COMMON MARKET LAW REVIEW

CONTENTS Vol. 53 No. 6 December 2016

Aims
The Common Market Law Review is designed to function as a medium for the understanding and implementation of European Union Law within the Member States and elsewhere, and for the dissemination of legal thinking on European Union Law matters. It thus aims to meet the needs of both the academic and the practitioner. For practical reasons, English is used as the language of communication.

Common Market Law Review is published bimonthly.
Subscription prices 2017 [Volume 54, 6 issues] including postage and handling:
2017 Print Subscription Price Starting at EUR 834/ USD 1180/ GBP 595.
2017 Online Subscription Price Starting at EUR 788/ USD 1119/ GBP 566.
This journal is also available online. Online and individual subscription prices are available upon request. Please contact our sales department for further information at +31(0)172 641562 or at sales@kluwerlaw.com.
Periodicals postage paid at Rahway, N.J. USPS no. 663–170.
U.S. Mailing Agent: Mercury Airfreight International Ltd., 365 Blair Road, Avenel, NJ 07001.
Published by Kluwer Law International B.V., P.O. Box 316, 2400 AH Alphen aan den Rijn, The Netherlands

---

Printed on acid-free paper.

COMMON MARKET LAW REVIEW

Managing Editor: Alison McDonnell
Common Market Law Review
Europa Instituut
Steenschuur 25
2311 ES Leiden
The Netherlands
e-mail: a.m.mcdonnell@law.leidenuniv.nl
tel. + 31 71 5277549
fax: + 31 71 5277600

Establishment and Aims
The Common Market Law Review was established in 1963 in cooperation with the British Institute of International and Comparative Law and the Europa Instituut of the University of Leyden.The Common Market Law Review is designed to function as a medium for the understanding and analysis of European Union Law, and for the dissemination of legal thinking on all matters of European Union Law. It aims to meet the needs of both the academic and the practitioner. For practical reasons, English is used as the language of communication.

Editorial policy
The editors will consider for publication manuscripts by contributors from any country. Articles will be subjected to a review procedure. The author should ensure that the significance of the contribution will be apparent also to readers outside the specific expertise. Special terms and abbreviations should be clearly defined in the text or notes. Accepted manuscripts will be edited, if necessary, to improve the general effectiveness of communication. If editing should be extensive, with a consequent danger of altering the meaning, the manuscript will be returned to the author for approval before type is set.

Submission of manuscripts
Manuscripts should be submitted together with a covering letter to the Managing Editor. They must be accompanied by written assurance that the article has not been published, submitted or accepted elsewhere. The author will be notified of acceptance, rejection or need for revision within three to nine weeks. Digital submissions are welcomed. Articles should preferably be no longer than 28 pages (approx. 9,000 words). Annotations should be no longer than 10 pages (approx. 3,000 words). Details concerning submission and the review process can be found on the journal's website http://www.kluwerlawonline.com/toc.php?pubcode=COLA

Common Market Law Review **53**: 1575–1624, 2016.

THE SERVITIZATION OF INDUSTRY: EU LAW IMPLICATIONS AND CHALLENGES

JANJA HOJNIK*

Abstract

Servitization is one of the economic megatrends in modern society, a process that creates value by adding services to products, ranging from renting and maintaining expensive capital goods to producing smart objects and rapid prototyping. This article explores some of the EU law implications and challenges of servitization from the competition and consumer law perspective; it also considers servitization in cross-border trade, highlighting the close connection between servitization and globalization. EU law may on the one hand act as a driver for servitization, by helping to pave the way for more innovative solutions, while at the same time preventing the negative implications of servitization for European society and economy. However, when regulation lacks clarity or is not timely adopted, it may be a barrier to new business models, thereby restraining the competitiveness of EU industry and growth.

