STRICT LIABILITY FOR INDIVIDUALS? THE IMPACT OF 3-D PRINTING ON PRODUCTS LIABILITY LAW

I. INTRODUCTION

Although a relatively new technology, three-dimensional ("3-D") printing has been pronounced an invention with "the potential to revolutionize the way we make almost everything."[1] Worldwide shipments of 3-D printers are expected to surge from roughly 100,000 units in 2014 to over 2.3 million units by 2018.[2] Consumer-sector growth follows significant media attention to the widespread uses of 3-D printing in the commercial realm. For example, the makers of the latest James Bond movie, *Skyfall*, used an industrial 3-D printer to create 1:3 scale replicas of an Aston Martin for an action scene.[3] 3-D printing has been used by medical researchers to design highly customized life-saving implants for patients.[4] NASA sent a 3-D printer to the International Space Station in

1. President Barack Obama, State of the Union Address (Feb. 12, 2013) (transcript available at the White House website: Office of the Press Secretary, *available at* http://www.whitehouse.gov/the-press-office/2013/02/12/remarks-president-state-union-address, *archived at* http://perma.cc/KES9-7KBX).

2. Press Release, Gartner Inc., Gartner Says Worldwide Shipments of 3D Printers to Reach More than 217,000 in 2015 (Oct. 27, 2014) (available at http://www.gartner.com/newsroom/id/2887417, *archived at* http://perma.cc/2SNG-WXKW) (noting that "the 3D printer market is at an inflection point"); *see also* Press Release, Gartner Inc., Gartner Says Worldwide Shipments of 3D Printers to Grow 49 Percent in 2013 (Oct. 2, 2013) (available at http://www.gartner.com/newsroom/id/2600115, *archived at* http://perma.cc/UV7X-77NP); John Greenough, *The 3D-Printer Industry Is Taking Shape, with Big Implications for Product Design, Manufacturing, and Marketing*, BUSINESS INSIDER (Jan. 28, 2015, 12:45 PM), http://www.businessinsider.com/3d-printers-could-create-a-new-marketplace-for-entrepeneurs-2015-1, *archived at* http://perma.cc/5QUT-F4PX.

3. Mark Hearn, *Voxeljet 3D Printer Used to Produce Skyfall's Aston Martin Stunt Double*, ENGADGET (Nov. 12, 2012, 10:16 PM), http://www.engadget.com/2012/11/12/voxeljet-3d-printer-skyfalls-aston-martin-stunt-double, *archived at* http://perma.cc/BL3F-TGRJ.

4. In 2011, researchers at the University of Michigan designed a 3-D printed splint to treat patients with tracheobronchomalacia, a condition where the windpipe is too weak and collapses, preventing the flow of oxygen. The researchers got emergency FDA approval for this splint and were able to save the life of a six-week old boy by implanting a custom-sized splint around his windpipe. Using a 3-D printer, this sort of splint can be made in less than twenty-four hours. Rachael Rettner, *Baby's Life Saved with 3D Printing*, LIVESCIENCE (May 22, 2013, 5:15 PM), http://www.livescience.com/34613-3d-printing-airway-splint.html, *archived at* http://perma.cc/77TA-VUQM.

On March 4, 2013, another patient underwent a skull implant, where seventy-five percent of his skull was replaced using a FDA-approved 3-D printed implant. These successes open the door for other uses of 3-D printed implants or bone replacements. Jeremy Hsu, *3D-Printed Skull Implant Ready for Operation*, OXFORD PERFORMANCE MATERIALS (Mar. 6, 2013, 12:25 PM), http://www.oxfordpm.com/news/article/2013-03-06_3d-printed_skull_implant_ready_for_operation, *archived at* http://perma.cc/XKB3-QA6Y.

2014 to manufacture spare parts and tools.[5] Goldman Sachs called 3-D printing one of eight technologies set to creatively disrupt and transform businesses.[6] 3-D printing has already become an extremely valuable technology across business fields. As the price of consumer-grade 3-D printers continues to decrease, and more consumers invest in this technology, the entire manufacturing landscape is expected to transform dramatically.[7]

Despite these remarkable applications, 3-D printing technology is still a relatively young technology. In the mid-1950s, engineers developed inkjet printing using a controlled high-pressure pump to distribute ink droplets onto paper and replicate a digital image in high resolution.[8] 3-D printing technology developed in the 1980s through innovations in inkjet printing technology.[9] In the 1990s, the process of 3-D printing was further refined,

---

5. Grant Lowery, *Made in Space Bringing 3D Printing to Space*, NRP POST, Summer 2013, at 1, 5, *available at* http://www.nasa.gov/sites/default/files/ nrppostsummer13_3.pdf, *archived at* http://perma.cc/8L8S-EWLB; *see also* Mike Wall, *Space Station's 3D Printer Makes 1st Part*, SPACE.COM (Nov. 25, 2014 3:33 PM), http://www.space.com/ 27861-3d-printer-space-station-first-part.html, *archived at* http://perma.cc/PM3T-7KQG. On November 24, 2014, the 3-D printer on the International Space Station manufactured its first part. *Id.* The goal of this initial phase of the project is to test 3-D printing technology in orbit. *Id.* The next phase of this project involves actual utilization of the 3-D printed parts. *Id.* On a similar but less immediate note, the European Space Agency, as well as several other organizations, is studying the possibility of sending 3-D printers to the Moon, where they could be used to print shelters using Moon-soil for potential inhabitants. Kelsey Campbell-Dollaghan, *Could Future Astronauts 3D Print Habitats Using Mars and Moon Soil?*, GIZMODO (Sept. 10, 2013, 2:52 PM), 2013 WLNR 22564472.

6. Rob Wile, *Goldman: The 8 Extraordinary Technologies Forcing Businesses to Adapt or Die*, BUSINESS INSIDER (Aug. 8, 2013, 6:29 PM), http://www.businessinsider.com/goldman-sachs-creative-destruction-2013-8?op=1, *archived at* http://perma.cc/ECQ3-6PQQ.

7. VIVEK SRINIVASAN & JARROD BASSAN, CSC LEADING EDGE FORUM, 3D PRINTING AND THE FUTURE OF MANUFACTURING, 2–4 (2012), *available at* http://assets1.csc.com/innovation/downloads/ LEF_20123DPrinting.pdf, *archived at* http://perma.cc/ 7TFW-YJQ7. The Leading Edge Forum's Fall 2012 report outlines several ways that 3-D printing will impact manufacturing. First, manufacturing is becoming democratized, meaning that the traditional barriers (financial resources and skills) preventing people from manufacturing their own products are being stripped away. *Id.* at 17–20. In turn, the traditional manufacturing industry may see an increase in competition. Second, 3D printing will also change the traditional manufacturing industry, by shrinking the timetable for getting products to the market, normalizing customization of products, and mitigating the price advantages associated with low-cost regions. *Id.* at 21. Third, the lines between individuals, retailers, and manufacturers will blur "as more organizations and individuals become manufacturers." *Id.*; *see also The Third Industrial Revolution*, THE ECONOMIST, Apr. 21, 2012, *available at* http://www.economist.com/node/21553017, *archived at* http://perma.cc/ZA9G-UBTM.

8. Alan Hudd, *Inkjet Printing Technologies*, *in* CHEMISTRY OF INKJET INKS 3, 3 (Shlomo Magdassi ed., 2010). *See also* Drew Kaplan, *Here's Olivetti's $499 State-of-the-Art, Dry Ink Jet, Plain Paper Printer*, POPULAR SCIENCE, July 1984, at 22–23.

9. Jimmy Daly, *The History of 3-D Printing*, STATETECH MAGAZINE, Aug. 13, 2013, *available at* http://www.statetechmagazine.com/article/2013/08/history-3-D-printing-infographic, *archived at* http://perma.cc/EZ24-AK9N. Charles Hull, founder of 3D Systems, invented the first 3-D printer in 1984, using a technique called stereolithography. Stereolithography is the original type of additive manufacturing, now known as 3-D printing. Stereolithograhic 3-D printers use UV technology to cure

allowing these printers to manufacture complex products very quickly.[10] Over the last fifteen years, 3-D printing has experienced additional advances, such as the ability to print metal, clothing materials, and even chocolate, the capacity to manufacture tissues and organs, and the influx of affordable, personal 3-D printers.[11]

Thus, because of its tremendous power and extensive benefits, 3-D printing offers several advantages over traditional manufacturing. First, it uses material more efficiently.[12] In traditional manufacturing, metal and plastic parts are cut out from larger sheets of material, resulting in the waste of up to 90% of the material.[13] However, with 3-D printing, the material is precisely fused together, with very little wasted.[14] Second, 3-D printers are not subject to traditional manufacturing engineering constraints, which means that 3-D printed objects may be less clunky and contain less surplus material.[15] As a result, a 3-D printed part may be 60% lighter but still as sturdy as its traditionally manufactured equivalent.[16] Finally, 3-D printing offers an inexpensive route to innovation. An amateur entrepreneur could print a single prototype to test and improve his or her invention before investing in large-scale manufacturing.[17] As can be seen, 3-D printing has been used commercially for decades, primarily as a means to make cheap prototypes before manufacturing products on a

liquid photopolymer, or resin. U.S. Patent No. 4,575,330 (filed Aug. 8, 1984). First, a movable perforated platform is lowered just below the surface of the vat of resin. The UV laser traces a cross-section of the object onto the surface of the resin, which causes the photopolymer to harden and bond to the platform. *Id.* The platform is lowered very slightly, and the layer traces and hardens another layer of the resin, which sticks to the first layer because of the self-adhesive property of photopolymer. *Id.* This layering process is repeated until the object is complete. *Id.*

10. Daly, *supra* note 9.

11. Daly, *supra* note 9; Katherine Bayly, *3D Chocolate Printer Could Be Future of Gifts*, THE TELEGRAPH (July 8, 2011, 7:20 AM), http://www.telegraph.co.uk/technology/news/8620908/3D-chocolate-printer-could-be-future-of-gifts.html, *archived at* http://perma.cc/S6D2-43VD; Steve Hargreaves, *Hershey's to Make 3-D Chocolate Printer*, CNN MONEY (Jan. 16, 2014, 1:44 PM), http://money.cnn.com/2014/01/16/technology/3d-printer-chocolate/, *archived at* http://perma.cc/Y2HF-WEWN.

12. *3-D Printing: The Printed World*, THE ECONOMIST, Feb. 12, 2011, at 77–79, *available at* http://www.economist.com/node/18114221/.

13. *Id.*

14. *Id.*

15. *Id.* Andy Hawkins, lead engineer on the EADS Innovation Works project, explained that with 3-D printing "[y]ou only put material where you need to have material." *Id.* In other words, because 3-D printed objects are constructed layer by layer, it is possible to leave hollow areas, whereas a traditional manufacturing machine would not be able to create such a void. *Id.*

16. *Id.*

17. *Id.*

larger scale.[18] But now, as the capabilities of 3-D printers have improved, they have taken on a larger role in the manufacturing of final products.[19]

At the time of this Note's publication, personal 3-D printers are available for as little as $499, or as much as $4900, depending on the resolution, print size, and numbers of colors in each print.[20] Makerbot, one of the foremost 3-D printer manufacturers, offers a personal 3-D scanner for only $799 that can scan an object in approximately twelve minutes.[21] Websites such as Thingiverse serve as a marketplace for 3-D designs, while other websites allow users to upload their own design that it will print and ship to them.[22] In July 2013, eBay released an iPhone application that allows consumers to buy and customize 3-D printed merchandise.[23] The increasing affordability of 3-D printers also makes it more profitable for retailers to carry 3-D printers. Staples already sells 3-D printers in its stores, and Gartner Consulting projects that seven of the largest fifty multinational retailers will do so by 2015.[24] Even Amazon has created a

18. *Id.* More recently, as 3-D printing has become more affordable, small businesses have similarly begun to use 3-D printers to print prototypes. Karen E. Klein, *How 3D Printing is Speeding up Small Businesses*, BLOOMBERG BUSINESSWEEK (July 10, 2014), http://www.businessweek.com/articles/2014-07-10/how-small-businesses-use-3-d-printing-to-create-prototypes-faster, *archived at* http://perma.cc/GTM5-FL9N.

19. *3-D Printing: The Printed World*, *supra* note 12.

20. In 2014, Solidoodle offered its second-generation 3-D printer for only $499. This printer has a build volume of 8" x 8" x 8" and can print layers as thin as 0.1mm. *Solidoodle Press*, SOLIDOODLE, http://www.solidoodle.com/Press (last visited Oct. 12, 2014). Cubify offers four different 3-D printers at price points from $999 through $4900. CUBIFY, http://cubify.com/en/Compare/Printers (last visited Oct. 12, 2014). The least expensive Cubify printer, as of 2014, has a build volume of 6" x 6" x 6" and can print two colors at a time in layers as small as 70 microns. *Id.* One of Cubify's most expensive printers can print up to three colors in one print and offers a print volume of 10.8" x 10.45" x 9.5". *Id.* Like the Solidoodle second-generation printer, the more expensive class of Cubify printers print in layers of 100 microns. *Id.* New, affordable stereolithographic printers might offer even better resolution, but current models have relatively small build volumes. Joseph Flaherty, *New 3-D Printers that Don't Suck*, WIRED (July 11, 2012, 6:30 AM), http://www.wired.com/design/2012/07/3-d-printers-that-dont-suck, *archived at* http://perma.cc/YRY2-98AF; *see also* Daly, *supra* note 9, for an explanation of stereolithographic printing technology.

