

Apportionment in the Semiconductor Age

J.P. Long, Ph.D.

J. Preston (J.P.) Long is a Partner at Finnegan, Henderson, Farabow, Garrett & Dunner L.L.P. and a graduate of the Duke University School of Law. He holds a Ph.D. in physics for his research on electronic and optical materials and devices and regularly draws from his technical expertise to assist clients. Much of J.P.'s practice involves client counseling and patent litigation in U.S. district courts, the International Trade Commission, and the Patent Trial and Appeal Board.

The extent to which certain apportionment principles, such as the entire market value rule and related doctrines, may constrain damages theories in patent infringement cases remains uncertain. This article reviews the current state of apportionment law through the lens of semiconductors and electronic components—ideal archetypes for such issues—and proposes a framework to help reconcile governing precedents that, at times, seem to conflict.

Introduction

We often define the state of human civilization by the materials we use to make tools—the Stone Age, Bronze Age, Iron Age, and so on. It seems reasonable to say that we live in the Semiconductor Age. Essentially everything in the modern world relies in some way on semiconductor technologies and electronic components. They dominate not just our smartphones, tablets, and computers, but also our cars, home appliances, and even light bulbs. Even the most innocuous household items depend on them. Modern products are often designed using computers, constructed with the aid of digitally managed processes, ordered over the Internet, and tracked and shipped using digital logistics networks. All of these tasks depend on semiconductors and electronic components, and our collective reliance on those technologies seems unlikely to abate any time soon. The automobile industry cannot even manufacture certain vehicles right now simply because semiconductor chips are in short supply.¹

The sheer ubiquity of semiconductor technologies means companies from automobile manufacturers²

to retailers³—not just electronic device designers and semiconductor foundries—will continue to be potential targets for semiconductor-related patent infringement lawsuits. But, despite their ubiquity, semiconductor technologies often hide behind the scenes in tiny features of what consumers and businesses actually buy, sell, and use. Most people never see or think about them, which is why semiconductor technologies and electronic components are often the tip of the spear for patent damages law.

A patent may only improve one aspect of an accused device that might include hundreds, if not thousands, of other valuable additions. This implicates a concept called “apportionment,” intended to reflect the long-standing principle that a patent’s value should not exceed its relative contribution to the value of a product. Because apportionment is often an important issue in cases involving semiconductors and electronic components, they provide the basis for much of the Federal Circuit’s governing law about apportionment.

Patent lawsuits involving semiconductors and electronic components can also lead to large damages awards simply because semiconductor technology is so ubiquitous.⁴ The chart on the next page illustrates the point, showing some of the most eye-catching damages awards from cases decided in the last several years, including a recent \$2.18 billion verdict against Intel.

Entire Market Value Rule (EMVR)

In most patent cases, the damages inquiry centers on what constitutes a “reasonable royalty.”⁶ Such a royalty typically includes two components: (1) a royalty base, which defines the value of units for which damages are assessed; and (2) a royalty rate, which defines the relative value of the claimed invention per unit. The total royalty is the product of the base and the rate, accounting for product volumes and time. Any reasonable royalty determined through litigation must account for apportionment.

Discussions of apportionment often invoke *Garretson v. Clark*, a terse Supreme Court decision authored by Justice Field in 1884 that consists of just two paragraphs.

Year	Plaintiff(s)	Defendant(s)	Technology	Verdict ⁵
2021	VLSI Technology	Intel	Management of Clock Speeds and Power	\$2.18 B
2012	Carnegie Mellon University	Marvell	Viterbi Detectors (Hard Disk Read-Out)	\$1.17 B
2020	California Institute of Technology	Apple/Broadcom	IRA Coding Blocks (Wi-Fi)	\$838 M (Apple) \$270 M (Broadcom)
2020	Unwired Planet	Apple	Wireless Coding Blocks (4G/LTE)	\$506 M
2018	KAIST	Samsung	FinFETs	\$400 M
2015	Wisconsin Alumni Research Foundation	Apple	Speculation Circuits (Parallel Computing)	\$234 M
2014	Power Integrations	Fairchild Semiconductor	Switch-Mode Power Supplies	\$140 M
2020	Wi-LAN	Apple	Wireless Coding Blocks (4G/LTE)	\$85.2 M

The invention at issue related to a replacement mop head, and the patentee improperly sought to recover damages based on the value of the entire mop. Quoting the trial court, the Supreme Court stated:

The patentee . . . must in every case give evidence tending to separate or apportion the defendant's profits and the patentee's damages between the patented feature and the unpatented features, and such evidence must be reliable and tangible, and not conjectural or speculative; or he must show, by equally reliable and satisfactory evidence, that the profits and damages are to be calculated on the whole machine, for the reason that the entire value of the whole machine, as a marketable article, is properly and legally attributable to the patented feature.⁷

This appears to be the first articulation of an apportionment principle called the “entire market value rule” (EMVR).⁸ Put more succinctly, the EMVR says a patented feature of a component should not be tied to the value of a multi-component article unless the patented feature drives demand for the article as a whole.⁹

This is typically difficult to show, especially for semiconductor technologies and electronic components. It is not enough that consumers would prefer the accused product to include the patented feature or even that removing the patented feature would create an undesirable or inoperable product. Rather, the EMVR exception applies only when the patented feature itself prompts consumers to buy the product.¹⁰ Patented aspects of certain products, like pharmaceuticals, may be able to clear that hurdle more easily. A person buying a patented drug composition, for example, may be buying that drug precisely because of its patented composition. In many

other products, however, patented features can be farther removed from purchasing decisions. Patented quantum-well structures used in LEDs or error-correction protocols used in wireless communications, for example, might not be at the top of consumers' minds when purchasing a light bulb or smartphone. In such circumstances, the EMVR may preclude relying on the value of the entire product as a royalty base.