1. Introduction: Servitization-oriented industrial renaissance in Europe

At the turn of the millennium, a colleague of mine was laughed at by a shop assistant in Paris when asking if a particular handbag was made in France. The assistant nonchalantly explained that bags were no longer made in France, as they are all imported from China. Although the shop assistant surely exaggerated, it is hardly disputable that manufacturing in developed economies is under massive pressure.[1] The story of deindustrialization of

* PhD, Associate Law Professor, Jean Monnet Chair, Faculty of Law, University of Maribor, Slovenia. Contact: janja.hojnik@um.si. Grateful thanks to Petra Weingerl, Claire Whittaker, and Tatjana Jovanić for their comments on draft versions of this article. Thanks also to CML Rev. editors and anonymous referees for their helpful remarks. Any errors remain mine. The article reflects the state of affairs at June 2016; all websites last accessed on 22 Aug. 2016.

1. Neely, "The servitization of manufacturing: An analysis of global trends", 14th European Operations Management Association Conference (Ankara, 2007); Johansson, "Servicification of Swedish manufacturing", 1 *Kommerskollegium* (2010).

developed economies started in the 1950s and the value added by manufacturing as a percentage of GDP is now below 15 percent in most OECD countries.[2] Levitt's statement of 1972 that "everybody is in service"[3] is thus progressively becoming true. Nevertheless, the financial crisis of 2008 and the recession that followed led many people and companies to seek alternative sources of income and it made developed economies recognize the danger of over-reliance on financial services. Moreover, economic recovery proves more difficult in countries with a weak industrial sector. It is consequently broadly supported that Europe needs to rebalance its economy, focusing particularly on manufacturing.[4] It is believed that "an industrial renaissance" or "reindustrialization" can bring jobs and growth back to Europe.[5] But even so, for developed economies to survive, providing products alone is insufficient. It is therefore being suggested that manufacturing companies must climb up the value chain, innovating and creating ever more sophisticated products and services, in order not to compete on the basis of cost alone.[6] Despite the conventional separation of manufacturing and services, it is increasingly realistic for manufacturers to offer services; in fact, they gradually base entire competitive strategies on service innovation.[7] Additionally, as the complexity and variety of business activities grow and digitalization spreads, the boundaries between services and manufacturing become increasingly elusive.[8] To describe these processes, the term "servitization" has recently emerged, evidencing that we are in the midst of redefining the very concept of manufacturing.[9]

2. Crozet, "The servitization of French manufacturing firms", CEPII Working Paper No. 2014/10; Kemekliene et al., "Services employment in Europe, now and in the future", ETUI-REHS, Background paper for UNI-Europa Conference (Athens, 2007).

3. Levitt, "Production-line approach to service", 50 *Harvard Business Review* (1972), 20.

4. Livesey, "The need for a new understanding of manufacturing and industrial policy in leading economies", 7 *Innovations* (2012), 193; Lightfoot et al., "The servitization of manufacturing: A systematic literature review of interdependent trends", 33 *International Journal of Operations & Production Management* (2013), 1408.

5. Aiginger and Bailey, "The high road: Europe must seize the potential of advanced manufacturing", *EurActiv* (26 Jan. 2016); Bieńkowska, "Reindustrialisation of Europe: Industry 4.0 – Innovation, growth and jobs", Forum Europe conference, speech of 23 June 2015.

6. Porter and Ketels, "UK competitiveness: Moving to the next stage", DTI Economics Paper No. 3 (2003).

7. Baines, "Exploring service innovation and the servitization of the manufacturing firm", 58 *Research Technology Management* (2015), 9.

8. Crozet, op. cit. *supra* note 2; Leseure et al., "Blurring the boundary: Convergence of factory and service processes", 21 *Journal of Manufacturing Technology Management* (2010), 341.