21. *MakerBot Digitizer: Desktop 3D Scanner*, MAKERBOT, http://store.makerbot.com/digitizer.html (last visited Oct. 12, 2014).

22. Shapeways allows users to upload designs and buy and sell 3-D printed products. SHAPEWAYS, http://www.shapeways.com (last visited Oct. 12, 2014). Thingiverse, by Makerbot, allows users to upload and share designs to print at-home on their personal 3-D printers. MAKERBOT THINGIVERSE, http://www.thingiverse.com (last visited Oct. 12, 2014). Another website, Sculpteo, allows users to upload their 3-D design and have it printed by an industrial-grade 3-D printer in a variety of materials. SCULPTEO, http://www.sculpteo.com (last visited Oct. 12, 2014).

23. *eBay Inc. Is Getting Multi-Dimensional with eBay Exact*, EBAY INC. BLOG (July 11, 2013), http://blog.ebay.com/ebay-inc-is-getting-multi-dimensional-with-ebay-exact, *archived at* http://perma.cc/5B52-FFXK.

24. Natasha Lomas, *The Much-Hyped 3D Printer Market is Entering a New Growth Phase, Says Gartner*, TECH CRUNCH (Oct. 2, 2013), http://techcrunch.com/2013/10/02/gartner-3-D-printer-market-forecast, *archived at* http://perma.cc/LT8K-X25K.

separate online retail department for 3-D printers and their components.[25] While current consumers are primarily hobbyists, Gartner projects that ordinary consumers will make up a larger percentage of future sales, particularly as user-friendly "plug and play" tools become available, likely by 2016.[26] As personal 3-D printing becomes more prevalent, the possibilities are truly endless, limited only by the users' creativity. While this seemingly infinite potential is quite exciting, it also raises new legal questions: if individuals can 3-D print products, should they be held strictly liable for defective products that they manufacture and sell? And if not, what should be the scope of individual products liability?

This Note confronts the issues that arise in applying strict products liability law to personal 3-D printer users. Part II will explain the basic technology behind 3-D printing and address the expected growth of the personal 3-D printer market. Part III will discuss the evolution of products liability law and the policy reasons for its transformation. Part IV will analyze the impact of 3-D printing on the underlying rationale for strict products liability. Finally, Part V will explain the advantages and disadvantages of several proposals for resolving these inconsistent policy objectives, ultimately recommending that an affirmative defense for "micro-sellers" will best resolve this issue.

II. HOW 3-D PRINTING WORKS

Every 3-D printed object begins with a digital design for the object. Individuals can either develop their own designs with computer aided design ("CAD") software or animation modeling software, or purchase and download designs from an online marketplace.[27] The individual then sends the design to the 3-D printer, as it would any ordinary computer file.[28] This design serves as a "virtual blueprint" for the 3-D object.[29]

While there are several different methods to achieve 3-D printing, most inexpensive personal 3-D printers use fused deposition modeling

25. *3D Printers & Supplies*, AMAZON, http://www.amazon.com/b?ie=UTF8&node=6066126011 (last visited Oct. 12, 2014), *archived at* http://perma.cc/MH98-XQ2S.

26. Lomas, *supra* note 24.

27. Matt Petronzio, *How 3D Printing Actually Works*, MASHABLE (Mar. 28, 2013), http://mashable.com/2013/03/28/3-D-printing-explained, *archived at* http://perma.cc/8GTA-UVXB; *see also* Rebecca Matulka, *How 3D Printers Work*, U.S. DEPARTMENT OF ENERGY (June 19, 2014, 9:28 AM), http://energy.gov/articles/how-3d-printers-work, *archived at* http://perma.cc/6CFR-UJSR.

28. *Id.*

29. *Id.*

technology ("FDM").[30] In FDM 3-D printing, the individual selects the input material, called the filament. Most personal 3-D printers offer several variations and colors of plastic filament, but industrial 3-D printers can print metal, rubber, and powder filaments.[31] The filament is held in a string-like spool, reminiscent of the plastic lanyard used in children's craft projects, in the back of the printer.[32] After the design is sent to the printer, the printer pulls the filament through a tube and into a nozzle, which heats the material and squirts it out in thin layers over the platform.[33] 3-D printing is also known as additive manufacturing because the printer makes passes over the platform, adds more filament to the platform, and builds the object layer by layer until it is complete.[34] Throughout the process, the layers automatically fuse together to create a single three-dimensional object.[35]

While the process is similar for personal and industrial 3-D printers, there are some differences between these processes, evident in the quality of the final product. The quality of a 3-D printer is primarily measured by

30. Elizabeth Palermo, *Fused Deposition Modeling: Most Common 3D Printing Method*, LIVESCIENCE (Sept. 19, 2013, 6:28 PM), http://www.livescience.com/39810-fused-deposition-modeling.html, *archived at* http://perma.cc/6FSV-AAEE. Another type of 3-D printing technology involves binding powder substances. This technology is often used to manufacture metal objects. These powders can be bound either with glue or heat. C. Hauser et al., *Spiral Growth Manufacturing (SGM)—A Continuous Additive Manufacturing Technology for Processing Metal Powder by Selective Laser Melting*, 2005 SOLID FREEFORM FABRICATION SYMP. 1, 1–2, *available at* http://utwired.engr.utexas.edu/lff/symposium/proceedingsArchive/pubs/Manuscripts/2005/2005-01-Hauser.pdf, *archived at* http://perma.cc/CUG5-BB87. The process for both methods is very similar—a layer of powder is rolled onto a platform, either glue or heat is used to bind the individual granules, and once the layer is hardened, another thin layer of powder deposited on top. *Id.*

31. Stephen Evanczuk & Clive Maxfield, *10 3D Printers Under $1000*, EDN NETWORK (Sept. 19, 2013), http://www.edn.com/electronics-blogs/systems-interface/4421382/10-3-D-printers-under--1000, *archived at* http://perma.cc/GT7W-HSFQ. The plastic filament used in personal 3-D printers is available for $43 per spool. In comparison, a 1-liter bottle of resin for a stereolithographic printer costs $149. The affordability of the input material may be another reason why FDM is the preferred technology for personal 3-D printer manufacturers. *Id.*

32. *Id.*

33. Petronzio, *supra* note 27. Industrial 3-D printers may have multiple nozzles to deposit different materials simultaneously. Evanczuk & Maxfield, *supra* note 31.

34. Petronzio, *supra* note 27.

35. *Id.* The different additive processes used to create 3-D objects differ in two important ways: (1) the method of depositing the input material and (2) the method of fusing the layers together. Sebastian Anthony, *What is 3D Printing?*, EXTREMETECH (Jan. 25, 2012, 2:16 PM), http://www.extremetech.com/extreme/115503-what-is-3-D-printing, *archived at* http://perma.cc/86Y4-9CAP. Other methods include stereolithography, a process of curing liquid resin to build layers, and selective laser sintering, a technique used to fuse powers into a 3-D object. Daly, *supra* note 9; Hauser et al., *supra* note 30; Alex Lou & Carol Grosvenor, *Selective Laser Sintering, Birth of an Industry*, UNIV. TEXAS (Dec. 7, 2012), http://www.me.utexas.edu/news/2012/0712_sls_history.php, *archived at* http://perma.cc/9SVF-RN8L; Elizabeth Palermo, *What Is Stereolithograhy?*, LIVESCIENCE (July 16, 2013, 2:39 AM), http://www.livescience.com/38190-stereolithography.html.

four factors.[36] First, quality is measured by the print resolution, which refers to the thickness of individual layers.[37] Personal 3-D printers typically print in a lower resolution than industrial 3-D printers, which means that the 3-D printed objects are less precise, with thicker layers.[38] Second, the number of nozzles, and the respective material fed through those nozzles, differentiates personal and industrial 3-D printers. Most personal 3-D printers currently only have the capacity to print forms of plastic, while their more costly commercial counterparts can print metal, rubber, and other materials.[39] Moreover, personal 3-D printers are usually outfitted with only one nozzle, such that they can only print one material and in one color at time.[40] Some personal 3-D printers may have two or three nozzles.[41] On the other hand, industrial grade printers are commonly outfitted with multiple nozzles.[42] The additional nozzles can be used to print different materials at the same time or can be used to merely print the

36. *See generally 3D Printer Buyer's Guide*, 3DSYSTEMS (2014), http://www.3dsystems.com/files/2014_white_paper_3d_printer_buyers_guide_web.pdf; D.A. Roberson, D. Espalin, and R.B. Wicker, *3D Printer Selection: A Decision-Making Evaluation and Ranking Model*, 8 VIRTUAL & PHYSICAL PROTOTYPING 201 (2013), *available at* http://www.tandfonline.com/doi/abs/10.1080/17452759.2013.830939#tabModule. *See also 3D Printer Comparison*, MAKER SHED, http://www.makershed.com/pages/3d-printer-comparison (last visited Feb. 6, 2015), *archived at* http://perma.cc/QZA3-PD2F; Richard Baguley, *3D Printer Buyer's Guide 2014*, TOM'S GUIDE US (Oct. 8, 2013, 7:08 AM), http://www.tomsguide.com/us/3d-printer-buyers-guide,news-17651.html, *archived at* http://perma.cc/QR4F-VVAK; Randall Marsh, *2013 3D Printer Comparison Guide*, GIZMAG (Dec. 19, 2013), http://www.gizmag.com/2013-3d-printer-comparison-guide/30187/, *archived at* http://perma.cc/23BZ-C9VF, for information on what criteria consumers use to differentiate 3-D printers.

37. *See* Baguley, *supra* note 36.

38. *See* Lyndsey Gilpin, *3D Printing: 10 Factors Still Holding It Back*, TECHREPUBLIC (Feb. 19, 2014, 11:33 AM), http://www.techrepublic.com/article/3d-printing-10-factors-still-holding-it-back, *archived at* http://perma.cc/FG8L-GTBC. It should be noted that although personal 3-D printers may have lower resolution than industrial-grade 3-D printers, they still average a layer width of only 0.1mm. *See supra* note 20. This thickness is the same as that of a strand of hair or a coat of paint. Accordingly, personal 3-D printers are perfectly capable of printing high-quality household products, but would be insufficiently precise for NASA's more technical applications.

39. *See* Mark P. Mills, *Will Home Depot, Amazon, or Dell, Launch the 3D Printer Revolution?*, FORBES (July 16, 2014, 10:49 AM), http://www.forbes.com/sites/markpmills/2014/07/16/will-home-depot-amazon-or-dell-launch-the-3d-printer-revolution.

40. *See* Michelle Starr, *Dual-Nozzle 3D Printer Allows Two-Colour Prints*, CNET (Feb, 24, 2014, 8:55 PM), http://www.cnet.com/news/dual-nozzle-3d-printer-allows-two-colour-prints/, *archived at* http://perma.cc/DG8F-TSE5.

41. *Id.*

42. *See* Jason Dorrier, *Beyond the Hype and Hope of 3D Printing: What Consumers Should Expect*, SINGULARITYHUB (Apr. 29, 2014, 10:00 AM), http://singularityhub.com/2014/04/29/beyond-the-hype-and-hope-of-3d-printing-what-consumers-should-expect/, *archived at* http://perma.cc/PHH2-7LZF.

same material faster.[43] Third, the build volume represents the maximum sized-object the printer is capable of building. Personal 3-D printers have a smaller printing volume than industrial models. While a typical personal 3-D printer might be able to print object up to 8" x 8" x 8", an industrial 3-D printer can print much larger objects.[44] Accordingly, personal 3-D printers are primarily useful for printing toys and other small gadgets at this time. Fourth, the print speed affects how quickly the final product can be produced. Personal 3-D printers range in print speed from three to three hundred millimeters per second;[45] in other words, it may take several hours to print even small objects. Some industrial 3-D printers, however, can product objects at speeds 200 to 500 times faster than typical 3-D printers.[46]

While industrial-grade 3-D printers may have faster print speeds that person 3-D printers, the typical build time is still too slow to compete with traditional manufacturing methods. As a result, 3-D printing manufacturers have targeted print speed as a key area for improvement.[47] As the consumer 3-D printing market grows, the capabilities of personal 3-D printers should also expand.[48]

---

43. *Cf.* ORD Solutions, *5 Color/Material 3D Filament Printer—With Liquid Cooling!*, KICKSTARTER, http://www.kickstarter.com/projects/ordsolutions/5-color-material-3d-filament-printer-made-in-canad (last visited Oct. 12, 2014), *archived at* http://perma.cc/S5S8-4JLM.