Smallest Salable Patent-Practicing Unit (SSPPU) and Its Limitations

Although the EMVR does not say what royalty base to use (only which one *not* to use), a concept called the smallest salable patent-practicing unit (SSPPU) sheds some light on this issue. Sitting by designation, the former Chief Judge of the Federal Circuit presided over a trial involving a patented way of issuing instructions in a microprocessor. Instead of using the value of the accused computer product as the royalty base, which had “significant non-infringing components,” he noted, “The logical and readily available alternative was the smallest salable infringing unit with close relation to the claimed invention—namely, the processor itself.”¹¹ The Federal Circuit later endorsed this idea of the SSPPU, calling the EMVR a “narrow exception”:

Where small elements of multi-component products are accused of infringement, calculating a royalty on the entire product carries a considerable risk that the patentee will be improperly compensated for non-infringing components of that product. Thus, it is generally required that royalties be based not

on the entire product, but instead on the “smallest salable patent-practicing unit.” The entire market value rule is a narrow exception to this general rule.¹²

As this passage suggests, the SSPPU helps to fulfill what the Federal Circuit calls the “substantive” purpose of apportionment: ensuring the value of a patent “does not overreach and encompass components not covered by the patent.”¹³

The SSPPU also furthers the “evidentiary” purpose of apportionment: “to help our jury system reliably implement the substantive statutory requirement of apportionment.”¹⁴ Large financial sums associated with “the entire market value . . . cannot help but skew the damages horizon for the jury, regardless of the contribution of the patented component.”¹⁵ For that reason, the Federal Circuit cautions trial courts to avoid undue emphasis on the value of the entire accused product.¹⁶ As one trial court observed, “[t]he \$19 billion cat” could not be “put back into the bag” after the jury heard it.¹⁷ Applying a smaller base, such as the SSPPU, helps to avoid jury prejudice that can result from being exposed to such large numbers.

The SSPPU concept, however, is incomplete. Consider, for example, an inventive architecture for a general-purpose processor. A clever draftsman might be tempted to write a claim directed to an end-user device, such as a smartphone, tablet, or automobile, by adding conventional features only tangentially related, if at all, to the patented improvement. Technically, the SSPPU for such a claim would be the end-user device, not the processor, but it might strike some as odd if the law permitted a patentee to dictate a larger royalty base using such a gimmick.¹⁸ The Federal Circuit has suggested it may agree, rejecting the idea “that when the [SSPPU] is used as the royalty base, there is necessarily no further constraint on the selection of the base.”¹⁹ According to the court, “That is wrong” because “the fundamental concern about skewing the damages horizon—of using a base that misleadingly suggests an inappropriate range—does not disappear simply because the [SSPPU] is used.”²⁰ A more recent Federal Circuit decision, however, suggests the Federal Circuit may be moving in a different direction.

An Uncertain Future for the EMVR and SSPPU

In *Exmark Mfg. Co. v. Briggs & Stratton Power Products Group, LLC*, the invention related to an improved lawn-mower baffle.²¹ The claims recited an entire lawnmower, including conventional lawnmower features and the improved baffle, and the parties disputed whether it was appropriate to use the entire lawnmower as a royalty base.

Without mentioning the EMVR or SSPPU, the Federal Circuit stated, “Using the accused lawn mower sales as the royalty base is particularly appropriate in this case because the asserted claim is, in fact, directed to the lawn mower as a whole. . . . It is not the baffle that infringes the claim, but rather the entire accused mower.”²²

In support of this approach, *Exmark* quotes *Ericsson, Inc. v. D-Link Systems*:

We have held that apportionment can be addressed in a variety of ways, including “by careful selection of the royalty base to reflect the value added by the patented feature [or] . . . by adjustment of the royalty rate so” as to discount the value of a product’s non-patented features; or by a combination thereof. So long as *Exmark* adequately and reliably apportions between the improved and conventional features of the accused mower, using the accused mower as a royalty base and apportioning through the royalty rate is an acceptable methodology.²³

To some, these open-ended statements (and the general tenor of *Exmark*) might appear to conflict with earlier Federal Circuit precedents. In *VirnetX, Inc. v. Cisco Systems*, for example, the Federal Circuit was more circumspect:

[A] patentee may not balance out an unreasonably high royalty base simply by asserting a low enough royalty rate. Although the result of that equation would be mathematically sound if properly applied by the jury, there is concern that the high royalty base would cause the jury to deviate upward from the proper outcome.²⁴

The *Ericsson* decision that *Exmark* quotes contains a similar caveat. The quoted portion of *Ericsson* states, “Logically, an economist could [apportion] in various ways—by careful selection of the royalty base to reflect the value added by the patented feature . . . ; by adjustment of the royalty rate . . . ; or by a combination thereof.”²⁵ But in the next paragraph, *Ericsson* explains why, despite the mathematical equivalence of those methods, the law does *not* view them as equivalent:

It is not that an appropriately apportioned royalty award could never be fashioned by starting with the entire market value of a multi-component product—by, for instance, dramatically reducing the royalty rate to be applied in those cases—it is that reliance on the entire market value might mislead the jury, who may be less equipped to understand the extent to which the royalty rate would need to do the work in such instances. . . . [C]ourts must insist on a more

realistic starting point for the royalty calculations by juries—often, the smallest salable unit and, at times, even less.²⁶

It remains to be seen how (or whether) the Federal Circuit will reconcile *Exmark*'s more sweeping remarks, but the actual holding of *Exmark*—that the lawn mower was the appropriate royalty base—seems to fit with the court's earlier precedents. The cases are consistent with the notion that, unless an exception applies, the appropriate royalty base is the competitive market value of the smallest unit that has such a value and benefits from the patented improvement²⁷—like the Price Is Right® in reverse (*i.e.*, the smallest number that captures the inventive benefit without going under). Such an approach minimizes the risk of jury prejudice while ensuring the royalty base includes the added value of the invention.²⁸

The patented improvement in *Exmark* related to the baffle's "structure and orientation within the mower deck," not from the baffle alone,²⁹ so the manufacturing cost of the baffle alone would not have captured the added value of the patented improvement. It seems the baffle was a unique part of the overall mower design. Perhaps because of this, it also seems there was no separate market in which the improved baffle competed as a stand-alone product. The smallest relevant value in a competitive marketplace appears to have been the value of the lawnmower itself.

Despite *Exmark*'s language suggesting otherwise, it should not matter whether the claims recited a mower. The scope of a claim does not necessarily reflect the value of an invention. Just like an infringing product may contain valuable non-infringing features, a patent claim may include extraneous features with no contribution to the invention's added value. Suppose in *Exmark* the claims recited only the baffle. The appropriate royalty base still would be the price of the lawnmower, not the cost to manufacture a baffle, because the mower is the smallest unit with a competitive market price that captures the value of the inventive baffle. Similarly, in the case of our hypothetical draftsman claiming an inventive general-purpose processor, it should not matter whether a claim recites a processor or an end-user product. The processor, not a smartphone, tablet, or automobile, would likely be the smallest component with a competitive market price that captures the invention's value.