9. In recent years this term has rapidly spread from English to other languages. One may thus find "servitization" in French, "*Servitization*" in German and Dutch, "*servitizzazione*" in Italian, "*servitización*" in Spanish, "*servitização*" in Portuguese, "*servitisering*" in Danish,

Economic studies show that servitization is one of the economic megatrends of modern society, along with globalization, encompassing a broad range of business models that are currently occurring on the market.[10] Additionally, it is a complex interdisciplinary concept increasingly popular among distinct scholar communities with complementary perspectives – ranging from manufacturing, management and marketing to environmental and computer sciences.[11] This fact, along with rapid development of information and communications technologies (ICT), which have important implications for servitization, makes dealing with this topic particularly challenging for law researchers and policy makers. Nevertheless, considering its increasing importance, as well as the fact that several EU institutions are in the midst of a multi-dimensional response to the servitization trend, legal scholars and practitioners must respond to servitization by examining the legal challenges related to it.

This article attempts to outline some of the EU law implications arising from the servitization process. Although some aspects of servitization have already been examined from a legal point of view, legal scholars have not yet discussed these distinct business models as variations of a more general business trend, known in non-legal research fields as "servitization". Consequently, the first part of the article explains servitization and similar concepts as defined in non-legal fields, with emphasis on the relationship between the service revolution and the information revolution. The second part of the article explores current response to this trend by EU institutions and some of the EU law implications of servitization from the competition and consumer law perspective, corresponding to the two main motives behind the servitization strategy, i.e. locking out competitors and locking in consumers. Finally, servitization in cross-border trade is considered, both within and outside the EU, thereby highlighting the close connection between servitization and globalization. Due to the limited space, however, other important aspects of servitization, such as fundamental rights, environmental law, intellectual property,[12] labour law,[13]

"*serwicyzacja*" in Polish, "*servitizace*" in Czech, "*servitizácia*" in Slovakian, and "*servitizacija*" in Latvian and Slovenian.

10. E.g. Parametric Technology Corporation (PTC), "Manufacturing transformation, achieving competitive advantage in a changing global marketplace", *Oxford Economics* (2013); PwC, "Industry 4.0: Opportunities and challenges of the industrial internet", www.pwc.nl/en/publicaties/industrie-4-0.html.

11. Lightfoot et al., op. cit. *supra* note 4; Chesbrough and Spohrer, "A research manifesto for services science", 49 *Communications of the ACM – Services science* (2006), 35.

12. Robinson, "Patent law challenges for the internet of things", 15 *Wake Forest Journal of Business and Intellectual Property Law* (2015), 657; Osborn, "Regulating three-dimensional printing: The converging worlds of bits and atoms", 51 *San Diego Law Review* (2014), 553.

13. See e.g. Rotman, "How technology is destroying jobs", 16 *Technology Review* (2013), 28.

cybersecurity, and telecommunications[14] are beyond the scope of this article. Additionally, the article focuses on servitization *sensu stricto* – the sharing economy, which is considered part of servitization *sensu lato,* is therefore not covered. The article is limited to services related to the product or solution and does not cover services at pre-production activities and during manufacturing, which are at times also understood to fall under servitization *sensu lato* (or servicification).

2. Servitization: "A new paradigm of business operations"[15]

2.1. *Servitization and similar models promoting selling of product-service systems*

One may admittedly wonder whether "servitization" is the proper word at all. The term was conceived in 1988 by Vandermerwe and Rada, two management scholars writing about "the increasing offering of fuller market packages or 'bundles' of customer focused combination of goods, services, support, self-service and knowledge in order to add value to core corporate offerings".[16] Later definitions of servitization explained it as "the emergence of product-based services which blur the traditional distinction between manufacturing and traditional service sector enterprises",[17] or as "a trend in which manufacturing firms adopt more and more service components in their offerings".[18] Servitization is nowadays widely recognized as the process of creating value by adding services to products and is considered omnipresent in manufacturing companies in developed economies.[19] A comparable process is "productization", describing the evolution of the services component to include a product, such as when hairdressers not only use products while carrying out haircare but also sell them to increase the profit from a

14. Frevert et al., in Bräutigam and Klindt, *Digitalisierte Wirtschaft/Industrie 4.0* (BDI, 2015), pp. 179–186.

15. Toffel, "Contracting for servicizing", Harvard Business School Technology & Operations Management Unit Research Paper No. 08-063 (2008), 6.