44. *See supra* note 20; Ann R. Thryft, *Faster Industrial 3D Printer Boosts Build Volume*, DESIGN NEWS (Oct. 17, 2012), http://www.designnews.com/document.asp?doc_id=252293&dfpPParams=ind_183,industry_aero,industry_machinery,aid_252293&dfpLayout=article. *See also* Michael Franco, *Giant 3D Printer Starts Spitting out a House*, CNET (Mar. 14, 2014, 12:01 PM), http://www.cnet.com/news/giant-3d-printer-starts-spitting-out-a-house/, *archived at* http://perma.cc/ 6H4N-Z9VF.

45. MAKER SHED, *supra* note 36.

46. Todd Halterman, *BAAM Prints a Car in 44 Hours*, 3D PRINTER WORLD (Sept. 9, 2014), http://www.3dprinterworld.com/article/baam-prints-car-44-hours, *archived at* http://perma.cc/98LR-GTK2; Beth McKenna, *Bigger Is One Giant Step Closer to Commercialization*, MOTLEY FOOL (June 9, 2014), http://www.fool.com/investing/general/2014/06/08/a-3-d-printer-that-can-print-parts-200-times-faste.aspx, *archived at* http://perma.cc/Z92T-FWMS. For example, in 2014, Cincinnati Inc. contracted with the U.S. Department of Energy's Oak Ridge National Lab to develop a 3-D printer capable of printing 200-500 times faster than most 3-D printers on the market. *Id.* Functionally, this machine was able to manufacture a 3-D printed car in only fourty-four hours. Halterman, *supra*.

47. *See* Tasha Keeney, *Could Hewlett-Packard Be a Serious 3-D Printing Competitor?*, SEEKING ALPHA (Feb. 5, 2015, 10:43 AM), http://seekingalpha.com/article/2887786-could-hewlett-packard-be-a-serious-3-d-printing-competitor, *archived at* http://perma.cc/Z64J-DCH8; Whitney Hipolite, *TNO Is Developing a Racetrack 3D Printing System that Is '10 Times Faster than Current Technology'*, 3DPRINT.COM (Jan. 14, 2015), http://3dprint.com/37356/tno-racetrack-3d-printing/, *archived at* http://perma.cc/5CDL-49KW; TJ McCue, *500x Faster—New Ultra-Fast 3D Printer in Works*, FORBES (Feb. 28, 2014, 1:29 PM), http://www.forbes.com/sites/tjmccue/2014/02/28/500x-faster-new-ultra-fast-3d-printer-in-works.

48. This Note discusses the implications of existing personal 3-D printers on products liability law, but it should be noted that these effects would be amplified when the capabilities of personal 3-D printers expand.

The 3-D printing market is poised for significant growth among both consumers and businesses. This expected growth is reflected in the value of the market for 3-D printing, worth about $3.5 to $4 billion in 2014 and projected to reach $180 to $490 billion by 2025.[49] One Citigroup analyst, who specializes in 3-D printing markets, predicts that the 3-D printing market will triple in the next five years.[50] As 3-D printing technology becomes more prevalent in the consumer sphere, the legal issues associated with 3-D printing will also become more significant. Academic scholars and news journalists alike have thoroughly discussed the intellectual property concerns associated with 3-D printing.[51] However, the products liability implications of 3-D printing have not faced similar attention.[52]

III. HISTORY OF PRODUCTS LIABILITY LAW

The umbrella of products liability law is comprised of various legal theories concerning the liability of a seller of a product when personal injury or property damage is caused by a product defect.[53] Products liability statutes vary by state, but the "seller" is generally defined as "any person or entity that is engaged in the business of selling products, whether the sale is for resale, or for use or consumption."[54] Thus, this definition of "seller" covers not only retailers, but also manufacturers,

49. Tasha Keeney, *3-D Printing: Analysts Are Underestimating the Future*, SEEKING ALPHA (Feb. 3, 2015, 10:00 AM), http://seekingalpha.com/article/2877996-3-d-printing-analysts-are-underestimating-the-future, *archived at* http://perma.cc/X49Q-RE2M. *See also* Ashlee Vance, *3D Printers: Make Whatever You Want*, BLOOMBERG BUSINESSWEEK (Apr. 26, 2012), http://www.businessweek.com/articles/2012-04-26/3-D-printers-make-whatever-you-want, *archived at* http://perma.cc/M9LB-UJ2U (accurately projecting the growth of the 3-D printing market from $1.7 billion in 2012 to $3.7 billion by 2015).

50. Dan Gallagher, *3D Printing Stocks Jump on Bullish Citi Note*, MARKETWATCH (Aug. 26, 2013), http://www.marketwatch.com/story/3-D-printing-stocks-jump-on-bullish-citi-note-2013-08-26, *archived at* http://perma.cc/L94D-8UU8.

51. *See, e.g.*, Daniel Harris Brean, *Asserting Patents to Combat Infringement via 3D Printing: It's No "Use"*, 23 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 771 (2013); Charles W. Finocchiaro, Note, *Personal Factory or Catalyst for Piracy? The Hype, Hysteria, and Hard Realities of Consumer 3-D Printing*, 31 CARDOZO ARTS & ENT. L.J. 473 (2013); Oliver Herzfeld, *Protecting 3D Printing Designs and Objects*, FORBES (May 29, 2013, 10:07 AM), http://www.forbes.com/sites/oliverherzfeld/2013/05/29/protecting-3d-printing-designs-and-objects, *archived at* http://perma.cc/N8R9-KWNY.

52. Nora Engstrom recently published an insightful essay in Fall 2013, identifying some of the potential implications of 3-D printing on products liability law. In this brief essay, however, Engstrom left open the question of how to resolve these potential problems. *See* Nora Freeman Engstrom, Essay, *3-D Printing and Product Liability: Identifying the Obstacles*, 162 U. PA. L. REV. ONLINE 35, 37 (2013).

53. CHARLES J. NAGY, JR., AMERICAN LAW OF PRODUCTS LIABILITY § 1:1 (3d ed. 2013).

54. Model Uniform Product Liabilities Act § 102(a), 44 Fed. Reg. 62,714 (Oct. 31, 1979); *see, e.g.*, IND. CODE ANN. § 34-20-2-1 (West 2013).

wholesalers, distributors, and designers of products.[55] Most courts exclude "occasional sellers" from the strict products liability definition of sellers.[56] Occasional sellers are those "whose sale of a product is wholly incidental to the seller's regular business."[57] The primary causes of action under the products liability umbrella include breach of express or implied warranty, negligence, and strict products liability for manufacturing, design, and warning defects.[58]

Products liability law historically revolved around warranty contracts between buyers and sellers.[59] Historically, businesses were small organizations, and buyers and sellers had essentially equivalent bargaining power and equal ability to bear the risk of defect.[60] Products were relatively simple, so buyers were capable of inspecting a product for defects.[61] Under the traditional products liability doctrine, buyers only had a cause of action against the direct seller, based upon a theory of express or implied warranty of fitness.[62] This theory reflected judicial and societal

55. Model Uniform Product Liabilities Act § 102.

56. *See* Frank J. Cavico, Jr., *The Strict Tort Liability of Retailers, Wholesalers, and Distributors of Defective Products*, 12 NOVA L. REV. 213, 223 –44 and 223 nn.49, 50 (1987) ("Comment f to Section 402A and case law clearly indicate . . . that strict liability applies to persons engaged in the business of selling products; the rule does not apply to 'occasional' sellers.").

57. Jaramillo v. Weyerhaeuser Co., 570 F.3d 487, 489 (2d Cir. 2009); *see also* Galindo v. Precision Am. Corp., 754 F.2d 1212, 1220 (5th Cir. 1985) (finding most decisions that found the seller to be an occasional seller "involved a single sale or transaction" in the context of depreciated equipment). The precise definition of "occasional sellers," however, is not entirely clear and varies by state. For example, the case law is clear that an isolated sale of a product is categorized as occasional, but the case law is less clear on multiple sales of the same product. *See infra* note 113. In Comment f, the Restatement (Second) of Torts § 402A specified that the rule of strict products liability does not apply to "the occasional seller of food or other such products who is not engaged in that activity as a part of his business," such as a housewife who, on one occasion, sells her neighbor a jar of jam or the owner of an automobile who, on one occasion, sells it to a used car dealer. However, the Restatement similarly failed to clarify whether individuals who make more than one isolated sale are subject to the rule of strict products liability. This distinction may take on greater relevance in the context of 3-D printing. *See infra* note 113.

58. CHARLES J. NAGY, JR., AMERICAN LAW OF PRODUCTS LIABILITY § 1:9 (3d ed. 2013). *See also infra* notes 62, 71.

59. Gary E. Sullivan & Braxton Thrash, *Purchasers Lacking Privity Overcoming "The Rule" for Express Warranty Claims: Expanding Judicial Application of Common Law Theories and Liberal Interpretation of U.C.C. Section 2-318*, 5 DREXEL L. REV. 49, 51 (2012).

60. *See infra* note 65.

61. JANE P. MALLOR ET AL., BUSINESS LAW AND THE REGULATORY ENVIRONMENT 400 (11th ed. 2001).

62. Sullivan, *supra* note 59, at 51–52. Today, the Uniform Commercial Code (U.C.C.), adopted by the majority of states, governs claims for breach of express or implied warranty. The Magnuson-Moss Warranty Act also regulates written warranties on consumer products. Pub. L. 93-637 (1975) (codified at scattered sections of 15 U.S.C.). An express warranty is an affirmative statement or promise regarding the fitness or merchantability of the product and the seller's commitment to remedy defects. U.C.C. § 2-313 (2012). The U.C.C. also provides for two types of implied warranties: (1) an implied warranty of merchantability and (2) an implied warranty of fitness for a particular purpose.

concern with the potentially unlimited liability for sellers in expanding liability beyond privity of contract.[63]

In the early to mid-1900s, courts reconsidered the principles behind the requirement of privity.[64] While the historical market conditions of face-to-face transactions and equal ability to inspect for defects supported this requirement, modern transactions often involved far-removed manufacturers and less technically-competent consumers.[65] The expansion of products liability law was imperative to address this new economic system.[66] Two reasons, in particular, drove this change. First, because these modern buyers were more removed from the actual sale, the manufacturers were in the better position to have knowledge of probable danger.[67] Thus, manufacturers had a duty of vigilance, extending beyond the immediate purchaser. Because the buyer was unable to inspect the product, all incidental users of the product relied on the manufacturer to

---

U.C.C. §§ 2-314, 2-315. U.C.C. § 2-314 defines implied warranty of merchantability, in pertinent part, as "fit for the ordinary purposes for which such goods are used." U.C.C. § 2-314. U.C.C. § 2-315 provides that an implied warranty of fitness for a particular purpose arises "[w]here the seller at the time of contracting has reason to known any particular purpose for which the goods are required and that the buyer is relying on the seller's skill or judgment to select or furnish suitable goods." U.C.C. § 2-315. A buyer may seek remedy for breach of warranty where the seller breaks his promise of warranty. *Businessperson's Guide to Federal Warranty Law*, FEDERAL TRADE COMM'N: BUREAU OF CONSUMER PROTECTION (Dec. 2006), http://www.business.ftc.gov/documents/bus01-businesspersons-guide-federal-warranty-law, *archived at* http://perma.cc/NTT2-6U2Q.

63. Sullivan, *supra* note 59, at 56. In the landmark case of *Winterbottom v. Wright*, Lord Abington eloquently articulated the concern of expanding liability for product defects, stating:

> There is no privity of contract between these parties; and if the plaintiff can sue, every passenger, or even any person passing along the road, who was injured by the upsetting of the coach, might bring a similar action. Unless we confine the operation of such contracts as this to the parties who entered into them, the most absurd and outrageous consequences, to which I can see no limit, would ensue.

Winterbottom v. Wright, 152 Eng. Rep. 402 (Ex. 1842).

64. *See* MacPherson v. Buick Motor Co., 111 N.E. 1050, 1054 (N.Y. 1916); Henningsen v. Bloomfield Motors, Inc., 161 A.2d 69, 80–81 (N.J. 1960).

65. *Henningsen*, 161 A.2d at 80–81. The *Henningsen* court recognized that:

> The limitations of privity in contracts for the sale of goods developed their place in the law when marketing conditions were simple, when maker and buyer frequently met face to face on an equal bargaining plane and when many of the products were relatively uncomplicated and conducive to inspection by a buyer competent to evaluate their quality.

Id. at 80. However, the court determined that, in the modern economy, the buyer-seller relationship was different:

> [T]he manufacturer became remote from the purchaser . . . . Thus, where the commodities sold are such that if defectively manufactured they will be dangerous to life or limb, then society's interests can only be protected by eliminating the requirement of privity between the maker and his dealers and the reasonably expected ultimate consumer.

Id. at 80–81.

66. *See id.* at 83.