Thinking About Apportionment as a Two-Step Process

The term "apportionment" means to divide and allocate. In the context of patent damages, the division comes by

separating the patented features from the non-patented features, and the allocation comes by assigning the patented features a relative value. Both aspects of apportionment are impossible without first specifying a royalty base that defines the universe of features under consideration. Because of this, it may help to think of "apportionment" as a two-step process where only one step truly involves apportioning. The first step is to select the royalty base, and the second step is to apportion the royalty base.

Consider, for example, an accused automobile where the asserted patent relates to an improved microchip. The first step may be to determine whether to apportion the value of the accused vehicle itself, the value of a telematics unit inside the vehicle, the value of a circuit board inside the telematics unit, or the value of a chip on that circuit board. No financial figures are divided or allocated in this first step; the law simply requires the selection of a royalty base from these discrete options. The second step is to apportion that royalty base, generally via the royalty rate. This means dividing the relevant product into patented and unpatented features and allocating relative values to the patented features.³⁰

Unlike selection of the royalty base, which involves choosing from discrete options, determining a royalty rate is inherently imprecise, so the courts allow much more leeway.³¹ One approach might be to apportion through counting techniques. In *Finjan, Inc. v. Blue Coat Systems*, for example, the Federal Circuit affirmed an apportionment analysis based on 24 functional blocks in the architectural diagram for a computer system.³² One patent related to just one of the functional blocks, so the defendant's expert advocated an apportionment adjustment of 1/24. Another patent related to three of the functional blocks, so the defendant's expert advocated an apportionment adjustment of 3/24. Despite an admission by the defendant that each functional block lacked equal value, the Federal Circuit affirmed this approach.³³ Other courts have permitted apportionment adjustments based on the relative surface area of a microchip³⁴ or relative amount of source code³⁵ associated with the invention.

Some courts, however, have rejected such counting methods. In *Eidos Display, LLC v. Chi Mei Innolux Corp.*, for example, a trial court rejected an apportionment analysis based on feature counting.³⁶ The patent was directed to a method for making a semiconductor device, and the accused product employed 10 manufacturing steps. Because only one of those steps related to the patent, the defendant's expert advocated a 1/10 apportionment adjustment factor. The court ruled this approach "is inherently flawed because it mistakenly assumes that all ten steps . . . are of equal value."³⁷ The court, however, permitted another approach—to compare the prior art to the claimed invention. The analysis singled out "those parts of the [item associated with the royalty base] that

could not have been formed using conventional methods,” arguing those features represented the incremental value of the invention.³⁸ According to the court, this approach was preferable to counting manufacturing steps because it would “account for the incremental benefit conferred by the nonconventional elements of [the] patent claim[s] taken as a whole.”³⁹

Whatever method is used to perform this type of royalty rate allocation, chances are some courts have allowed it and others have rejected it. Such conflicting outcomes are not unexpected given the discretion trial judges have “to ensure that the testimony presented—using whatever methodology—is sufficiently reliable to support a damages award.”⁴⁰ Different outcomes merely illustrate the fact-specific nature of such issues in each case, the court’s discretion, and the “inherent imprecision in patent valuation.”⁴¹

But such wide latitude is not guaranteed. Some apportionment models notably attract more scrutiny than others. Following a \$388 million jury verdict against Microsoft, the Federal Circuit famously eliminated the so-called “25 Percent Rule” and similar rules of thumb.⁴² The court called it a “fundamentally flawed tool” and concluded it is “inadmissible . . . because it fails to tie a reasonable royalty base to the facts of the case at issue.”⁴³ For similar reasons, the court later disparaged the so-called Nash Bargaining solution after a \$368 million jury verdict against Apple, essentially destroying its viability as well.⁴⁴ A similar battle is now brewing over regression models.

Using regression models to apportion damages has gained a lot of attention recently. Not only did a regression model lead to VLSI’s \$2.18 billion jury verdict against Intel this year,⁴⁵ but a regression model also led to KAIST’s \$400 million jury verdict against Samsung in 2018.⁴⁶ The Federal Circuit has never had an opportunity to pass judgment on such regression models, but Judge Dyk, sitting by designation in the Eastern District of Texas, previously ruled that a plaintiff’s “own description of hedonic regression analysis suggests that such subjective assessments are not reliable indicators of consumer marketplace behavior.”⁴⁷ The viability of such regression models will likely feature prominently in Intel’s appeal of the VLSI decision, and the result could have massive implications both for future patent litigations and patent valuation more generally.

The Importance of the *Georgia-Pacific* Factors and Comparable Licenses

So far, this article has centered on the Federal Circuit’s rules for assessing the incremental value of an invention

in the first instance, but “there may be more than one reliable method for estimating a reasonable royalty.”⁴⁸ Courts have widely endorsed analyzing the 15 *Georgia-Pacific* factors to assess a reasonable royalty,⁴⁹ and only a few of those factors implicate the type of *ab initio* incremental value assessment discussed so far.⁵⁰ Other factors relate to comparable patent licenses that may demonstrate how the marketplace has valued an invention in practice.⁵¹ When sufficiently comparable, such licenses “may be the most effective method of estimating the asserted patent’s value” and are “typically reliable because the parties are constrained by the market’s actual valuation of the patent.”⁵²

To preclude reliance on a comparable license just because it may employ a large royalty base, even the entire market value, would be inappropriate.⁵³ But it also would be inappropriate to rely on a large royalty base just because it appears in a license. The license must be sufficiently comparable to a hypothetical license between the patentee and accused infringer.⁵⁴ Although not limiting, courts often weigh the following considerations to determine whether a jury would be unduly prejudiced by any differences between the prior license and the case at hand:

- the patentee’s relationships with the licensee and accused infringer;
- the date and duration of the license;
- whether the license includes the asserted patent;
- how many other patents the license includes and how many are related to the asserted patent;
- the geographic scope of the licensed patents;
- whether the license includes any other valuable consideration (*e.g.*, rights to sub-license or enforce the licensed patents, trade secrets, know-how, material support, cross-licensing terms, services, etc.);
- whether the licensee and accused infringer have comparable bargaining power (*e.g.*, market sizes, resources, relationships with the patent owner, or other leverage);
- whether the license provides a lump sum or ongoing royalty, and how any lump sum was determined;
- whether the license is a litigation settlement and, if so, whether the license reflects the value of the invention, as opposed to the costs associated with litigation; and

- whether the license is for technology sufficiently close to the patented technology.⁵⁵

Prior licenses are “almost never perfectly analogous to the infringement action,”⁵⁶ and trial courts have a great deal of discretion whether to admit such evidence.⁵⁷ “In each case, district courts must assess the extent to which the proffered testimony, evidence, and arguments would skew unfairly the jury’s ability to apportion the damages to account only for the value attributable to the infringing features.”⁵⁸

Assuming the license is sufficiently comparable, a damages theory may employ the same royalty base as the license, even the entire market value.⁵⁹ But any such theory must assess the royalty rate in a way that accounts for the factual differences between the license and the litigation.⁶⁰ “[E]xpert testimony opining on a reasonable royalty must ‘sufficiently [tie the expert testimony on damages] to the facts of the case.’”⁶¹ Typically, this means applying the relevant *Georgia-Pacific* factors,⁶² but “superficial recitation of the *Georgia-Pacific* factors, followed by conclusory remarks, [cannot] support [a] jury’s verdict.”⁶³ Any testimony must explain “both why and generally to what extent the particular factor[s] impact[] the royalty calculation.”⁶⁴

This framework for comparable licenses may seem familiar. It is essentially the same two-step process discussed above in the context of the EMVR and SSPPU: first, select a legally permissible royalty base, then apportion that royalty base by determining a royalty rate. Like the EMVR, a comparable license is just another exception to the baseline rule for what constitutes a legally permissible royalty base.⁶⁵ Parties are then free to apportion the royalty base via the royalty rate so long as the analysis is sufficiently tied to the facts at hand.

Summary and Open Questions

For all the complexity and, at times, conflicting language of Federal Circuit cases on apportionment, this simple, two-step framework seems to describe their outcomes:

- **Step One (Royalty Base Selection)**—Absent evidence that an exception applies, the royalty base should be the competitive market value of the smallest component that has such a value and benefits from the patented improvement. This is often the SSPPU, but it may be larger or smaller. The two recognized exceptions appear to be (1) the EMVR exception (*i.e.*, the invention provides the primary reason consumers purchase a specific downstream component) and

(2) the comparable license exception (*i.e.*, specific evidence, such as a comparable license or comparable negotiations, makes clear a certain royalty base would be appropriate in the context of the apportionment analysis provided).

- **Step Two (Royalty Rate Allocation)**—Analyze the applicable *Georgia-Pacific* factors in the context of the specific facts at hand to determine the proportion of the royalty base attributable to the invention’s incremental value. Such analysis must explain both why and to what extent each *Georgia-Pacific* factor impacts the proposed royalty allocation.

Although the Federal Circuit has not expressly articulated this framework, it seems to reconcile some of the tension inherent in the court’s written opinions.

Whether the Federal Circuit will continue to scrutinize the selection of royalty base, or whether cases like *Exmark* signal more tolerance for damages theories that employ the entire market value, remains to be seen. One interesting test case might have been *KAIST IP US LLC v. Samsung Electronics Co.*,⁶⁶ which settled on appeal.⁶⁷ In *KAIST*, the claimed invention related to a particular fin-shaped structure for a field-effect transistor—tiny switches (you could fit thousands across the width of a human hair) that control electronic signals in a microchip.⁶⁸ The patentee proposed a damages model based on the value of smartphones and tablets, not the microchips inside them: about \$1 per smartphone or tablet for every 1% increase in processor speed attributable to the transistor, allegedly 18% to 25%.⁶⁹ The court permitted the patentee to present this model to the jury, reasoning it “doesn’t derive a per-unit royalty by applying a royalty rate to the price of the devices, so [it] does not implicate the[] jury-confusion concerns” the EMVR and SSPPU are designed to prevent.⁷⁰ The result was a jury verdict of \$400 million.⁷¹

It would have been interesting to see whether the Federal Circuit agrees that such a model does not apply a per-unit royalty rate or skew the damages horizon. The *KAIST* trial court apparently concluded the EMVR does not apply because the patentee sought about \$18 to \$25 per device rather than expressing it, for example, as 3.6% to 5.0% per \$500 device. Although the Federal Circuit may leave the door open to damages models that superficially avoid the royalty base × royalty rate formulation in this way,⁷² whether it would agree with the *KAIST* court remains unclear.

The *KAIST* damages model seems to rely on the value of end-user devices as the royalty base without offering a comparable license or proving the EMVR exception applies. The ratio of \$1 per 1% improvement in processor speed came from a regression analysis. That analysis began

with the prices of accused smartphones and tablets, then correlated those prices with processor speeds.⁷³ That is, the price of the accused smartphones and tablets served as the royalty base, and the regression analysis was part of the royalty rate apportionment analysis. Although this model avoided expressing the result as a percentage of smartphone or tablet prices, the unresolved question remains whether the law recognizes a meaningful distinction.

Had the same regression analysis been applied to the price of processors in the accused devices, the resulting value per chip likely would have been much less, and the patentee almost certainly would have been unable to ask the jury for \$1.5 billion in damages as it did at trial.⁷⁴ The *KAIST* model, however, did avoid asking the jury for, say, 5% of \$30 billion in total sales, which would have been mathematically equivalent. The court kept the \$30 billion cat securely in the bag. If the EMVR is intended only to prevent exposing the jury to prejudicial sums exceeding the damages sought, not to limit the damages sought by restricting when patentees can seek damages based on downstream products, the *KAIST* court's view may prevail.

More test cases are surely on their way. No doubt patent applicants are drafting claims that recite expensive

downstream products only indirectly related to their inventions. More patentees are likely to adopt damages models like the one in *KAIST* that avoid the appearance of a royalty base \times royalty rate formulation, and more patentees will surely adopt regression models to perform apportionment. There is little doubt that sophisticated patent-assertion entities and litigation funders will exploit comparable-license rules by structuring self-serving licenses. And high-profile consumer product manufacturers are now designing proprietary processors for their products instead of integrating general-purpose chips available on the open market.⁷⁵ All of these developments will test the boundaries and continued viability of the Federal Circuit's apportionment rules.