16. Vandermerwe and Rada, "Servitization of business: Adding value by adding services", 6 *European Management Journal* (1988), 314.

17. White et al., *Servicizing: The Quiet Transition to Extended Product Responsibility* (Tellus Institute, 1999).

18. Van Looy et al., *Services Management: An Integrated Approach*, 2nd ed. (Financial Times/Prentice Hall, 2003); see also Ren and Gregory, "Servitization in manufacturing companies: A conceptualization, critical review, and research agenda", *16th Annual Frontiers in Service Conference* (2007).

19. Baines et al., "The servitization of manufacturing: A review of literature and reflection on future challenges", 20 *Journal of Manufacturing Technology Management* (2009), 547; Oliva and Kallenberg, "Managing the transition from products to services", 14 *International Journal of Service Industry Management* (2003), 160.

customer's visit.[20] In both cases the result of the process is a product-service "bundle".

While "product-service bundle" is a general description for combinations of products and services, "product-service system" (hereinafter: PSS) is a more specific scholarly concept that describes companies offering solutions aimed at increasing market share and consumer satisfaction, but also with a parallel objective of reducing the consumption of products through alternative scenarios of product use instead of acquiring it.[21] PSS is thus strongly based on reduced environmental impact[22] and presents the philosophical basis of *access-based consumption*, promoting business models where consumers acquire consumption time with the item and are willing to pay for the use of that item rather than owning it, be it because they could otherwise not afford it or because they choose not to own due to concerns such as space limitations or the environment.[23] While public access to goods, such as books in public libraries or public transportation, has been known for centuries, the Internet – coinciding with the economic crisis during which consumers reconsider their values and spending habits – has fuelled new business models of access-based consumption that are considered as central pillars of servitization.[24] Despite the difference in the motivation, servitization and PSS are converging and servitization is nowadays seen as encompassing the PSS theme.[25]

Conversely, a concept of "reversed servitization" has recently been thought up as a path that is contrary to "forward-unidirectional servitization".[26] It

20. Harkonen et al., "Productization: A review and research agenda", 164 *International Journal of Production Economics* (2015), 65.

21. Beuren et al., "Product-service systems: A literature review on integrated products and services", 47 *Journal of Cleaner Production* (2013), 222.

22. Goedkoop et al., "Product service systems, ecological and economic basics", *Ministry of Housing, Spatial Planning and the Environment* (March 1999); Mont, "Clarifying the concept of product–service system", 10 *Journal of Cleaner Production* (2002), 237.

23. Durgee and O'Connor, "An exploration into renting as consumption behavior", 12 *Psychology and Marketing* (1995), 89; Bardhi and Eckhardt, "Access-based consumption: The case of car sharing", 39 *Journal of Consumer Research* (2012), 881.

24. Cusumano, "How traditional firms must compete in the sharing economy", 58 *Communications of the ACM* (2015), 32; Dyal-Chand, "Regulating sharing: The sharing economy as an alternative capitalist system", 90 *Tulane Law Review* (2015), 241. See Hatzopoulos and Roma, "Caring for Sharing? Collaborative economy under EU law", 54 CML Rev. (2017, forthcoming).

25. Baines et al., op. cit. *supra* note 19, 554; Tukker, "Eight types of product–service system: Eight ways to sustainability? Experiences from SusProNet", 13 *Business Strategy and the Environment* (2004), 246. In addition to servitization and PSS, several other related terms may be observed in scholarly papers, such as servinomics, servicizing, servicization, service design, going downstream, new manufacturing, integrated solutions, product of service, tertiarization, functionalization and service-oriented manufacturing.