67. *See MacPherson*, 111 N.E. at 1053–55; *accord* Escola v. Coca Cola Bottling Co. of Fresno, 150 P.2d 436, 440–41 (Cal. 1944) (Traynor, J., concurring).

inspect for defects.[68] Second, manufacturers were growing in both size and scope, such that they were better able to spread the costs of injuries from defective products.[69] Applying the premise that the burden should be borne by those who can best spread and absorb the losses, courts expanded traditional products liability doctrine beyond privity.[70]

After this expansion, users of defective products were not limited to remedy for breach of warranty, but also had standing to bring negligence actions.[71] However, in cases of defective goods, plaintiffs frequently had insufficient evidence to prove that the manufacturer or other seller acted negligently.[72] Although the scope of liability had expanded, manufacturers still routinely escaped liability for these negligence actions.[73] As a result, it was less expensive for manufacturers to pay damages in the negligible percentage of successful lawsuits rather than to take efforts to prevent

68. *See MacPherson*, 111 N.E. at 1053–55.

69. See Charles Hirschman & Elizabeth Mogford, *Immigration and the American Industrial Revolution From 1880 to 1920*, 38 SOC. SCI. RES. 897, 897 (2009), for a discussion on the rise of productivity in the manufacturing sector from 1880 to 1920. Technological advances, such as electricity and the assembly line, as well as the urbanization of the American labor force, resulted in economies of scale in the manufacturing industry. *Id.* at 898.

70. *Henningsen*, 161 A.2d at 81. The *Henningsen* court, adopting the reasoning laid out by Justice Cardozo in *MacPherson*, recognized that eliminating the requirement of privity ensures that "the burden of losses consequent upon use of defective articles is borne by those who are in a position to either control the danger or make an equitable distribution of the losses when they do occur." *Id*. In the case of manufactured goods, the manufacturer is in both the best position to control the danger *and* the best position to spread the losses. Thus, the manufacturer should owe the same duty to all users of its products as it does to the direct purchaser.

71. The negligence cause of action probably has the most variance among states as compared with other types of claims under the products liability umbrella. The Restatement (Third) of Torts, promulgated in 2010, outlines a common approach for negligence actions. As applied to products liability, the elements of negligence under the Third Restatement include: (1) the duty of the seller to the injured individual, (2) breach of that duty, (3) actual cause, (4) harm within the scope of liability, previously known as proximate cause, and (5) physical injury. Mike Steenson, *Minnesota Negligence Law and the Restatement (Third) of Torts: Liability for Physical and Emotional Harms*, 37 WM. MITCHELL L. REV. 1055, 1059 (2011). Under the duty element, a manufacturer owes a duty to all foreseeable users of its products. This reflects the expansion beyond privity and affords a remedy to users other than the purchaser. *Id.* However, while there may be a low burden for the plaintiff to establish the duty element in a negligence action, the plaintiff has to overcome a huge evidentiary hurdle to establish breach and proximate cause. It is rare that a plaintiff has sufficient evidence regarding the alleged negligence of the manufacturer. Gibson B. Witherspoon, *Manufacturer's Negligence in Products Liability Cases*, 5 B.C. INDUS. & COM. L. REV. 585, 587 (1964).

72. *See supra* note 71.

73. *E.g.*, Long v. Flanigan Warehouse Co., 382 P.2d 399, 403–04 (Nev. 1963) (declining to adjudicate on the issue of strict liability, but finding that the plaintiff failed to demonstrate that the defendant had a duty to inspect for the claimed defect). *Cf.* Dement v. Olin-Mathieson Chem. Corp., 282 F.2d 76, 83 (5th Cir. 1960) (finding that although plaintiff was unable to produce any evidence that the dynamite was defective, the explosion itself was enough to shift the burden of proof to defendants under a theory of res ipsa loquitor).

defects.[74] Additionally, corporations during this time were much larger than their historical counterparts, and their bargaining power greatly outweighed that of ordinary consumers. Accordingly, manufacturers lacked the incentives to take proper precautions, such as inspecting their products for defects and removing them from the marketplace.[75] The doctrine of strict products liability developed in response to this discordance, shifting liability onto the sellers by holding them strictly liable for defective products.[76]

The early formation of no-fault liability for product defects was res ipsa loquitor.[77] The res ipsa loquitor doctrine provides for a presumption of fault derived from the nature of the accident itself.[78] In most jurisdictions, res ipsa loquitor operates to create an inference of negligence under certain factual circumstances.[79] The seminal case of res ipsa loquitor involved an individual who was struck by a barrel falling from a shop window.[80] The court found that the evidence that the barrel was in the possession of the shop owner and fell from the window was sufficient to

---

74. *Cf.* Derrick Williams, Note, *Secondhand Jurisprudence in Need of Legislative Repair: The Application of Strict Liability to Commercial Sellers of Used Goods*, 9 TEX.WESLEYAN L. REV. 255, 279–80 (2003) (concluding that for used goods dealers, "satisfying the [negligence] duty of reasonable care might only require that trivial precautions . . . be taken").

75. *See Henningsen*, 161 A.2d at 86.

76. *Id.*; *see also* Escola v. Coca Cola Bottling Co. of Fresno, 150 P.2d 436, 440–41 (Cal. 1944) (Traynor, J., concurring) (setting the foundation for strict liability for manufacturing defects). Courts reiterated the vulnerability of buyers as a primary purpose in adopting strict liability for products. "The purpose of such liability is to insure that the costs of injuries resulting from defective products are borne by the manufacturers that put such products on the market rather than by the injured persons who are powerless to protect themselves." Greenman v. Yuba Power Prods., Inc., 377 P.2d 897, 901 (Cal. 1963) (adopting the logic of Justice Traynor's concurrence in *Escola*).

77. *See Escola*, 150 P.2d at 439 (majority opinion).

78. *E.g.*, *id.*

79. *See, e.g.*, Maroules v. Jumbo, Inc., 452 F.3d 639, 642 (7th Cir. 2006) ("Res ipsa loquitor is a shortcut to a negligence claim."). For example, in *Escola v. Coca Cola Bottling*, the Supreme Court of California found that:

> [T]he evidence appears sufficient to support a reasonable inference that the bottle here involved was not damaged by any extraneous force after delivery to the restaurant by defendant. It follows, therefore, that the bottle was in some manner defective at the time defendant relinquished control, because sound and properly prepared bottles of carbonated liquids do not ordinarily explode when carefully handled.

150 P.2d at 439. Deducing further, the Court determined that:

> Although it is not clear in this case whether the explosion was caused by an excessive charge or a defect in the glass there is a sufficient showing that neither cause would ordinarily have been present if due care had been used. Further, defendant had exclusive control over both the charging and inspection of the bottles. Accordingly, all the requirements necessary to entitle plaintiff to rely on the doctrine of res ipsa loquitor to supply an inference of negligence are present.

Id. at 440.

80. Byrne v. Boadle, 159 Eng. Rep. 299 (Ex. 1963); 2 H. & C. 722.

create a presumption of negligence.[81] The doctrine of res ipsa loquitor launched the discussion of strict products liability.[82] In *Escola v. Coca Cola Bottling Co.*, a case decided on res ipsa loquitor grounds, Justice Traynor concurred in the judgment, arguing for strict liability for the manufacturer instead.[83] He noted that where the doctrine of res ipsa loquitor raises an inference of negligence and the jury must decide whether the inference has been dispelled, "the negligence rule approaches the rule of strict liability."[84] Accordingly, he determined that it would be better to openly impose the responsibility of strict liability on manufacturers, instead of "circuitous[ly]" using res ipsa loquitor to impose liability without negligence.[85] In 1963, the California Supreme Court became the first court to adopt a rule of strict products liability, finding support for its opinion in Justice Traynor's concurrence in *Escola*.[86] Within two years, the American Law Institute promulgated the Restatement (Second) of Torts, incorporating the strict products liability rule in Section 402A.[87] Since then, nearly all states have adopted a rule of strict liability for defective products.[88]

---

81. *Id.* at 300.

82. *See Escola*, 150 P.2d at 441 (Traynor, J., concurring).

83. *Id.*

84. *Id.* The traditional negligence doctrine differs from the strict liability rule by imposing a greater burden of proof on the plaintiff. In *Jiminez v. Sears, Roebuck & Co.*, the Supreme Court of California distinguished the two claims, explaining:

> It is pointed out that in a products liability case the plaintiff in order to recover in strict liability in tort must prove that he was injured by a defect in the product and that the product was defective when it left the hands of the retailer or manufacturer; whereas to recover in negligence the plaintiff must prove the same two elements plus an additional element, namely, that the defect in the product was due to negligence of the defendant.

482 P.2d 681, 683 (Cal. 1971).

85. *Escola*, 150 P.2d at 441.

86. Greenman v. Yuba Power Prods., Inc., 377 P.2d 897, 901 (Cal. 1963).

87. RESTATEMENT (SECOND) OF TORTS § 402A (1965).

88. *See* Randy M. Mastro, *The Myth of the Litigation Explosion*, 60 FORDHAM L. REV. 199, 211 & n.66 (1991) (reviewing WALTER K. OLSON, THE LITIGATION EXPLOSION: WHAT HAPPENED WHEN AMERICA UNLEASHED THE LAWSUIT (1991)); *see also* E. River S.S. Corp. v. Transamerica Delaval Inc., 476 U.S. 858, 866 (1986) (incorporating strict products liability principles into federal admiralty law). Only Virginia and North Carolina have declined to recognize a strict liability remedy in products liability actions. Peter Nash Swisher, *Proposed Legislation: A (Second) Modest Proposal to Protect Virginia Consumers Against Defective Products*, 43 U. RICH. L. REV. 19, 20 n.5 (2008).

While no-fault liability had previously been applied in the arenas of ultra-hazardous activities[89] and food service,[90] its application to manufacturers and sellers of all types of products was much more revolutionary. Courts drew upon a broad range of rationales as support for implementing such a dramatic policy shift.[91] In his article, *Rethinking the Policies of Strict Products Liability*, David Owen concisely summarized these policy rationales:

> (1) Manufacturers convey to the public a general sense of product quality through the use of mass advertising and merchandising practices, causing consumers to rely for their protection upon the skill and expertise of the manufacturing community.
>
> (2) Consumers no longer have the ability to protect themselves adequately from defective products due to the vast number and complexity of products which must be "consumed" in order to function in modern society.
>
> (3) Sellers are often in a better position than consumers to identify the potential product risks, to determine the acceptable levels of such risks, and to confine the risks within those levels.
>
> (4) A majority of product accidents not caused by product abuse are probably attributable to the negligent acts or omissions of manufacturers at some stage of the manufacturing or marketing process, yet the difficulties of discovering and proving this negligence are often practicably insurmountable.
>
> (5) Negligence liability is generally insufficient to induce manufacturers to market adequately safe products.

---

89. *See* Rylands v. Fletcher, [1868] 3 L.R.E. & I. App. 330 (H.L.) 339–40 (Lord Cairns L.C.) (appeal taken from Ct. of Exch.) (U.K.) (finding the defendant was "*prima facie* answerable for all the damage which is the natural consequence" of a reservoir he had built on his land (quoting Fletcher v. Rylands, [1866] L.R. 1 Ex. 265)). Although some states were initially hesitant to adopt a strict liability rule following *Rylands*, by the early twentieth century, "[t]he American authorities, with hardly an exception, follow the doctrine [of strict liability]." Kleebauer v. W. Fuse & Explosives Co., 69 P. 246, 247 (Cal. 1902); *see also* RESTATEMENT (SECOND) OF TORTS § 519 (1977) (embracing the *Rylands v. Fletcher* rule of strict liability for abnormally dangerous activities); Jed Handelsman Shugerman, Note, *The Floodgates of Strict Liability: Bursting Reservoirs and the Adoption of* Fletcher v. Rylands *in the Gilded Age*, 110 YALE L.J. 333, 342–46 (2000).

90. *E.g.*, Hunter v. Derby Foods, Inc., 110 F.2d 970, 972 (2d Cir. 1940) ("[T]he sale of unwholesome food in violation of [the Ohio penal statute] renders sellers civilly liable in damages to those injured, without regard to negligence in the ordinary sense of the word. . . . It is not essential to recovery that there be privity of contract between the person injured and the defendant.").

91. *See* David G. Owen, *Rethinking the Policies of Strict Products Liability*, 33 VAND. L. REV. 681, 684–85 (1980).

> (6) Sellers almost invariably are in a better position than consumers to absorb or spread the costs of product accidents.
>
> (7) The costs of injuries flowing from typical risks inherent in products can fairly be put upon the enterprises marketing the products as a cost of their doing business, thus assuring that these enterprises will fully "pay their way" in the society from which they derive their profits.[92]

As can be seen, many of these reasons parallel those used to eliminate the requirement of privity.[93] And they comparably justified the further expansion of manufacturer liability with a rule of strict products liability. Furthermore, as businesses became larger and technology became more complex, these factors weighed even more heavily in favor of strict liability for manufacturers. For example, the larger and more technical a business, the better position it is in to identify risks and spread costs, and the worse position a consumer is in to protect him or herself from defective products.

