with free-range grazing prohibited fences but permitted landowners to exclude bovines from their property. At some level, frustrating a party's ability to realize a right impairs that right. On balance, Apple has a decent case to make that the Backdoor Law would affect a *Loretto* taking.

2. *Penn Central* Balancing Test

Under the Backdoor Law above, Apple would have a colorable takings claim under *Penn Central*. The *Penn Central* test requires courts to balance three different factors: (1) the economic impact of the regulation on the claimant, (2) the extent of the interference with the claimant's reasonable

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201. *See* Kaiser Aetna v. United States, 444 U.S. 164, 176 (1979).

202. *See* Nollan v. Cal. Coastal Comm'n, 483 U.S. 825, 832 (1987) (finding that no singular third party need permanently occupy property to trigger a *Loretto* taking).

203. *Loretto*, 458 U.S. at 440.

204. *See* Pennsylvania Coal Co. v. Mahon, 260 U.S. 393, 415 (1922). The Court there found that a regulation forbidding a mining company to engage in mining that caused subsidence of homes infringed upon the mining company's right to extract coal from its property. *See id.* at 412–13. Thus, the regulation placed a barrier to the mining company's right to extract coal from its property—but did not directly restrict the right to mine coal itself—the Court still held that it was a taking, and thus impermissible without compensation. *See id.* at 414.

investment-backed expectations, and (3) the character of the government action.[205]

a. Economic Impact of a Backdoor Law on Apple

Impairing the efficacy of iOS's security features by mandating backdoor access to law enforcement will likely influence the value consumers will pay for iOS devices, resulting in an economic loss of value to Apple.[206] Moreover, stock price rose while Apple fought the FBI's court order, showing that customers gained confidence in Apple when it took a strong stance on device security.[207] If consumers do value that security, consumers will value iOS's security less when regulation neuters Apple's security features by mandating backdoor access to iOS to law enforcement. In that case, Apple will suffer a diminution in the value of iOS.

One could make a weak argument that the regulation will benefit Apple as well as the public, weighing this factor against finding a taking.[208] Under this theory, Apple's employees would enjoy increased safety because the regulation lowers the chance of harm to Apple's employees. But this increase in safety is likely too remote and speculative: one is more likely to die being crushed by a chifforobe than die in a terrorist attack.[209] As such, this factor weighs in favor of finding a taking.

b. Interference with Apple's Reasonable Investment-Backed Expectations

Apple's argument under this factor is relatively weak. Its strongest argument is that the decreased security of iOS with the backdoor vulnerability will expose Apple to costs for which it has not historically had to prepare.

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205. *See supra* Part II.C.2.

206. Apple often touts its security features in press releases. *See supra* note 171 (collecting press releases).

207. *See* AAPL Stock Price from 02/16/2016 to 2/16/2018, YAHOO FINANCE, https://finance.yahoo.com/quote/AAPL/history [https://perma.cc/6LME-MMTP] (click dropdown menu for "Time Period" and enter 02/16/2016 as the start date and 02/16/2018 as the end date). A year after the court order, AAPL closed even higher, at $135.35, and two years later, it traded at $172.43. *See id.*

208. *See, e.g.*, Penn Cent. Transp. Co. v. City of New York, 438 U.S. 104, 134–35 (1978) (finding that the fact that a property owner benefited from the regulation it complained of weighed against finding a taking); *Mahon*, 260 U.S. at 415 (reading Plymouth Coal Co. v. Pennsylvania, 232 U.S. 531 (1914) to not find a taking because the employer enjoyed an average reciprocity of advantage).

209. *See* Andrew Shaver, *You're More Likely To Be Fatally Crushed by Furniture than Killed by a Terrorist*, WASH. POST (Nov. 23, 2015), https://www.washingtonpost.com/news/monkey-cage/wp/2015/11/23/youre-more-likely-to-be-fatally-crushed-by-furniture-than-killed-by-a-terrorist/ [https://perma.cc/W8GY-ATEJ].

Apple has reasonably expected to produce a version of iOS over which it exerts total control, plugging up vulnerabilities and strengthening security features. The Backdoor Law would interfere with the expectation that its right would continue unimpeded and requires Apple to invest more capital in security research and development to bring its security back to balance. Moreover, increased risk of data breach will increase data breach insurance premiums. If iOS with the mandated backdoor is more vulnerable than iOS without the backdoor, Apple's data breach insurance premiums will rise.

On the other hand, the expectation of future revenue weighs only slightly in favor of finding a taking. Apple knows that its devices are subject to regulation constantly. Courts tend to find an expectation of future revenue unreasonable when a company "should have known . . . that the operations they chose to conduct were subject to constant regulation and were intertwined with matters of public policy that at some time might not be balanced in their favor."[210] Therefore, this factor weighs against finding a taking.

c. Character of the Government Action

As addressed in Part II.C.3, government action amounting to a permanent, physical occupation of private property is per se a taking under *Loretto*. Nevertheless, if a court does not find a *Loretto* taking because the permanent occupation is nonphysical, Apple may still prevail under the invasion test from *Causby*. There, the Court determined that government action characterized as an invasion, even a nonphysical one, triggers a taking.[211] Here, requiring Apple to accept a certain security functionality in its operating system resembles an invasion. Apple does not want iOS to include backdoor functionality, and compliance with the Backdoor Law requires Apple to accept that vulnerability within the boundary of its property, iOS. Thus, this factor weighs in favor of finding a taking.