26. Finne et al., "Reversed servitization paths: A case analysis of two manufacturers", 7 *Service Business* (2013), 513.

refers to a situation where companies take steps backwards in servitizing – the service strategy has been withdrawn based on management decisions in favour of increasing product dominance and traditional manufacturing. While one would expect that the reasons for reversed servitization lie in the fact that servitization proved unsuccessful, this is not necessarily so.[27]

Nevertheless, there are many illustrations of the successful fusing of the supply of goods and services in practice, resulting in companies' increased profitability and employee numbers.[28] The most commonly provided service in practice is still the delivery of products, followed by the provision of spare parts and consumables, and a customer helpline or support desk.[29] One of the most archetypal examples of innovative servitization is Rolls-Royce's airplane rental model (called *Power-by-the-Hour*) – and by adopting sensors that are able to monitor the airplane's engine status 24/7 (*TotalCare* programme), Rolls-Royce considerably simplified the maintenance process.[30] Similarly, Xerox developed a cost-per-print model for their photocopying machines, and French train manufacturer Alstom has introduced "train life services", offering maintenance and parts supply services to transport companies.[31] Although Volvo is essentially a car manufacturer, it is nowadays also involved in the wide spectrum of activities associated with automobile transportation, ranging from insurance to gas stations and roadside assistance, and currently even developing a vehicle that can, via smartphone, alert a mobile fuel supplier to come and top up the tank when the car is parked.[32]

27. Ibid. Finne et al. show that U.S. competition authorities forced Xerox, a photocopier manufacturer, to move from a service-based toward a product-based business model, whereas CapgoodCo (pseudonym), a leading global capital goods manufacturer, quadrupled its production volumes in ten years, while the conditions to provide associated product services became unfavourable and the company has decided to withdraw successful servitization strategy.

28. Crozet and Milet found that compared to firms that produce goods only, firms that start selling services increase their profitability by 3.7 to 5.3 % and increase their number of employees by 30 %; see Crozet and Milet, "Should everybody be in services? The effect of servitization on manufacturing firm performance", CEPII Working Paper No. 2015/19, p. 25. Moreover, the Commission refers to studies that estimate that just in Germany, further digitization of industry is expected to bring up to 8 % of productivity growth over 10 years and lead to a 6 % increase in employment; see Commission Communication of 19 April 2016, "Digitising European industry: Reaping the full benefits of a Digital Single Market", COM(2016)180 final.

29. Tether and Bascavusoglu-Moreau, "Servitization: The extent and motivations for service provision amongst UK manufacturers", DRUID 2012, p. 17.

30. Christopher and Ryals, "The supply chain becomes the demand chain", 35 *Journal of Business Logistics* (2014), at 29–30; Editor's Note, "Britain's lonely high-flier", *The Economist* (8 Jan. 2009).

31. Baines, op. cit. *supra* note 7, at 9; Alstom, "Trainlife services", available at <www.alstom.org/transport>.

32. Vandermerwe and Rada, op. cit. *supra* note 16, at 318; Steiner, "Self-filling cars that never run out of fuel" *Daily Mail* (1 Feb. 2015).

BMW and Daimler, in addition to car production, also offer membership-based systems of car sharing with annual membership fees and prices per kilometre for users.[33] While servitization often involves large multinationals supporting high-value capital equipment, there is a rising number of cases where servitization is not confined to expensive capital goods. For example, AB Electrolux installs washing machines in customers' homes, maintains and repairs them and charges by the laundry load[34] and several companies provide irrigation services instead of selling irrigation systems.[35] Moreover, Amazon does not just sell books, but offers a variety of related services, including cloud infrastructure and networking; and IBM has turned, with its software and consultancy growth, from a computer hardware manufacturer to a service company.[36] All these companies have thus succeeded in converting from selling goods to integrated solutions.[37]

2.2. *Servitization in the digital age: Digital manufacturing and mass customization*

Several of the above cases demonstrate that the move towards servitization has coincided with a rising trend towards digitalization.[38] It is thus claimed that the service revolution and the information revolution are two sides of the same coin and informatization is becoming a necessary component of servitization.[39] The emergence of fast and powerful ICT, like the Internet, constitutes a leading role in terms of improving existing business models and

33. Gardiner, "Big European players embrace the car-sharing trend", *The New York Times*, 19 Nov. 2013. Such car sharing services are nowadays broadly offered also by companies that do not produce cars (such as Zipcar and Hertz) and companies such as Uber, Juno and Lyft offer cheaper and more environmentally sustainable ways of transporting people by connecting car owners and those in need of transport over an online platform, i.e. ridesharing or carpooling.