This doctrinal change did not occur without major criticism. Scholars and jurists alike expressed concern that strict liability was unduly burdensome for businesses, deterred manufacturing of worthwhile products, and impeded research and development.[94] Critics have also

---

92. *Id.*; *see also* Dominick Vetri, *Order out of Chaos: Products Liability Design-Defect Law*, 43 U. RICH. L. REV. 1373, 1375, 1381, 1385 (2009) (explaining that manufacturers should be held strictly liable as a matter of policy because they are better able to absorb and spread the loss, they are in the best position to correct product defects and control quality, and they should be incentivized to manufacture safer products). Comment c of the Restatement (Second) of Torts § 402A suggests similar rationales support a rule of strict liability, explaining:

> On whatever theory, the justification for the strict liability has been said to be that the seller, by marketing his product for use and consumption, has undertaken and assumed a special responsibility toward any member of the consuming public who may be injured by it; that the public has the right to and does expect, in the case of products which it needs and for which it is forced to rely upon the seller, that reputable sellers will stand behind their goods; that public policy demands that the burden of accidental injuries caused by products intended for consumption be placed upon those who market them, and be treated as a cost of production against which liability insurance can be obtained; and that the consumer of such products is entitled to the maximum of protection at the hands of someone, and the proper persons to afford it are those who market the products.

RESTATEMENT (SECOND) OF TORTS § 402A cmt. c. Many of these reasons overlap with those used to justify eliminating the requirement of privity. This is quite logical, considering that both the elimination of privity and the adoption of a strict products liability rule are expansions of traditional torts doctrine and operate to broaden manufacturers' liability exposure. *See supra* notes 65, 70 and accompanying text.

93. *See supra* notes 67–70 and accompanying text.

94. Teresa M. Schwartz, *Product Liability Reform by the Judiciary*, 27 GONZ. L. REV. 303, 304–05 (1991). Schwartz also notes that claims of overdeterrence lack "reliable data to confirm that such

argued that the judiciary overstepped in carving out this doctrine, displacing and contradicting the warranty provisions of the Uniform Commercial Code, which has been adopted by forty-nine states.[95] Some scholars have debated the economic efficiency of strict liability as compared to a negligence approach.[96] Finally, other authors have criticized strict products liability as arbitrarily distinguishing product cases from other personal injury cases, arguing that there is no meaningful difference between them.[97]

Today, strict products liability operates to hold sellers liable for injuries caused by their products, regardless of whether the seller was negligent in manufacturing the product, designing the product, or instructing or warning customers about foreseeable risks of harm.[98] Most courts apply the strict liability standard codified in the Restatement (Second) of Torts § 402A or Restatement (Third) of Torts: Products Liability.[99] The

---

adverse affects [sic] are caused by the product liability system." *Id.* at 314.

95. Markle v. Mulholland's Inc., 509 P.2d 529, 537 (Or. 1973) (en banc) (O'Connell, C.J., concurring) (arguing that the court did not have "the license to create a separate body of common law which covers substantially the same field and displaces the Code's explicit provisions").

96. *Compare* Richard A. Posner, *Strict Liability: A Comment*, 2 J. LEGAL STUD. 205, 207–08 (1973), *with* Guido Calabresi & Jon T. Hirschoff, *Toward a Test for Strict Liability in Torts*, 81 YALE L.J. 1055, 1060–61 (1972).

97. William Powers, Jr., *A Modest Proposal to Abandon Strict Products Liability*, 1991 U. ILL. L. REV. 639, 640. Powers is particularly troubled by the application of different rules to commercial defendants in products cases and other personal injury cases, noting that "[i]ncentives for safety might support strict liability generally (depending on the empirical evidence), but they do not explain the *selective* application of strict liability to product injuries." *Id.* at 645.

98. Ellen Wertheimer, *Unknowable Dangers and the Death of Strict Products Liability: The Empire Strikes Back*, 60 U. CIN. L. REV. 1183, 1185 (1992).

99. David G. Owen, *The Evolution of Products Liability Law*, 26 REV. LITIG. 955, 977–87 (2007).

The Restatement (Second) § 402A reads in pertinent part as follows:

> § 402A. Special Liability of Sellers of Product for Physical Harm to User or Consumer
>
> (1) One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if
>
> (a) the seller is engaged in the business of selling such a product, and
>
> (b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.
>
> (2) The rule stated in subsection (1) applies although
>
> (a) the seller has exercised all possible care in the preparation and sale of his product, and
>
> (b) the user or consumer has not bought the product from or entered into any contractual relation with the seller.

RESTATEMENT (SECOND) OF TORTS § 402A (1965). The American Law Institute promulgated this section to recognize privity-free strict products liability. *See* RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB., Introduction (1997). In the years following the publication of the Restatement (Second), case law evolved into a more precise framework for managing products liability claims. The Restatement

Restatement (Third) specifies three types of strict products liability claims: manufacturing defects, design defects, and warning defects.[100] While the Restatement (Second) does not explicitly separate the types of strict products liability claims, many jurisdictions that have adopted the Restatement (Second) have applied the rule set out in § 402A to manufacturing defects, design defects, and warning defects claims in the manner provided by the Restatement (Third).[101] As a general matter, a seller may be strictly liable for injuries caused by a product sold in a defective condition if it reaches the "consumer without substantial change in the condition in which it is sold."[102] In addition to strict products liability, plaintiffs who are injured by defective products may also bring claims for negligence, breach of warranty, and misrepresentation.[103]

IV. ANALYSIS OF THE IMPACT OF 3-D PRINTING ON PRODUCTS LIABILITY LAW

A. Impact on Breach of Warranty and Negligence Claims

3-D printing will have a minimal impact on the breach of warranty theory that antedated strict products liability theory. As discussed above, this cause of action is based in contract law and is most equitable when

---

(Third), promulgated in 1997, attempted to codify this case law. *See id.* Of particular import, the Restatement (Third) separates the forms of strict products liability into three categories, providing that:

> A product is defective when, at the time of sale or distribution, it contains a manufacturing defect, is defective in design, or is defective because of inadequate instructions or warnings. A product:
>
> (a) contains a manufacturing defect when the product departs from its intended design even though all possible care was exercised in the preparation and marketing of the product;
>
> (b) is defective in design when the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design by the seller or other distributor, or a predecessor in the commercial chain of distribution, and the omission of the alternative design renders the product not reasonably safe;
>
> (c) is defective because of inadequate instructions or warnings when the foreseeable risks of harm posed by the product could have been reduced or avoided by the provision of reasonable instructions or warnings by the seller or other distributor, or a predecessor in the commercial chain of distribution, and the omission of the instructions or warnings renders the product not reasonably safe.

Id. § 2.

100. *Id.*

101. *See supra* note 99.

102. RESTATEMENT (SECOND) OF TORTS § 402A (1965).

103. *See supra* notes 62, 71. The Restatement (Second) provides that strict liability claims should be accompanied by such other causes of action. RESTATEMENT (SECOND) OF TORTS § 402A cmt. a. On the other hand, the Restatement (Third) recommends that a plaintiff just bring one unified product defect claim. RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 2 cmt. n.

buyers and sellers have equal bargaining power. 3-D printing enables ordinary individuals to act as manufacturers and sellers, and this new group of sellers would presumably have equal footing in negotiations with buyers, who typically are also individuals. This is comparable to the old, pre-Industrial Revolution marketplace, where buyers and sellers had relatively equivalent expertise and neither party had significant leverage in warranty negotiations.[104] Thus, the breach of warranty theory would undergo negligible, if any, changes as a result of 3-D printing; however, the underlying warranties may reflect more even terms as a result of the more balanced bargaining landscape.

The negligence theory of liability should also experience relatively few ramifications as a result of 3-D printing, but it may become a more feasible option for plaintiffs. Because 3-D printed products are based on a digital design, there is presumably a digital record of the defective product.[105] If a plaintiff can access the original design for the product that caused his or her injuries, he or she would be in a better position to identify the defect. As a result, the evidentiary burden on plaintiffs would be alleviated. Additionally, the sudden upswing in the sheer number of manufacturers may affect negligence claims. While a limited number of large-scale manufacturers have the resources to inspect for and prevent defects, as well as recall products that are defective, a much larger group of small-scale 3-D printing manufacturers may have trouble taking such preventive and corrective action. Thus, the rise of 3-D printing may result in a considerable increase in the number of negligence products cases because the new group of manufacturers may be more "careless" in avoiding design defects.[106]

B. Impact on Strict Products Liability Claims

While all products liability theories may be impacted by the increasing prevalence of 3-D printing,[107] strict products liability for design defects

104. *See supra* note 65.

105. *See* Max Marder, *Leave 3D Printing Alone*, HUFFINGTON POST (Jan. 27, 2014, 5:02 PM), http://www.huffingtonpost.com/the-morningside-post/leave-3d-printing-alone_b_4666660.html, *archived at* http://perma.cc/3SQA-MHM5 ("A 3D printer interprets computer aided design (CAD) files—three-dimensional schematics used by engineers since the 1980s—and builds objects up layer-by-layer out of plastic, metal, or in principle any other material.").

106. The word "careless" is used loosely in this context, merely supposing that manufacturers who do not properly prevent and correct defects in their products act "carelessly," in spite of the fact that they may have inadequate resources to do so.

107. The theories underlying breach of warranty and negligence claims may be affected by the influx of cases likely to arise as a result of the growing number of inexperienced manufacturers/sellers.

will likely undergo the most change.[108] Two categories of individuals would be subject to liability for injuries resulting from a defective 3-D printed product.[109] The first category is the "hobbyist inventor" who prints and sells the 3-D printed products.[110] The second type of affected individual is the "digital designer" who develops designs and sells them via an online marketplace.[111] Any entities in the subsequent chain of commerce might also be liable for these defectively designed products.[112] While experienced manufacturers and businesses may already carry liability insurance to protect against these sorts of losses, 3-D printing enables amateur designers and regular people to take on the same risks, albeit with less experience and less protection.[113]

Although 3-D printing has begun to emerge from its infancy, no case law has developed concerning its impact on the liability of individuals as of the date of this publication. This is not surprising—until recently, most

---

However, it is not entirely clear how such case law will evolve in response to these new sellers. Further inquiry, outside the scope of this Note, would be necessary to make such a determination.

108. The Restatement (Third) of Torts: Products Liability divides product defect cases into the discrete categories of manufacturing defects, design defects, and warning defects. The Restatement (Second) of Torts, on the other hand, provides guidance for all categories of product defects under a single rule. This Note does not address whether a strict products liability policy for 3-D printing sellers would be more appropriate considering whether a jurisdiction has embraced a risk-utility or consumer-expectations approach to evaluating design defect claims. It is relevant to recognize, however, that the "micro-seller" approach, detailed later in this Note, is more consistent with the similarly seller-focused risk-utility test. For more information on the risk-utility and consumer-expectations tests, see, e.g., *Sperry-New Holland v. Prestage*, 617 So. 2d 248, 252–56 (Miss. 1993) (considering the two approaches and explicating their origins).

109. Engstrom, *supra* note 52, at 37–38 (2013). Engstrom also addresses the liability of the manufacturer of the 3-D printer. *Id.* at 38. Because the 3-D printer itself must be defective for such a lawsuit to be viable, and strict products liability already effectively contemplates such large-scale manufacturers, this Note will not address the impact on this category of individuals. The two categories of individuals, the "hobbyist inventor" and "digital designer," addressed by this Note, are identical to those discussed by Engstrom.

110. *Id.* at 37.

111. *Id.* at 38.

112. *See* RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 1 cmt. e (1998).

113. It is important to note that these individuals must be actually selling their respective products or designs to satisfy the definition of someone "engaged in the business." *Id.* § 1 cmt. c. However, it is just as important to recognize the unresolved, and potentially minimal, threshold for "seller." *See* Model Uniform Product Liabilities Act § 102, 44 Fed. Reg. 62,714 (Oct. 31, 1979). Because the threshold for "occasional seller" is not entirely clear, an individual who sells more than one design or 3-D printed product may be considered a "seller" for the purposes of strict products liability law. *See, e.g.*, RESTATEMENT (SECOND) OF TORTS § 402A cmt. f (providing examples of sellers who "on *one* occasion" made a sale, but not clarifying how many sales exceeds "occasional"); Siemen v. Alden, 341 N.E.2d 713, 715 (Ill. App. Ct. 1975) (finding that defendant's *only* sale of a saw or sawmill equipment was to plaintiff, so it was "an isolated transaction and [did] not come within the provisions of 402A"). The number of individuals potentially subject to liability for 3-D printing designs or 3-D printed products depends on courts' interpretations of "occasional sellers." This unpredictability highlights the importance of a legislative approach to categorizing these sorts of individuals.