The question is not exactly mop heads versus mops anymore. Justice Field penned *Garretson v. Clark* in 1884, during the Industrial Age. There were no smartphones or tablets, no transistors, not even automobiles. Now, in the Semiconductor Age, courts may be asked how much value a nano-sized transistor design adds to a self-driving SUV. Justice Field might have found that one a little tougher to work out. Then again, maybe the two-step framework proposed above was the type of analysis he was trying to telegraph. It works for mops and self-driving SUVs, too.

1. See, e.g., Jonathan M. Gitlin, *A Silicon Shortage Is Causing Big Issues for Automakers*, Wired (Feb. 7, 2021), available at <https://www.wired.com/story/silicon-chip-shortage-automakers/> (“[I]t’s getting so bad that a number of OEMs . . . have had to go as far as idling shifts and even entire factories.”).
2. See, e.g., Complaint, *Advanced Silicon Technologies, LLC v. Volkswagen AG*, Case No. 1:15-cv-01181 (D. Del. Dec. 21, 2015), ECF No. 1 (accusing Volkswagen and Audi of infringing patents directed to graphics processor circuit architectures).
3. See, e.g., Complaint, *Seoul Semiconductor Co. v. Bed Bath & Beyond, Inc.*, Case No. 2:18-cv-03837 (C.D. Ca. May 8, 2018), ECF No. 1 (accusing Bed Bath & Beyond of infringing patents directed to LEDs and LED packages, including “epitaxially produced quantum dot semiconductor components”).
4. See, e.g., Scott Graham, *How Irell’s Morgan Chu Is “Spoon-Feeding” a Billion-Dollar Damages Case to Jurors*, The AmLaw Litigation Daily (Feb. 22, 2021) (noting that “even a 1% royalty could cost Intel billions of dollars” because it has sold so many microprocessors).
5. See Jury Verdict Form, *VLSI Tech. LLC v. Intel Corp.*, Case No. 6:21-cv-00057-ADA (W.D. Tex. Mar. 2, 2021), ECF No. 564; Verdict Form, *Carnegie Mellon Univ. v. Marvell Tech. Grp., Ltd.*, Civil Action No. 09-290 (W.D. Pa. Dec. 26, 2012), ECF No. 762; Jury Verdict, *Cal. Inst. of Tech. v. Broadcom Ltd.*, Case No. CV 16-3714-GW-AGRx, (C.D. Cal. Jan. 29, 2020), ECF No. 2114; Verdict Form, *Optis Wireless Tech., LLC v. Apple Inc.*, Civil Action No. 2:19-cv-00066-JRG (E.D. Tex. Aug. 11, 2020), ECF No. 483; Verdict Form, *KAIST IP US LLC v. Samsung Elecs. Co., Ltd.*, Case No. 2:16-cv-01314-JRG-RSP (E.D. Tex. June 15, 2018), ECF No. 481; Special Verdict - Damages, *Wis. Alumni Research Found. v. Apple, Inc.*, No. 14-cv-062-wmc (W.D. Wis. Oct. 16, 2015), ECF No. 642; Verdict Form, *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, Case No. 09-cv-05235-MMK (N.D. Cal. Dec. 17, 2015), ECF No. 918; Verdict Form, *Wi-LAN, Inc. v. Apple Inc.*, Case No. 14cv2235 DMS (BLM) (S.D. Cal. Jan. 24, 2020), ECF No. 845.
6. The main damages statute in United States patent law states that “the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court.” 35 U.S.C. § 284 (2018) (emphasis added). A royalty is “reasonable” when “a person, desiring to manufacture, use, or sell a patented article, as a business proposition, would be willing to pay [that amount] as a royalty” and still make “a reasonable profit.” *Applied Med. Research Corp. v. U.S. Surgical Corp.*, 435 F.3d 1356, 1361 (Fed. Cir. 2006) (quoting *TransWorld Mfg. Corp. v. Al Nyman & Sons, Inc.*, 750 F.2d 1552, 1568 (Fed. Cir. 1984)). Alternatively, a patentee can seek lost profits when it can demonstrate it would have made

- sales but for the defendant's conduct. Lost profits claims also require apportionment, though lost profits are less common than reasonable royalties. See *Mentor Graphics Corp. v. EVE-USA, Inc.*, 851 F.3d 1275, 1287 (Fed. Cir. 2017) (“[A]pportionment is an important component of damages law generally, and we believe it is necessary in both reasonable royalty and lost profits analysis.”).
7. *Garretson v. Clark*, 111 U.S. 120, 121 (1884); see also *Seymour v. McCormick*, 57 U.S. (16 How.) 480, 490–91 (1853) (“[I]t is a very grave error to instruct a jury ‘that as to the measure of damages the same rule is to govern, whether the patent covers an entire machine or an improvement on a machine.’”).
 8. See, e.g., *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1336–38 (Fed. Cir. 2009) (discussing the origins of the entire market value rule).
 9. See *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1549 (Fed. Cir. 1995) (en banc) (“We have held that the entire market value rule permits recovery of damages based on the value of a patentee’s entire apparatus containing several features when the patent-related feature is the ‘basis for customer demand.’” (quoting *State Indus., Inc. v. Mor-Flo Indus., Inc.*, 883 F.2d 1573, 1580 (Fed. Cir. 1989))); see also *Lucent*, 580 F.3d at 1337 (“The first flaw with any application of the entire market value rule in the present case is the lack of evidence demonstrating the patented method of the [asserted] patent as the basis—or even a substantial basis—of the consumer demand for [the accused product].”).
 10. See *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 904 F.3d 965, 979 (Fed. Cir. 2018) (“[W]hen the product contains multiple valuable features, it is not enough to merely show that the patented feature is viewed as essential, that a product would not be commercially viable without the patented feature, or that consumers would not purchase the product without the patented feature. When the product contains other valuable features, the patentee must prove that those other features do not cause consumers to purchase the product.”); *LaserDynamics, Inc. v. Quanta Computer, Inc.*, 694 F.3d 51, 68–69 (Fed. Cir. 2012) (“It is not enough to merely show that the [patented feature] is viewed as valuable, important, or even essential to the use of the [entire product]. Nor is it enough to show that [the entire product] without [the patented feature] would be commercially unviable. Were this sufficient, a plethora of features . . . could be deemed to drive demand for the entire product.”).
 11. *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 287–88 (N.D.N.Y. 2009).
 12. *LaserDynamics*, 694 F.3d at 67–68 (citations omitted) (quoting *Cornell*, 609 F. Supp. 2d at 28788); see also *Power Integrations*, 904 F.3d at 977 (“We have articulated that, where multi-component products are accused of infringement, the royalty base should not be larger than the smallest salable unit