34. Toffel, op. cit. *supra* note 15, at 8.

35. Commission Communication of 15 Dec. 2011, "Innovation for a sustainable future: The Eco-innovation Action Plan (Eco-AP)", COM(2011)899 final.

36. Gerstner, *Who Says Elephants Can't Dance? Leading an Enterprise through Dramatic Change* (Harper Business, 2002). For many other examples across various industry sectors see Lay, *Servitization in Industry* (Springer, 2014).

37. Windahl and Lakemond, "Integrated solutions from a service-centered perspective: Applicability and limitations in the capital goods industry", 39 *Industrial Marketing Management* (2010), 1278.

38. Lerch and Gotsch, "Digitalized product-service systems in manufacturing firms", 58 *Research Technology Management* (2015), 45.

39. Rust, "If everything is service, why is this happening now, and what difference does it make", 68 *Journal of Marketing* (2004), 23–24; Opresnik et al., "Information: The hidden value of servitization" in Prabhu et al. (Eds.), *Advances in Production Management Systems: Sustainable Production and Service Supply Chains* (Springer, 2013).

it is perceived as an important *enabler* of (innovative) servitization.[40] The interactive element of the Internet thus immensely advances more traditional digitalization possibilities of manufacturing: while chips had been installed in machines already prior to the emergence of Internet, the latter has significantly facilitated the manufacturing process and spread of servitization as it enables remote control of machines by the service provider. Internet of Things (IoT), which is seen as one of the most important enablers of servitization, helps manufacturers of larger goods to remotely monitor the condition of equipment and look for indicators of imminent failure (e.g. vibration, temperature and pressure).[41] This means that the manufacturer can make fewer visits, reducing costs and producing less disruption and higher satisfaction for the customer.[42] Remote diagnostics may not, however, only be important for repairing industrial machines but also for human health, such as in respect of remote control of pacemakers, while various smart home equipment makes running a household easier and more environmentally friendly.[43] Consequently, smart products present an advanced form of servitization, which fuses tangible products and intangible (Internet based) services,[44] ranging from maintenance and repair services, monitoring of humans' health condition, energy efficiency services, locating the nearest taxi, to parking assistance or even autonomous driving.

40. Lightfoot et al., "Emerging technology and the service delivery supply chain" in Chan et al. (Eds.), *Decision-Making for Supply Chain Integration* (Springer, 2012); Kryvinska et al., "Servitization: Its raise through information and communication technologies" in Snene and Leonard (Eds.), *Exploring Services Science* (Springer, 2014), p. 3; Kowalkowski et al., "ICT as a catalyst for service business orientation", 28 *Journal of Business & Industrial Marketing* (2013), 506.

41. ICT is changing "tagged things" into "smart objects" with sensors supporting a wireless communication link to the Internet; see more in Miller, *The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World* (Que Publishing, 2015).

42. Verizon Enterprise Solutions, "State of the market: The Internet of Things 2015", 13; Brax and Jonsson, "Developing integrated solution offerings for remote diagnostics: A comparative case study of two manufacturers", 29 *International Journal of Operations & Production Management* (2009), 539.

43. Mobile smart objects can also move around and GPS makes it possible to identify their location. This technology facilitates the development of "connected cars" and even "digital trucks" which present one of the cornerstones of the EU digitizing industry; see Kopetz, *Real-Time Systems* (Springer, 2011), p. 308; Cremer, "VW to spend about half a billion euros on digital trucks by 2020", *Reuters* (4 April 2016).