3-D printers were cost-prohibitive for personal use and the less expensive models lacked the build space needed to manufacture more sophisticated products. However, some standard is necessary to address the products liability issues that *will* arise as a result of 3-D printing.[114] The following two hypothetical situations draw attention to this issue.[115]

In the first scenario, an average individual, John, creates a design for the plastic components of a toddler car seat. John may have some background in engineering, but he has no realistic way to "crash test" the car seat as a more experienced manufacturer would. John sells his car seat design through a 3-D printing marketplace.[116] A family with a 3-D printer browses the designs on the marketplace and selects John's design.[117] The family prints and assembles the 3-D printed components. At some point this family gets into a car accident, during which the car seat breaks and

114. This Note ultimately recommends a legislative approach because the present volume of cases is still low and courts are often slow to adapt to new technology. For example, the Supreme Court did not apply the Fourth Amendment protection from unreasonable search and seizure to telephone calls until 1967, nearly forty years after it first considered the issue. Katz v. United States, 389 U.S. 347, 359 (1967); *see also* Olmstead v. United States, 277 U.S. 438, 468 (1928). In his article, *The Fourth Amendment and New Technologies: Constitutional Myths and the Case for Caution*, Orin Kerr contemplated judicial competency in developing law in response to new technology:

> Courts lack the institutional capacity to easily grasp the privacy implications of new technologies they encounter. Judges cannot readily understand how the technologies may develop, cannot easily appreciate context, and often cannot even recognize whether the facts of the case before them raise privacy implications that happen to be typical or atypical. Judicially created rules also lack necessary flexibility; they cannot change quickly and cannot test various regulatory approaches. . . . The context of legislative rule-creation offers significantly better prospects for the generation of balanced, nuanced, and effective investigative rules involving new technologies.

Orin S. Kerr, *The Fourth Amendment and New Technologies: Constitutional Myths and the Case for Caution*, 102 MICH. L. REV. 801, 858–59 (2004).

115. Although the plaintiff in these hypotheticals may theoretically bring a breach of warranty action, the reader should assume that no straightforward breach of warranty action is available. The hypotheticals were simplified to highlight the issue of strict products liability, but in some cases, a breach of warranty claim may also be viable.

116. See Lucas S. Osborn, *Regulating Three-Dimensional Printing: The Converging Worlds of Bits and Atoms*, 51 SAN DIEGO L. REV. 553, 567–68 (2014), for a discussion on whether a CAD file should be considered a product. Osborn argues that CAD files may best be analogized to computer software. *Id.* at 568. He notes that most of the commentary on applying strict products liability to software distinguishes between whether the software has a greater service aspect or product aspect. *Id.* (citing Michael D. Scott, *Tort Liability for Vendors of Insecure Software: Has the Time Finally Come?*, 67 MD. L. REV. 425, 534 (2008); Frances E. Zollers et al., *No More Soft Landings for Software: Liability for Defects in an Industry that Has Come of Age*, 21 SANTA CLARA COMPUTER & HIGH TECH. L.J. 745, 745 n.1, 756 nn.57–58 (2005)). Osborn further proposes that this same distinction could apply to CAD files: "courts could label mass-marketed files as products while labeling custom-made files, such as complex 3D art, as services." *Id.*

117. Presumably, in an online marketplace, there are design offerings of brand name manufacturers, as well as individuals. The family's motivation for selecting John's design is not of particular relevance—perhaps it is cheaper, or perhaps there is some other motivation.

injures the child occupying it. The family later discovers that the car seat broke because John's design failed to make one of the component parts thick enough to withstand the force of an accident. Should John be held strictly liable for the injuries to the child that resulted from his defective design?

In the second scenario, Mary finds John's design on the Internet. She realizes that many people will not want to go through the trouble of putting together the component parts, so she 3-D prints the parts and assembles them herself. Mary then sells these 3-D printed car seats to her friends and neighbors with small children. As in the first scenario, a family who buys this car seat ends up in a car accident, at which point the car seat breaks and injures the child. Should Mary be held strictly liable for the injuries that resulted from her manufacture and sale of a defectively designed product?[118]

Of course, car seats are not the only product that could potentially be defectively designed or manufactured with a 3-D printer. In 2013, the Consumer Product Safety Commission recalled sitting stools (the stabilizing bar could break), toy play-set figures (the plastic hats on the figures created a choking hazard), travel trunks (the handle was too sharp), and candle holders (an arm on the candle holder could break allowing the candle to fall out).[119] All of these products can be manufactured using current personal 3-D printing technology and the category of potentially defective products may expand further when personal 3-D printers are improved to print a wider range of materials.[120] Additionally, the size of 3-D printed objects alone poses potential liability issues. Today's personal 3-D printers are best used to print small objects, toys, and parts, all of which

118. Nora Freeman Engstrom, an Associate Professor at Stanford Law School, reasons that a digital design may not be construed as a "product", but as intangible content, such as that in a book. Engstrom, *supra* note 109, at 38–39. She likens the defective design code to inaccurate information contained in *The Encylopedia of Mushrooms*, which the Ninth Circuit determined to be outside the scope of products liability. *Id.* Alternatively, Engstrom contends, even if digital designs are considered products, a court might treat designers like architects or determine that the printing process is a substantial change, and refrain from imposing strict liability. *Id.*; *see, e.g.*, City of Mounds View v. Walijarvi, 263 N.W.2d 420, 423–25 (Minn. 1978) (holding that the doctrine of strict liability does not apply to architects). It is not obvious, however, that courts will address the design code in this manner. Because no court has addressed this particular issue, this Note treats digital designs as "products" to illustrate the potential liability issues.

119. *Recent Recalls*, U.S. CONSUMER PRODUCT SAFETY COMMISSION, http://www.cpsc.gov/en/Recalls/ (last visited Oct. 28, 2014), *archived at* http://perma.cc/EU4N-CYPS.

120. *See supra* note 20.

may create choking and asphyxiation hazards for infants and young children.[121]

In both scenarios described above, the scale of operations may vary significantly. The theory of strict liability developed in response to enterprise sellers; however, 3-D printing makes small-scale manufacturing more feasible.[122] In a larger scale operation, there might be more basis for encouraging these sellers to carry insurance as an ordinary business would. On the other hand, it may not be socially beneficial to encourage this sort of liability protection in the case of small-scale individuals selling designs or printed products to their friends and family.[123] These hypothetical individuals may not even realize they are "engaged in the business" of selling the defective design or product until it is too late.[124] In addition, while the Consumer Product Safety Commission might be able to recall products manufactured and sold on a large scale, it cannot possibly manage recalls of all defective products manufactured on a smaller

121. See *supra* note 20 for information regarding the build volume of today's personal 3-D printers.

122. Engstrom explains that this influx of small-scale sellers destroys the syllogism justifying strict products liability. She defines the syllogism as "(1) those who manufacture and sell products tend to be enterprises; (2) imposing liability on enterprises is beneficial; and, consequently, (3) imposing liability on manufacturers and sellers is beneficial." Engstrom, *supra* note 109, at 40–41. If ordinary Americans become the manufacturers and sellers, however, "3-D printing *severs* the long-established identity between manufacturers and sellers, on the one hand, and enterprises, on the other." *Id.* at 41. Accordingly, we must re-examine the underlying policies of strict products liability and evaluate whether they still apply after 3-D printing overhauls the traditional syllogism.

123. Encouraging individuals and small businesses to buy liability insurance by holding them strictly liable may seem like a fair solution, but it is necessary to more closely examine the consequences of such a strategy. For a large-scale seller, reallocating resources to purchase insurance may mean reducing salaries by a small percentage, minimally raising prices across product lines, or some other minor operational change. While smaller-scale sellers can make similar changes, the cost of insurance may be a greater percentage of their operations, requiring more drastic measures. For a small-scale seller, the money for insurance may come from reduced product safety inspections or a switch to lower quality input materials. Neither of these changes seems particularly socially satisfactory. Alternatively, a small-scale seller who decides to opt out of buying liability insurance altogether would not need to reallocate resources in this way. However, if that seller is later sued and held strictly liable for a defective product, he may be unable to cover the cost of the damages, leaving the injured plaintiff with an inadequate remedy. Moreover, the idea of increasing product prices to insure against potential liability is "often infeasible for design defect cases involving an entire product line because of the magnitude of the loss." W. Kip Viscusi, *Product and Occupational Liability*, J. ECON. PERSP., Summer 1991, at 71, 73. As can be seen, strict products liability for small-scale sellers leaves much to be desired. Because 3-D printing increases the numerosity of small-scale sellers as well as their potential for liability, methods to limit the scope of strict products liability for these sellers should be more thoughtfully considered.

124. In other words, without a clearly defined category of "occasional seller," an individual may make an isolated sale, and then another, until some threshold is reached at which point he is "engaged in the business of selling" and may be subject to strict products liability. *See supra* notes 55, 113; *see also* Osborn, *supra* note 116, at 570 (raising the question of whether a one-time uploader of a CAD file should be considered an occasional seller).

scale.[125] Finally, the fairness rationale for imposing strict liability on sellers of defective products is incompatible with imposing strict liability on small-scale sellers who may not have the resources or ability to incur the costs of such liability.[126]

C. Searching for a Policy-Based Solution

Before discussing any proposals for managing the impact of 3-D printing, policy objectives should be considered in the context of 3-D printing. One of the major benefits of 3-D printing is that it advances innovation by allowing designers and manufacturers to "piggyback" on each other's designs and customize products.[127] However, this should be balanced with the desire to promote consumer safety, as well as consumer reliance on manufacturers.[128] Some consideration should also be given to the benefits of uniformity and predictability that accompany a bright-line rule.[129] While these objectives overlap with some of those served by the strict products liability theory, as outlined above, they undermine several of the policy justifications for strict products liability.

First, strict products liability is often justified as a way to place risk on the party in the best position to bear the risk of loss.[130] While that principle makes sense in the context of large enterprise sellers, it does not translate well to small-scale 3-D printing sellers. This new group of sellers is on relatively equal footing with buyers in their ability to bear the risk. Similarly, strict products liability developed, in part, to manage the

125. *See infra* note 147.

126. *See* Ellen Wertheimer, *The Third Restatement of Torts: An Unreasonably Dangerous Doctrine*, 28 SUFFOLK U. L. REV. 1235 (1994). Wertheimer suggests that in addition to a basis in economic theory, section 402A and strict products liability "[were] even more strongly motivated by fairness." *Id.* at 1235. The idea of fairness contemplated by Wertheimer "embodies the maxim that those who design, market, and profit from a product should also pay for the injuries it causes." *Id.* But even this conception of fairness presumes an enterprise manufacturer. In a two-party transaction, both parties "profit" from the transaction in some way and both parties bear some risk. *See* Powers, *supra* note 97, at 20 n.35 (citing Richard A. Posner, *A Theory of Negligence*, 1 J. LEGAL STUD. 29 (1972) (arguing that the alleged injurer imposes no more risks on the victim than vice versa)). Thus, fairness may also be recognized by requiring both parties to check for defects where they have equal bargaining power or by holding the victim accountable unless the manufacturer was truly negligent.

127. *See supra* note 12.

128. Osborn, *supra* note 116, at 566 ("The law must balance incentivizing proper care with incentivizing manufacturing and related commercial activity.").

129. *See* Arizona v. Roberson, 486 U.S. 675, 681–82 (1988) (discussing that a bright-line rule creates a "gain in specificity"); Pac. Inv. Mgmt. Co. v. Mayer Brown LLP, 603 F.3d 144, 157 (2d Cir. 2010) (discussing the many benefits of a bright-line rule and stressing that "[u]ncertainty can lead to many undesirable consequences").

130. *See supra* note 92.

discrepancy in bargaining power between buyers and sellers.[131] Such discrepancy does not exist, however, in the case of small-scale 3-D printing sellers. Although strict liability deters sellers from developing new products, large-scale designers and manufacturers at least have the resources to test novel ideas and can offset the costs of liability.[132] This deterrent effect is aggravated in the context of small-scale sellers, who do not have sophisticated research and development departments and cannot adequately spread these costs across product lines.[133] As discussed above, the solution is not as straightforward as simply requiring these small-scale sellers to buy insurance.[134] Assuming the enormous potential for innovation and societal benefit is worth encouraging, products liability law must be modified to at least partially mitigate this deterrent effect.

V. AN AFFIRMATIVE DEFENSE FOR MICRO-SELLERS

While many states employ a common law approach to strict products liability, a legislative or regulatory approach might better achieve a more predictable and straightforward rule.[135] It may be difficult, however, to develop a statute that encompasses all possible dangers from defective 3-D printed products.[136] Resistance to a statute modifying the current products liability framework should also be expected. As a result of the strong

131. *See supra* note 76.

132. *See* Posner, *supra* note 126, at 43.

133. For small-scale sellers, the risk of strict liability is higher relative to the benefits of selling the product because the seller has limited resources over which to spread costs. *Cf.* Williams, *supra* note 74 (discussing the cost-benefit analysis in the context of used goods dealers); Gerald F. Tietz, *Strict Products Liability, Design Defects and Corporate Decision-Making: Greater Deterrence Through Stricter Process*, 38 VILL. L. REV. 1361, 1440–42 (1993) (discussing strict liability's effect on the cost-benefit analysis generally).