- embodying the patented invention.”); *VirnetX, Inc. v. Cisco Sys.*, 767 F.3d 1308, 1326 (Fed. Cir. 2014) (“[W]hen claims are drawn to an individual component of a multi-component product, it is the exception, not the rule, that damages may be based upon the value of the multicomponent product.”).
13. *VirnetX*, 767 F.3d at 1326 (quoting *LaserDynamics*, 694 F.3d at 70); see also *Ericsson, Inc. v. DLink Sys.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014) (“As a substantive matter, [the value attributable to the patented invention] is the ‘value of what was taken’ that measures a ‘reasonable royalty’ under 35 U.S.C. § 284. What is taken from the owner of a utility patent . . . is only the patented technology, and so the value to be measured is only the value of the infringing features of an accused product.” (citations omitted)).
 14. *Ericsson*, 773 F.3d at 1226.
 15. *VirnetX*, 767 F.3d at 1327 (quoting *LaserDynamics*, 694 F.3d at 70).
 16. See *Ericsson*, 773 F.3d at 1226 (“[W]here a multi-component product is at issue and the patented feature is not the item which imbues the combination of the other features with value, care must be taken to avoid misleading the jury by placing undue emphasis on the value of the entire product.”).
 17. *Uniloc USA, Inc. v. Microsoft Corp.*, 640 F. Supp. 2d 150, 184 (D.R.I. 2009).
 18. See *GPNE Corp. v. Apple, Inc.*, Case No. 12-CV-02885-LHK, 2014 U.S. Dist. LEXIS 53234, at *50–52 (N.D. Cal. Apr. 16, 2014) (“[C]ursory recitation of the entire device in the asserted claims does not foreclose the component that directly implements the invention from being the smallest salable patent-practicing Adopting [contrary] reasoning would allow patent drafters to effectively abolish the smallest salable patent-practicing unit doctrine by simply drafting patent claims to cover end products rather than the individual components that actually embody the invention.”).
 19. *VirnetX*, 767 F.3d at 1317; see also *AstraZeneca AB v. Apotex Corp.*, 782 F.3d 1324, 1338 (Fed. Cir. 2015) (“When a patent covers the infringing product as a whole, and the claims recite both conventional elements and unconventional elements, the court must determine how to account for the relative value of the patentee’s invention in comparison to the value of the conventional elements recited in the claim, standing alone.”).
 20. *VirnetX*, 767 F.3d at 1317.
 21. 879 F.3d 1332, 1348 (Fed. Cir. 2018) (“[T]he patent makes clear that the patented improvement relates to the mower’s flow control baffle The remaining limitations of claim 1 recite conventional features of a lawn mower”).
 22. *Id.*
 23. *Id.* (quoting *Ericsson, Inc. v. DLink Sys.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014)).
 24. *VirnetX*, 767 F.3d at 1333.
 25. *Ericsson, Inc. v. DLink Sys.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014).
 26. *Id.* at 1226–27; see also *LaserDynamics, Inc. v. Quanta Computer, Inc.*, 694 F.3d 51, 67–68 (Fed. Cir. 2012) (barring the use of a large royalty base, even if mathematically offset by a “low enough royalty rate,” because such a base “carries a considerable risk” of misleading a jury (citing *Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1320 (Fed. Cir. 2011))); *VirnetX*, 767 F.3d at 1327 (“[T]he smallest salable unit approach was intended to produce a royalty base much more closely tied to the claimed invention than the entire market value of the accused products.”).
 27. See *AstraZeneca AB v. Apotex Corp.*, 782 F.3d 1324, 1339 (Fed. Cir. 2015) (suggesting that when a patent confers “new value” on conventional elements, “the value of [those] conventional elements” may not need to be “subtracted from the value of the patented invention as a whole”); *Ericsson*, 773 F.3d at 1227 (“[W]here the entire value of a machine as a marketable article is ‘properly and legally attributable to the patented feature,’ the damages owed to the patentee may be calculated by reference to that value. Where it is not, however, courts must insist on a more realistic starting point for the royalty calculations by juries—often, the [SSPPU] and, at times, even less.” (citation omitted)); *VirnetX*, 767 F.3d at 1327 (“Where the smallest salable unit is, in fact, a multi-component product containing several non-infringing features with no relation to the patented feature . . . , the patentee must do more to estimate what portion of the value of that product is attributable to the patented technology.”); *Lucent Technologies, Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1339 (Fed. Cir. 2009) (“There is nothing inherently wrong with using the market value of the entire product, especially when there is no established market value for the infringing component or feature”).
 28. See *VirnetX*, 767 F.3d at 1327 (“[T]he instruction mistakenly suggests that when the smallest salable unit is used as the royalty base, there is necessarily no further constraint on the selection of the base. That is wrong. For one thing, the fundamental concern about skewing the damages horizon—of using a base that misleadingly suggests an inappropriate range—does not disappear simply because the smallest salable unit is used. Moreover, the smallest salable unit approach was intended to produce a royalty base much more closely tied to the claimed invention than the entire market value of the accused products.”).
 29. *Exmark Mfg. Co. v. Briggs & Stratton Power Prods. Grp., LLC*, 879 F.3d 1332, 1347–48 (Fed. Cir. 2018).