44. As explained by Moeller, four characteristics have been regularly applied to denote what constitutes a service: intangibility, heterogeneity, inseparability, and perishability (so-called IHIP characteristics); see Moeller, "Characteristics of services: A new approach uncovers their value", 24 *Journal of Services Marketing* (2010), 359. See further Turner et al., "Turning software into a service", 36 *Computer* (2003), 38. In Case C-479/13, *Commission* v. *France*, EU:C:2015:141, and Case C-502/13, *Commission* v. *Luxembourg*, EU:C:2015:143, the EU Court considered supply of electronic books as a service.

ICT is also the basis of increasing use of cloud computing in manufacturing, where data is outsourced to third parties and accessed remotely via the Internet.[45] As a result, cloud computing stands for servitization in the IT domain.[46] More and more manufacturers are taking advantage of cloud computing, not just in simple forms such as placing business emails in a cloud, but progressively also for production purposes. Consequently, the whole concept of *cloud manufacturing* as a new service-oriented manufacturing mode has recently started to evolve, enabling massive production of customized items.[47] In this respect, a Polish start-up Tylko has received an international technology award for developing a smartphone application that allows users to change the dimensions, configuration, wood type and colour of furniture, and visualize the result before their order is transmitted to factory machines.[48] Finally, a specific manufacturing revolution is happening in the more mainstream application of 3D printing (also called additive manufacturing or rapid prototyping) that stands for digital manufacturing combining digital design (3D computer-aided design data) and technology that builds physical objects directly from the digital file with the help of a 3D printer using different materials.[49] This new technology has inconceivable potential to revolutionize countless industries, such as medicine, pharmaceuticals and architecture. Considering reports such as the one about a New York fashion designer, Mary Huang, who has begun selling 3D printed shoes and envisions a future in which she will send digital shoes to shops in London, avoiding shipping costs and import duties, it may be claimed that this technology is poised to radically disrupt established trade patterns.[50] 3D printing enables the purchasing of a product, solely in the digital form, which is a service that enables acquiring a product – similar to an architectural plan or a fashion design sent by e-mail. However, while the latter require skilled building workers or tailors to create the product, 3D printers take over the work instead of the people.

The rapid development of ICT is providing manufacturers with new means to gain competitive advantage, considering that digital production enables

45. Mell and Grance, "Perspectives on cloud computing and standards", *National Institute of Standards and Technology* (Gaithersburg, 2009).

46. Sultan, "Servitization of the IT industry: The cloud phenomenon", 23 *Strategic Change* (2014), 375.

47. Wu et al., "Cloud-based design and manufacturing: A new paradigm in digital manufacturing and design innovation", 59 *Computer-Aided Design* (2015), 1; Li and Mehnen (Eds.), *Cloud Manufacturing* (Springer, 2013).

48. Newton, "Custom flat-pack furniture", *Financial Times* (28 July 2015).

49. Ford et al., "The emergence of additive manufacturing: Introduction to the special issue", 102 *Technological Forecasting and Social Change* (2016), 156.

50. Gerwin, "The digital opportunity: Democratizing trade for the 99 percent", Progressive Policy Institute Policy Brief 3 (2015).

mass customization (or personalization) of manufacturing, which enhances a company's competitiveness in terms of the speed, quality and cost.[51] The customization adds a service dimension to mass manufacturing; however, while traditional tailor-made products were more expensive than mass products in order to compensate for the service rendered for the customer, digital production is changing this fact. Accordingly, Commissioner Elżbieta Bieńkowska stressed that "digital technologies offer the key to secure a robust industrial base for Europe also in the future" and announced that servitization would lead to Europe's industrial comeback.[52]

3. Legal implications and challenges of servitization: EU perspective

Industry is considered as one of the pillars of the EU economy – the manufacturing sector accounts for two million companies, 33 million jobs and over 80 percent of exports.[53] To enable industry to flourish, however, modern economic and technological development needs to be followed by appropriate regulatory framework that will control the associated hazards. Considering that the industry and consumers are becoming ever smarter, smart regulatory solutions need to follow,[54] thereby establishing the right balance between safety, liability and competition on one side and innovation and flexibility on the other. Regulation can in this respect be both a driver and a serious barrier for the uptake of innovative technologies: on the one hand, it is helping to pave the way for more innovative solutions and is driving growth, while a lack of clear regulation is reducing competitiveness of the EU industry and functions as a barrier to growth.[55] Conversely, servitization also has a rebound effect upon regulation – take for example the impact of the widespread practice of