134. *See supra* note 123. Maintaining the status quo and applying the strict products liability theory to this new group of manufacturers is, of course, the easiest solution. It requires no additional time or effort by the legislature or judiciary. However, this system lacks fairness for the seller; it continues to favor the buyer in a marketplace where the scales are balanced and deters innovation.

135. *See supra* note 114.

136. Many states, and the federal government, have adopted or proposed legislation to prohibit the production of 3-D printed guns. *E.g.*, H.D. 94, 2014 Leg., 434th Sess. (Md. 2014), *available at* http://openstates.org/md/bills/2014/HB94/documents/MDD00053513. 3-D printed firearms pose a significant, but vastly different, danger than defective 3-D printed products. *See generally* Julian J. Johnson, Note, *Print, Lock, and Load: 3-D Printers, Creation of Guns, and the Potential Threat to Fourth Amendment Rights*, 2013 U. ILL. J.L. TECH. & POL'Y 337, 340 (analyzing "the tension that exists between Second and Fourth Amendment rights amidst the rising prominence of 3-D printing technology"). Similar statutes, however, may be helpful to bar the 3-D printing production of other deleterious and inherently dangerous products.

opinions for and against strict products liability, any change will likely encounter significant contention.[137]

One proposal to this anticipated problem is to expand the Consumer Product Safety Commission (CPSC) to develop a more comprehensive inspection and certification program. The Consumer Product Safety Improvement Act of 2008 (CPSIA) increased the authority of the CPSC, requiring it to issue a certificate for certain classes of products, certifying that the product complies with all rules and regulations under the Act.[138] The CPSIA requires third-party testing for certification of a variety of products, but the statute particularly focuses on safety certification for children's products.[139] The CPSIA also increased penalties for those manufacturers who fail to comply with the laws, providing that violators may be subject to civil monetary penalties or up to five years of imprisonment.[140]

---

137. *See, e.g.*, *supra* notes 94–97 and accompanying text; *supra* note 126.

138. Turkmenistan, a small country that gained independence in 1991 after the breakup of the Soviet Union, recently adopted a similar measure that grants certification to products that pass quality and safety requirements. Huseyn Hasanov, *Law on Certification Takes Effect in Turkmenistan*, TREND (Dec. 29, 2013, 8:57 PM), http://en.trend.az/regions/casia/turkmenistan/2226001.html, *archived at* http://perma.cc/F9DH-2UWC. While it is too early to observe the success of this program, the Turkmenistan economy is quite different from that of the United States. Turkmenistan is noticeably smaller, both in size and population. Moreover, the U.S. Department of Commerce described the Turkmenistan market as lacking "consistent and transparent business legislation" and their government as corrupt at all levels. *Doing Business in Turkmenistan: 2012 Country Commercial Guide for U.S. Companies*, U.S. COMMERCIAL SERVICE, at 3, http://photos.state.gov/libraries/turkmenistan/ 49351/ pdf/Doing%20Business%20in%20Turkmenistan%202012%20CCG.pdf, *archived at* http://perma.cc/ 8Q5Y-VJ9B. Given these vast differences, even if such a certification program proved to reduce defects and their resulting injuries in Turkmenistan, it is not clear that the United States would experience similar success from a comparable initiative.

Another possibility is to permit manufacturers (excluding those already required by the statute) to choose to get CPSC safety certification. The manufacturers could then use the certification when marketing their products. For example, when listing a 3-D printed product in an online marketplace, the seller could indicate the third-party safety approval to attract safety-conscious consumers. However, this fails to adequately address the issue of a "neighborhood seller" in two ways. First, consumers may still feel comfortable purchasing non-certified products from a small-scale seller that they know or are acquainted with. Unfortunately, these are exactly the types of amateur manufacturers that may be the most dangerous with 3-D printers because they arguably have the least manufacturing and design expertise. Second, the neighborhood seller may believe that certification is really for large-scale operations and is not necessary for a "mom and pop" 3-D printing manufacturer. This is inconsistent with the goal of mitigating the injuries associated with these types of products.

139. *Regulations, Mandatory Standards and Bans*, U.S. CONSUMER PRODUCT SAFETY COMMISSION, http://www.cpsc.gov/Regulations-Laws--Standards/Regulations-Mandatory-Standards--Bans/Regulated-Products (last visited Oct. 15, 2014), *archived at* http://perma.cc/N3QH-33EX; *see also* 15 U.S.C. §§ 2052, 2063(a) (2008).

140. *Regulations, Mandatory Standards and Bans*, *supra* note 139.

However, for the majority of products, no third-party testing or certification is required.[141] Thus, for most products, the CSPC can only recall an unsafe product already on the market. This system is minimally useful in reducing the injuries associated with products manufactured on a small scale. 3-D printed products designed or manufactured by small-scale organizations would not be "caught" by the CPSC system before they caused an injury. The CPSC employs a National Electronic Injury Surveillance System (NEISS) which gathers data from approximately 100 hospitals to generate a probability sample of all 5,000+ United States hospitals with emergency departments.[142] Because products manufactured on a small-scale are inherently few in number, it is unlikely that their resultant injuries would present often enough on the NEISS to reach the level of scrutiny needed for a product recall.[143] An expansion of the CPSC to provide for third-party testing and certification of all products might mitigate the potential injuries from 3-D printed products by approving the products before they even entered the market. With reduced injuries, it would not be unreasonable to hold sellers of 3-D printed products and designs strictly liable when their defective products do cause injuries.

Yet, there are several issues with this proposal. First, a certification scheme faces obvious financial costs, which would need to be borne by the government, the companies requesting certification, or passed along to the consumers. None of these outcomes are particularly desirable. The government is already bogged down in enormous debt and is not in a position to bear additional costs.[144] If businesses were to bear these costs,

141. For these products, the CPSC learns about hazardous products through a consumer hotline and website, as well as through the National Electronic Injury Surveillance System (NEISS), which collects data on consumer product-related injuries treated in emergency rooms. *National Electronic Injury Surveillance System (NEISS)*, U.S. CONSUMER PRODUCT SAFETY COMMISSION, http://www.cpsc.gov/en/Research--Statistics/NEISS-Injury-Data (last visited Oct. 15, 2014), *archived at* http://perma.cc/5AH3-KD6Y.

142. *National Electronic Injury Surveillance System (NEISS)*, U.S. CONSUMER PRODUCT SAFETY COMMISSION, http://www.cpsc.gov/en/Safety-Education/Safety-Guides/General-Information/National-Electronic-Injury-Surveillance-System-NEISS/ (last visited Feb. 11, 2015), *archived at* http://perma.cc/AH6N-MNM9.

143. *See id.*

144. For each of the listed groups (government, businesses, consumers) there are potential negative consequences to bearing the costs of certification. As mentioned, the government is already in considerable debt, so any additional cost likely would need to be paid for either by reallocating existing funds away from other programs or by raising taxes. It seems unlikely that such a certification system would be more socially beneficial than lower taxes or other government programming, but it is difficult to predict without knowing the precise number of injuries and deaths such a system would prevent.

then the cost-saving effect of this plan is diminished.[145] And if consumers were to bear these costs, the demand for 3-D printed goods would fall and, consequently, the incentive to innovate and manufacture 3-D printed products would also decline.[146] Second, such certification would be burdensome and expensive to enforce.[147] It would necessitate monitoring online marketplaces for 3-D designs and 3-D printed products, and would still struggle to reach home manufacturing businesses.[148]

A second proposal is to expand and clarify the "occasional sellers" category, eliminating strict products liability for this group and leaving only the actions of negligence and breach of warranty as remedies for

145. In other words, the point of such a certification scheme would be to reduce businesses' costs stemming from strict liability for defective products. However, if businesses must bear the costs of a certification system, then the benefit created by the system is mitigated. In order to cover these costs without reducing profit margins, businesses would need to cut costs elsewhere or increase the prices of their products, passing along the cost to the consumers. Neither of these outcomes is particularly desirable.

146. This is a basic principle of economics. If a shift in supply causes the price of a product to rise, then demand for the product will decrease accordingly. Strict liability similarly operates to increase the cost of products, and consequently, decreases consumer demand. *See* Antonio J. Senagore, *The Benefits of Limiting Strict Liability for Used-Product Sellers*, 30 N. ILL. U. L. REV. 349, 358 (2010) ("By incorporating the cost of accidents into the cost of manufacture, strict liability seeks to reduce consumer demand for dangerous goods."). *Cf.* Catherine Rampell, *Why is Turkey Cheaper When Demand is Higher?*, N.Y. TIMES, Nov. 19, 2013, *available at* http://www.nytimes.com/2013/11/24/magazine/why-is-turkey-cheaper-when-demand-is-higher.html. One of the objectives of narrowing strict liability for defective 3-D printed goods is to encourage innovation by designers and manufacturers of 3-D printed products. However, such innovation is dependent on consumer demand and adoption as much as it is dependent on lower costs stemming from reduced exposure to strict liability claims. *See Demand and Innovation: How Customer Preferences Shape the Innovation Process* 12–13 (NESTA/The Work Foundation, Working Paper: March 2010), *available at* http://www.nesta.org.uk/sites/default/files/demand_and_innovation.pdf ("Demand is a necessary condition for successful innovation.").

147. As a frame of reference, the Consumer Product Safety Commission has a budget authorization of $136 million in 2014, increased from $80 million in 2008. 15 U.S.C. § 2081(a) (2008); U.S. CONSUMER PROD. SAFETY COMM'N, 2008 PERFORMANCE BUDGET (2008), *available at* http://www.cpsc.gov/PageFiles/122580/2008operatingplan.pdf. The CPSIA provided the $56 million of additional funding, in large part, to cover the cost of the additional testing for children's products. *See* Juan Carlos Rodriguez, *5 Years Later, the Law that Saved the CPSC*, LAW360 (Aug. 14, 2013, 6:26 PM), http://www.mintz.com/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=2246&PortalId=0&DownloadMethod=attachment. As can be extrapolated, further expanding the CPSC to cover testing for a broader range of products would be extremely costly. Moreover, the cost would almost surely outweigh the benefits of reduced injuries and medical expenses. The issue that arises with 3-D printing manufacturing is the potential for an upswing of defective products produced on a small scale. However, because the products are manufactured on a small scale, the number of injuries and the costs of those injuries for each manufactured product is likely to be low compared to the cost of testing and certifying each respective product.

148. It would be difficult, perhaps impossible, to require at-home sellers to certify their products before selling them. As discussed above, small-scale sellers may not recognize that they are "in the business of selling" and may believe such requirements are inapplicable to them. *See supra* note 124; *infra* note 162.

individuals injured by their defective products.[149] This category could be expanded to include sellers who do not make their livelihood selling the product, but make more than an "isolated sale."[150] Under a bright line rule for "occasional sellers," a seller may better predict whether he would be held strictly liable and make more informed manufacturing decisions.[151] While this is disadvantageous for victims of defective products, the decreased liability risk may encourage sellers to innovate.[152] As discussed above, innovation is a significant benefit of 3-D printing and should be encouraged when socially beneficial.[153] Moreover, this proposal advances the policy objective of placing the cost on the party who is best able to bear the risk.[154] By setting a clear threshold for occasional sellers, the judiciary or the legislature can ensure that only those sellers who can spread and absorb the losses are held strictly liable.[155] Additionally, this proposal holds consumers partially responsible for inspecting for defects. When consumers purchase products from small-scale sellers, they are on relatively equal footing to bargain for price and warranty and may also have equivalent expertise to check for defects. And the consumer would still have recourse against the "occasional seller" through a negligence or breach of warranty action, although the plaintiffs would bear a greater evidentiary burden in such action.[156]

On the other hand, there are several disadvantages under this proposal. First, the limited liability risk may also discourage sellers to take precautions and check for defects. If sellers believe that they will not be held liable for injuries from their defective products, they may eliminate

149. See *supra* notes 55, 113 for more information on "occasional sellers."

150. This Note intentionally declines to conclusively resolve the definition of "occasional seller." The legislature, after additional market research and statistical analysis, would be in the best position to define this term. This Note does propose that any specific definition should encompass both the number of units sold and the total revenue.

151. *See* Christopher Bingham Galligan, Case Note, FTC v. Watson Pharmaceuticals*: 677 F.3d 1298 (11th Cir. 2012)*, 23 DEPAUL J. ART TECH. & INTELL. PROP. L. 491, 506–07 (2013).

> Bright-line rules as a whole are beneficial because they foster consistency throughout the courts and because they alert parties to what is allowed and what is not in the eyes of the law. The Supreme Court has stated that one of the benefits of a bright-line rule is that the rule can provide "clear and unequivocal" guidelines for handling specific situations. Additionally, the Second Circuit has noted that one of the benefits of a bright line rule is that it is "relatively easy for district courts to apply and avoids protracted litigation and discovery."

Id.