 30. See *Finjan, Inc. v. Blue Coat Sys.*, 879 F.3d 1299, 1311 (Fed. Cir. 2018) (“[T]he essential requirement [is] the ultimate reasonable royalty award must be based on the incremental value that the patented invention adds to the end product.”); *Ericsson*, 773 F.3d at 1226 (“The essential requirement is that the ultimate reasonable royalty award must be based on the incremental value that the patented invention adds to the end product.”).
 31. See, e.g., *Commonwealth Scientific & Industrial Res. Org. v. Cisco Sys.*, 809 F.3d 1295, 1301 (Fed. Cir. 2015) (referring to “the inherent imprecision in patent valuation” and advising trial courts to “be proactive to ensure that the testimony presented—using whatever methodology—is sufficiently reliable to support a damages award”).
 32. See generally *Finjan*, 879 F.3d at 1312–13.
 33. See *id.* at 1313 (“[T]he existence of conflicting testimony does not mean the damages award is unsupported by substantial evidence. The jury was entitled to believe the patentee’s expert.”).
 34. See, e.g., *The Cal. Inst. of Tech. v. Broadcom Ltd.*, No. CV 16-3714-GW-AGR, slip op. 1–2 (C.D. Cal. Dec. 17, 2019), ECF No. 1723; *ZiiLabs Inc. v. Samsung Elecs. Co. Ltd.*, No. 2:14-cv-203-JRG-RSP, 2015 U.S. Dist. LEXIS 191436, at *22–25 (E.D. Tex. Dec. 8, 2015).
 35. See, e.g., *Comcast Cable Commc’ns, LLC v. Sprint Commc’ns Co.*, 218 F. Supp. 3d 375, 387 (E.D. Pa. 2016); *Finjan, Inc. v. Blue Coat Sys.*, Case No. 13-cv-03999-BLF, 2015 U.S. Dist. LEXIS 91528, at *13–19 (N.D. Cal. July 14, 2015).
 36. See generally *Eidos Display, LLC v. Chi Mei Innolux Corp.*, No. 6:11-CV-00201-JRG, 2017 U.S. Dist. LEXIS 52641, at *19–20 (E.D. Tex. Mar. 29, 2017).
 37. *Id.*
 38. *Id.* at *9.
 39. *Id.* at *10.
 40. *Commonwealth Scientific & Industrial Res. Org. v. Cisco Sys.*, 809 F.3d 1295, 1301 (Fed. Cir. 2015) [hereinafter *CSIRO*].
 41. *Id.*
 42. The 25 Percent Rule assumed, as a starting point, that 25% of a product’s value should go to the patent owner and 75% should remain with the accused infringer. The Federal Circuit unequivocally rejected it. See *Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1312–18 (Fed. Cir. 2011).
 43. *Id.* at 1315.
 44. The Nash Bargaining Solution assumes, as a starting point, that a patent owner and accused infringer would equally split the incremental profits resulting from a patented improvement. The Federal Circuit ruled such an assumption is inappropriate unless it can be tied to the facts of the case, which renders it almost impossible to use as a practical matter. See *VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1331–34 (Fed. Cir. 2013).
 45. See, e.g., *Guest Post by Alan Cox: The Damages Testimony in VLSI Technologies v. Intel*, <https://patentlyo.com/patent/2021/03/damages-testimony-technologies.html> (“The damages testimony in this trial is interesting for several reasons, including Plaintiff’s presentation of a regression analysis as the basis of its damages claim.”).
 46. See, e.g., *KAIST IP US LLC v. Samsung Electronics Co.*, No. 2:16-CV-01314-JRG-RSP, 2018 U.S. Dist. LEXIS 93876, at *3–4 (E.D. Tex. June 5, 2018) (“[The patentee] uses regression analysis to measure the relationship between changes in processor speed and the price of [the accused] devices.”).
 47. *Stragent, LLC v. Intel Corp.*, Case No. 6:11-cv-421, 2014 WL 1389304, at *4 (E.D. Tex. Mar. 6, 2014).
 48. *CSIRO*, 809 F.3d at 1301 (quoting *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1315 (Fed. Cir. 2014)).
 49. See *Georgia-Pacific Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970) (listing the relevant factors).
 50. See *id.* (factors 9–11 and 13, for example).
 51. See *id.* (factors 1–3, 5, 7, for example).
 52. *CSIRO*, 809 F.3d at 1303–04.
 53. See *Elbit Sys. Land & C4I Ltd. v. Hughes Network Sys., LLC*, 927 F.3d 1292, 1301 (Fed. Cir. 2019) (“[T]hose discussions . . . already informally apportioned the proposed license rates to the value of the patented technology. Hughes has not shown the unreasonableness of that analysis of how a negotiation can fulfill the apportionment requirement.”); *CSIRO*, 809 F.3d at 1303 (“[O]therwise comparable licenses are not inadmissible solely because they express the royalty rate as a percentage of total revenues”); *Ericsson, Inc. v. DLink Sys.*, 773 F.3d 1201, 1228 (Fed. Cir. 2014) (“[T]he mere fact that licenses predicated on the value of a multi-component product are referenced in that analysis—and the district court exercises its discretion not to exclude such evidence—is not reversible error.”).
 54. See *Elbit*, 927 F.3d at 1299 (“[T]he prior licenses or settlements need to be ‘sufficiently comparable’ for evidentiary purposes and any differences in circumstances must be soundly accounted for.”); *CSIRO*, 809 F.3d at 1302 (“Where the data used is not sufficiently tied to the facts of the case, a damages model cannot meet the substantive statutory requirement of apportionment of royalty damages to the invention’s value.” (citations and internal quotation marks omitted)); *VirnetX, Inc. v. Cisco Sys.*, 767 F.3d 1308, 1330 (Fed. Cir. 2014) (“[I]n attempting to establish a reasonable royalty, the ‘licenses relied on by the patentee in proving damages [must be] sufficiently comparable to the hypothetical license at issue in suit.’” (quoting *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1325 (Fed. Cir. 2009))); *LaserDynamics, Inc. v. Quanta Computer, Inc.*, 694 F.3d 51, 79 (Fed. Cir. 2012) (“When relying on