3. Balancing the *Penn Central* Factors

Though one or two factors weigh in favor of finding a taking, courts must balance all three factors to determine if there has been a taking under *Penn*

210. Sucn. Suarez v. Gelabert, 541 F. Supp. 1253, 1260 (D.P.R. 1982), *aff'd sub nom.* Sucesion Suarez v. Gelabert, 701 F.2d 231 (1st Cir. 1983).

211. *See* United States v. Causby, 328 U.S. 256, 266 (1946). *But see* Andrews v. United States, 108 Fed. Cl. 150, 156 (2012) (emphasizing that *Causby* still used a "physical takings framework").

Central.[212] Here, the balance tips in favor of finding a taking. First, the economic impact on Apple favors finding a taking. Second, the interference with investment-backed expectations weighs moderately against finding a taking. Finally, the character of the government action strongly favors finding a taking. On balance, with the worst-case scenario for Apple being a moderately favorable factor, a moderately unfavorable factor, and a strongly favorable factor, a court could reasonably find a taking.

C. Public Use

Once a party shows that a *Loretto* or *Penn Central* taking has occurred, courts must determine if the taking had a public purpose.[213] The Backdoor Law clearly serves a public purpose. It would enable law enforcement, armed with a warrant, to access the contents of a target device without the friction of hacking through security features. When law enforcement can search the contents of a target device, they can collect better data on the motives or future intentions of a suspect or group. Unquestionably, the Backdoor Law serves a public purpose under the *Kelo* standard. Accordingly, because the Backdoor Law would take private property—under *Penn Central* or *Loretto*—for a public use, Apple would be due just compensation under the Takings Clause of the Fifth Amendment.

D. Policy

Fundamental to the Takings Clause is the element of fairness.[214] An investigation conducted by the Office of the Inspector General two years after the San Bernardino shooting found that the FBI had not exhausted all its options before ordering Apple to assist in its investigation.[215] This is alarming

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212. *See* Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency, 535 U.S. 302, 302 (2002).

213. *See* Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419, 423 (1982).

214. *See* Sax, *supra* 41, at 57.

215. *See* Cyrus Farivar, *FBI Didn't Fully Know Its Own Capabilities During Showdown with Apple*, ARS TECHNICA (Mar. 28, 2018, 6:10 AM), https://arstechnica.com/tech-policy/2018/03/fbi-didnt-try-hard-enough-to-crack-iphone-before-taking-apple-to-court/ [https://perma.cc/9BNW-GVMD]. *See generally* U.S. DEP'T OF JUSTICE, A SPECIAL INQUIRY REGARDING THE ACCURACY OF FBI STATEMENTS CONCERNING ITS CAPABILITIES TO EXPLOIT AN IPHONE SEIZED DURING THE SAN BERNARDINO TERROR ATTACK INVESTIGATION (2018), https://www.documentcloud.org/documents/4423378-O1803.html [https://perma.cc/QRG3-4NJH] (outlining the steps the FBI should have taken to exhaust its in-house capacities for gaining access to Farook's phone).

because "criminal investigators . . . tend to have fewer resources and less expertise than some others in the private sector."[216] It is patently unfair to compel private companies to gut their encryption features when the FBI did not "consult its own internal experts or outside vendors" before seeking a court order for a backdoor.[217] Congress should not deputize private companies when it can instead fund law enforcement cryptography initiatives. Interfering with the copyrighted software of private technology companies could expose these companies to attacks from foreign governments, adding to the workload of law enforcement. Congress should instead appropriate funds for cryptography. This way, consumers enjoy secure data services and law enforcement need not find themselves impotent when a large tech company refuses to comply with a court order.

VII. CONCLUSION

This Comment shows that a company like Apple would have a colorable Takings Clause claim, under *Loretto* or *Penn Central*, if Congress passed the Backdoor Law. Accordingly, any law resembling the Backdoor Law should provide for just compensation to comply with the Takings Clause. If the law fails to include compensation, the FBI may want to incorporate damages under a potential takings claim into its calculation of the cost of a legislative solution to the federal government. Apple may wish to consider starting a small working group of programmers and consultants who develop in-house solutions to create and partition mobile operating systems that conform to potential backdoor legislation or future judicial orders.

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216. Orin S. Kerr & Bruce Schneier, *Encryption Workarounds*, 106 GEO. L.J. 989, 1015 (2018).

217. Stephen Nellis, *Lawmakers Question FBI over San Bernardino Suit Against Apple*, REUTERS (Apr. 13, 2018, 10:11 AM), https://www.reuters.com/article/us-apple-fbi-idUSKBN1HK2I6 [https://perma.cc/RH5B-5SG9].