152. *See* David Brown, *Managing Risk and Innovation: The Challenge for Smaller Businesses*, U. WARWICK RISK INITIATIVE BRIEFING (1997), *available at* http://www.oecd.org/sti/inno/ 2368582.pdf.

153. *See supra* note 17 and accompanying text.

154. *See supra* note 92 and accompanying text.

155. *See supra* note 151.

156. *See supra* note 71.

all prophylactic measures they currently have in place to reduce costs.[157] Additionally, while this proposal would encourage innovation of socially beneficial products, it would also encourage innovation of products that are detrimental to society.[158] A bright-line test also creates a perverse incentive for businesses who are "on the border" of the threshold to try to stay below it, which could ultimately stagnate innovation of those less-useful products.[159] A third issue is that, under this system, buyers may be hesitant to buy 3-D printed goods from small-scale sellers because they have more limited legal remedies in case of a product defect.[160] This gives large businesses an even greater advantage.[161] Finally, any bright line threshold would be arbitrary. It would be unfair to give small sellers, who are arguably "in the business of selling," the benefits of the occasional seller category. While someone who sells two or three products may not be "in the business of selling," someone who sells fifty products probably should be considered a seller as they would have developed a bit more expertise and can spread any losses across all of those sales. Thus, would sellers who sell twenty-five or thirty products be considered "occasional sellers?" What about those who sell ten products? As these examples

157. Keith N. Hylton, *The Law and Economics of Products Liability*, 88 NOTRE DAME L. REV. 2457, 2464 (2013) ("[I]f victims cannot identify the negligent acts or omissions, they will not be able to formulate negligence theories based on those occurrences, and negligence law will not serve effectively as a regulator of precautionary incentives.").

158. Cf. Viscusi, *supra* note 123, at 88 (discussing how products liability can "have a particularly chilling effect on product innovation"). Conversely, eliminating products liability would result in a lack of deterrence of the development of particularly risky products, where such deterrence may perhaps be beneficial.

159. If a business constantly seeks to remain under the occasional seller threshold to avoid strict liability, then it may stagnate its own growth. In theory, however, a business that manufactures a socially desirable product would choose to grow because any additional liability it may face would be outweighed by the additional income from the growth. *Cf.* Nicholas Graham, *BP's Profits Far Outweigh the Cost of Cleaning Up Gulf Oil Spill*, HUFFINGTON POST (May 27, 2010, 12:18 PM), http://www.huffingtonpost.com/2010/05/27/bps-profits-far-outweigh_n_591992.html, *archived at* http://perma.cc/TJ4U-YCLY (explaining that BP's profits significantly outweighed the costs of its major oil spill in the Gulf of Mexico in 2010). These manufacturers can be expected to act in a manner similar to BP, whose high profits allowed it to expand its oil drilling even with the risk and actuality of a major oil spill.

160. Buying a product from a seller who is not subject to strict products liability for defects is riskier than buying that product from a seller who is. All else being held equal, a rational consumer will choose the less risky alternative. *See* Daniel Kahneman et al., *Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias*, *in* CHOICES, VALUES, AND FRAMES 159, 165–68 (Daniel Kahneman & Amos Tversky eds., 1991).

161. Large-scale businesses already have advantages over small businesses, such as economies of scale and the capital to make investments in machines and labor. *Economies of Scale and Scope*, THE ECONOMIST (Oct. 20, 2008), *available at* http://www.economist.com/node/12446567. A system that would give large businesses an even greater advantage may ultimately eliminate the ability of small businesses to compete.

demonstrate, it is tremendously difficult to draw a bright line, which likely explains why courts have so vaguely defined "occasional seller."[162]

The third proposal, and ideal approach, is to create a separate category and legal standard for "micro-sellers," derived from the "occasional seller" category, but more flexible and less arbitrary. This "micro-seller" category would cover those sellers who surpass "occasional seller," but are not quite enterprise sellers. These are the sellers that are not in the best position to spread or absorb the losses and do not have superior bargaining power over their customers. Instead of applying strict liability to this category of sellers, this Note proposes an equitable affirmative defense to strict liability.

Under a theory of strict products liability, once a product is shown to be defective and to have caused the injury, the seller is liable unless he or she can demonstrate an affirmative defense, such as unforeseeable misuse or assumption of risk. However, under my proposed "micro-seller" affirmative defense, once the plaintiff establishes that the product was defective and caused his or her injury, the seller will have the opportunity to avoid strict liability by establishing that strict liability, in fairness, should not apply. In its fairness analysis, the court should consider factors such as (1) the seller's experience in manufacturing, selling, or designing products, (2) the scale of the seller's business in units and dollars, (3) the seller's ability to spread costs or buy insurance, (4) the societal desirability of the specific product at issue, and (5) the seller's good faith.

Each of these factors promotes a particular policy rationale for excusing some sellers from the strict liability rule.[163] One rationale for strict products liability is that sellers are often in a better position than consumers to identify product risks and defects, so this factor weighs against strict products liability where such rationale does not apply.[164] Factor (1) takes into account the seller's experience to determine whether the seller really was in the best position in the particular case at bar. Factor (2) essentially incorporates a flexible "occasional seller" doctrine. The court should look at both the number of units and the amount of revenue to consider whether the seller is an occasional seller. A seller of more expensive products may sell less units because there are less buyers in the

162. *See* Leslie A. Lunney, *The (Inevitably Arbitrary) Placement of Bright Lines:* Belton *and Its Progeny*, 79 TUL. L. REV. 365, 390 (2004) (explaining that "the fact that the line is inevitably arbitrary, in the sense that the line drawn balances the competing interests so well that the line could just as well have been drawn slightly to one side or the other, does not justify drawing a line that is entirely arbitrary").

163. *See supra* note 92 and accompanying text.

164. *See supra* note 70.

market, but the number and amount components account for that difference. Two other rationales for strict products liability are that sellers can absorb or spread the costs of product accidents and that the seller should bear the cost as a business expense.[165] Factor (3) considers the seller's ability to actually spread the costs or buy insurance. This factor relates to Factor (2); however, Factor (3) is different because it accounts for the seller's other product lines. If the seller's business is smaller, it will face greater difficulty spreading the costs or buying insurance.[166] Factor (4) seeks to encourage innovation where it is socially beneficial. This factor asks courts to make a difficult judgment call and, accordingly, should be judged neutral unless the product is overwhelmingly beneficial or detrimental to society. Factor (5) seeks to avoid potential issues with sellers trying to "game" the system. It is foreseeable that, as a result of this rule, sellers may try to keep their number and amount of sales below a certain level in order to avoid liability or intentionally ignore defects in their products. This defense, however, is really intended for the small-time seller who does not realize he is "in the business" and that he should perform quality checks or buy liability insurance. Factor (5) is an attempt to limit this defense to that type of individual.

Moreover, while courts should employ a relatively high threshold for the seller to establish this defense—ensuring that it only applies to those small-scale designers and manufacturers who, in fairness, should not bear the burden of strict liability—the precise standard is likely insignificant.[167] Even if the seller successfully demonstrates that this affirmative defense applies to him or her, he could still be held liable under another products liability theory, such as negligence or breach of warranty.[168]

There are several advantages to the micro-seller affirmative defense. First, it succeeds in placing the burden of strict liability only on those defendants who can adequately absorb and spread the losses and monitor

165. Owen, *supra* note 91. *See also supra* note 92 and accompanying text.

166. *See supra* notes 70, 92, 133.

167. While the micro-seller defense shares some similarities with the occasional seller doctrine, an important difference is that the seller has the burden to prove he is a micro-seller. On the other hand, the occasional seller doctrine dictates that the plaintiff must prove the seller is "in the business of selling." The particular allocation of the burden of proof is a crucial safeguard in the micro-seller defense to ensure that this defense is only available to a limited group of defendants.

168. Ideally, an individual who improperly escapes strict products liability would still be held liable under a negligence or breach of warranty theory. The availability of digital evidence associated with 3-D printed products should mitigate the potential for individuals to improperly avoid liability under all legal theories for sale of a defective product. In addition, Factor (5) of the micro-seller affirmative defense should safeguard against the defense's abuse. As a result, while a high standard of proof is advisable, the amount of sellers who would improperly slip by under a lower standard is likely negligible.

for defects. Second, it encourages most sellers, including those who are borderline "micro-sellers" to buy insurance.[169] Third, it encourages sellers to act in good faith in designing, producing, and advertising their products. Fourth, it grants courts some flexibility in applying strict liability to products that are especially beneficial. Fifth, this doctrine encourages innovation, at least more so than strict products liability alone. Finally, and perhaps controversially, it places some burden on individuals to inspect what they are buying. In the modern era, it is easy to research products on the Internet. Where the individual chooses a less reputable, cheaper generic product over a brand name design or product, it is not entirely unfair to impose some risk on the individual.

On the other hand, this proposal is not immune to criticism. Because of the holistic approach, it is somewhat inconsistent with the goal of creating a uniform and predictable system. It does not encourage sellers to take precautions and inspect for defects to the same extent as strict products liability, although it does so more than negligence theory.[170] And along with these disadvantages, it may make it difficult for consumers to rely on 3-D designs and printed products because they do not have the same assurance that their injuries will be remedied.[171] Critics may also be concerned about whether this defense will apply to all "at-home" manufacturers and not merely individual 3-D printing manufacturers. For years, individuals have manufactured jewelry, wooden furniture, and various other products in their homes, and have been subject to strict products liability.

This is not, however, a detriment of the micro-seller doctrine. The same policy reasons underlying the micro-seller affirmative defense apply to these types of individual manufacturers as well. While this issue has

169. Although the unpredictability of the "micro-seller" defense may be criticized, the uncertainty also operates to encourage those sellers on the cusp to buy insurance to protect against liability. Some sellers may decide to purchase insurance to protect against negligence liability as well. Moreover, this approach is less ambiguous than the current "occasional seller" doctrine because it *does* articulate factors to give the court greater guidance. *See supra* note 57.

170. It should be noted, however, that law and economics literature suggests that negligence and strict liability provide similar precautionary incentives. Hylton, *supra* note 157, at 2463–64. "In other words, if one is deciding *how much care* to take in some activity, such as driving, the level of care that would be privately optimal would be the same whether the law imposes strict liability or negligence." *Id.*

171. As discussed above, consumers have greater difficulty meeting their burden of proof in negligence actions and their recovery is much less certain. Accordingly, consumers may avoid 3-D printed products because they have a lower likelihood of recovering damages for injuries suffered due to defects in 3-D printed products compared with other products. *See supra* note 160. However, this effect may be mitigated in part by the increased availability of evidence in the form of digital designs. *See supra* note 105 and accompanying text.

become more pressing in light of 3-D printing and the ability to manufacture a wider range of products in one's home, individual manufacturers have historically been prejudiced by the strict products liability doctrine. In fact, the micro-seller affirmative defense would improve fairness for these sorts of transactions.

In spite of these disadvantages, the micro-seller affirmative defense will best address the policy inconsistencies triggered by the rise of 3-D printing. The defense effectively balances the desire to promote innovation with safety for consumers. Although this framework would only apply to the small group of sellers that fall into this "micro-seller" category, analysts anticipate significant growth in this category as 3-D printing expands beyond the hobbyist niche market.[172] As 3-D printers become more popular and individuals become manufacturers in their own homes, products liability law must account for the "ordinary" American seller.

VI. CONCLUSION

The personal 3-D printer market is growing at an exceptional pace. By enabling individuals to become manufacturers and sellers of sophisticated products, this new technology gives rise to novel issues in products liability law. Unlike commercial sellers, these individuals lack the expertise and resources to adequately inspect for and prevent defects in their products. Moreover, unlike their commercial counterparts, these individuals lack leverage over their buyers in price and warranty negotiations. Thus, buyers are in a much stronger position to negotiate for better terms of sale. As a result, the strict product theory of liability is too burdensome for these individuals and the risk deters them from developing new, potentially beneficial products. To counteract these ramifications, we should provide individual sellers with a "micro-seller" affirmative defense. Under this defense, the court will evaluate five factors to determine whether, in fairness, the seller should be subject to strict liability for the defective product. The micro-seller defense contemplates the modern marketplace of 3-D printed products and designs and addresses the policy inconsistencies resulting from personal 3-D printing. While it levels the legal landscape for sellers, the defense does not entirely eradicate recourse for consumers, who may still succeed on negligence or breach of warranty

172. *See supra* notes 2, 24, 26 and accompanying text.

claims. 3-D printing offers immense opportunities for innovation and societal growth. In turn, the micro-seller affirmative defense strikes the balance between promoting such innovation and encouraging consumer safety.

Nicole D. Berkowitz[*]

---

* J.D. (2015), Washington University School of Law; B.A. (2012) Vanderbilt University. Thank you to my colleagues on the *Washington University Law Review*, particularly Eric Rubin, Samantha Maerz, Jonathan Clow, and Patrick Paterson, for their excellent comments, edits, and suggestions. Thank you also to Marina Shturmakov and Professor Brian Tamanaha for their guidance in developing this piece. Finally, thank you to my family for their support and encouragement.