- licenses to prove a reasonable royalty, alleging a loose or vague comparability between different technologies or licenses does not suffice.”).
55. See generally *Elbit*, 927 F.3d at 1299; *CSIRO*, 809 F.3d at 1302 n.2 (describing factors the Federal Circuit has considered when assessing comparability); *VirnetX*, 767 F.3d at 1330–31 (same); *MLC Intellectual Prop., LLC v. Micon Tech., Inc.*, No. 14-cv-03657-SI, 2019 U.S. Dist. LEXIS 116634, at *7–9 (N.D. Cal. July 12, 2019); *Opticurrent, LLC v. Power Integrations, Inc.*, No. 17-cv-03597-WHO, 2019 U.S. Dist. LEXIS 94615, at *26 (N.D. Cal. June 5, 2019); *AVM Techs., LLC v. Intel Corp.*, No. 10-610-RGA, 2013 U.S. Dist. LEXIS 1165, at *8–9 (D. Del. Jan. 4, 2013).
 56. *Ericsson*, 773 F.3d at 1227.
 57. See generally 22A Charles Alan Wright & Arthur R. Miller, *Federal Practice and Procedure* § 5212 (Westlaw ed. 2020) (describing the policy and purpose of Fed. R. Evid. 403).
 58. *Ericsson*, 773 F.3d at 1227.
 59. See *CSIRO*, 809 F.3d at 1303 (“[O]therwise comparable licenses are not inadmissible solely because they express the royalty rate as a percentage of total revenues”); *Ericsson*, 773 F.3d at 1228 (“[T]he mere fact that licenses predicated on the value of a multi-component product are referenced in that analysis—and the district court exercises its discretion not to exclude such evidence—is not reversible error.”).
 60. See *CSIRO*, 809 F.3d at 1303 (“The district court still may need to adjust the negotiated royalty rates to account for other factors”); *Ericsson*, 773 F.3d at 1227 (“Testimony relying on licenses must account for such distinguishing facts when invoking them to value the patented invention.”); *ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1333 (Fed. Cir. 2012) (ruling under the circumstances that “[t]he degree of comparability . . . as well as any failure on the part of [patentee]’s expert to control for certain variables are factual issues best addressed by cross examination and not by exclusion”); *Finjan, Inc. v. Secure Computing Corp.*, 626 F.3d 1197, 1212 (Fed. Cir. 2010) (upholding the admissibility of testimony about a license where descriptions of the “differences [between the license and litigation] permitted the jury to properly discount the [comparable] license”).
 61. *Exmark Mfg. Co. v. Briggs & Stratton Power Prods. Grp., LLC*, 879 F.3d 1332, 1349 (Fed. Cir. 2018).
 62. See *id.* at 1348–49 (“[O]ne possible way to [apportion the royalty rate] is through a proper analysis of the *Georgia-Pacific* factors.”).
 63. *Whitserve, LLC v. Computer Packages, Inc.*, 694 F.3d 10, 31 (Fed. Cir. 2012); see also *Exmark*, 879 F.3d at 1350 (“When an expert employs the *Georgia-Pacific* factors, ‘reciting each factor and making a conclusory remark about its impact on the damages calculation before moving on does no more than tell the jury what factors a damages analysis could take into consideration.’” (quoting *Whitserve*, 694 F.3d at 26)); *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1329 (Fed. Cir. 2009) (explaining that a “damages award cannot stand solely on evidence which amounts to little more than a recitation of royalty numbers” and that “superficial testimony” with “no analysis” is inadmissible).
 64. *Whitserve*, 694 F.3d at 31.
 65. See, e.g., *CSIRO*, 809 F.3d at 1302 (“[T]he smallest salable patent-practicing unit principle provides that, where a damages model apportions from a royalty base, the model should use the smallest salable patent-practicing unit as the base. . . . That principle is inapplicable here, however, as the district court did not apportion from a royalty base at all. Instead, the district court began with the parties’ negotiations.”).
 66. No. 2:16-CV-01314-JRG-RSP, 2018 U.S. Dist. LEXIS 93876 (E.D. Tex. June 5, 2018).
 67. See generally D. Simpson, *KAIST, Samsung Settle \$203M Patent Suit Over Firm’s Protest*, Law360 (Sept. 10, 2020), available at <https://www.law360.com/articles/1308926/kaist-samsung-settle-203m-patent-suit-over-firm-s-protest> (last visited Feb. 4, 2021).
 68. Field-effect transistors have long served as building blocks for integrated circuits, and they can be arranged in an infinite number of ways to perform an infinite variety of tasks. The idea of “finFETs” was not new at the time. The patent asserted in *KAIST* was filed in 2003, but fin-shaped field-effect transistors and related fabrication processes had been known since the late 1990s. Their cousin, planar field-effect transistors, had been ubiquitous for decades.
 69. *KAIST IP US LLC v. Samsung Electronics Co.*, No. 2:16-CV-01314-JRG-RSP, 2018 U.S. Dist. LEXIS 93876, at *6–7 (E.D. Tex. June 5, 2018).
 70. *Id.* at *8.
 71. Verdict Form at 8, *KAIST IP US LLC v. Samsung Elecs. Co., Ltd.*, Case No. 2:16-cv-01314-JRG-RSP (E.D. Tex. June 15, 2018), ECF No. 481.
 72. See *Commonwealth Scientific & Industrial Res. Org. v. Cisco Sys.*, 809 F.3d 1295, 1302 (Fed. Cir. 2015) (“[The SSPPU] principle is inapplicable here . . . as the district court did not apportion from a royalty base at all.”).
 73. See *KAIST*, 2018 U.S. Dist. LEXIS 93876, at *3–4 (“[The patentee] uses regression analysis to measure the relationship between changes in processor speed and the price of [the accused] devices.”).
 74. See *id.* at *2 (“[The patentee’s expert] opines that Defendants owe at least \$1.5 billion in damages for infringement.”).
 75. See D. Clark, *Amazon and Apple are Powering a Shift Away From Intel’s Chips*, New York Times (Dec. 2, 2020), available at <https://nyti.ms/2Vrh30U> (last visited Feb. 5, 2021); T. Simonite, *With Its Own Chips, Apple Aims to Define the Future of PCs*, Wired (Nov. 10, 2020), available at <https://www.wired.com/story/own-chips-apple-aims-define-future-pcs/#:~:text=Tuesday%20the%20company%20unveiled%20the,and%20bringing%20improved%20power%20efficiency> (last visited Feb. 5, 2021); D. Coldewey, *Tesla Vaunts Creation of “the Best Chip in the World” for Self-Driving*, TechCrunch (Apr. 22, 2019), available at <https://techcrunch.com/2019/04/22/tesla-vaunts-creation-of-the-best-chip-in-the-world-for-self-driving/> (last visited Feb. 5, 2021).