51. Xu et al., "An integrated solution: KAGFM for mass customization in customer-oriented product design under cloud manufacturing environment", 84 *International Journal of Advanced Manufacturing Technology* (2015), 85; Qu et al., "Two-stage product platform development for mass customisation", 49 *International Journal of Production Research* (2011), 2197.

52. Bieńkowska, op. cit. *supra* note 5.

53. Davies, "Industry 4.0: Digitalisation for productivity and growth", EPRS Briefing (Sep. 2015).

54. Oettinger, Speech at Hannover Messe: "Europe's future is digital", Speech 15-4772 (April 2015).

55. E.g., eCall system, an integrated telecommunication solution helping in case of serious accidents, was made mandatory for new cars from April 2018. If a serious accident with a vehicle occurs, the system will automatically transmit an alert to the nearest emergency centre; see Regulation (EU) 2015/758 of 29 April 2015 concerning type-approval requirements for the deployment of the eCall in-vehicle system based on the 112 service and amending Directive 2007/46/EU, O.J. 2015, L 123/77. Market research has suggested that the eCall regulations will

access based consumption, where consumers tend not to own anything, on the efficiency of civil and criminal law enforcement procedures that are premised upon ownership.

The following section firstly highlights servitization from the perspective of EU industrial policy, where due to the principles of subsidiarity and proportionality coordination between EU and national courses of action is needed. Secondly, some soft and hard law documents that have responded to the servitization trend at the EU level (either expressly or implicitly) are identified. The third section explores EU competition law aspects of servitization (such as competition law treatment of tying and bundling, free offerings and Big Data), while the fourth section on EU consumer law explores servitization challenges in respect of consumer contracts and product-service liability and safety. The final section examines legal aspects of cross-border trade with combinations of products and services, both on the EU internal market and with third countries, exploring the possibilities for converging distinct rules on free movement of goods and services to the newly developed business models where boundaries between goods and services are blurred.

3.1. *Industrial policy within the EU multi-level governance system*

When framing the EU response to the servitization trend, the EU institutions first of all need to respect the EU multi-level governance system, thereby respecting the competences of various levels of governance.[56] EU industrial policy is horizontal in nature and aims at securing framework conditions favourable to industrial competitiveness.[57] It falls among those policies where the EU has competence to carry out actions to support the actions of the Member States (Art. 6 TFEU). Consequently, it is the Member States that are the holders of their respective industrial policies, thereby adopting corresponding national strategies on digitalization of manufacturing.[58] The

significantly drive growth in this sector between 2015 and 2020; see Lengton et al., "Internet of Things, connected cars", *Business Innovation Observatory* (2015), 11.

56. Marks et al., "European integration from the 1980s: State-centric v. multi-level governance", 34 JCMS (1996), 341.

57. Commission Communication of 11 Dec. 2002 on industrial policy in an enlarged Europe, COM(2002)714 final.

58. In Germany the development of manufacturers equipping their products and machines with intelligent digital systems is referred to as "*Industrie* 4.0", the French term for the same is "*Industrie du Futur*", in the Netherlands and in Slovakia strategists talk about "Smart Industry", in the UK about "Catapult" (High Value Manufacturing), in Spain about "*Industria Conectada 4.0*", and in Italy it is referred to as *"Fabbrica Intelligente"*. See further Bauernhansl, "Industry 4.0: Challenges and limitations in the production: Keynote", (2013) *ATKearney Fact*; Dujin et al., "Industry 4.0: The new industrial revolution", (2014) *Roland Berger Strategy Consultants*.

EU's response, recently revealed in the Commission's action plan on the digitizing industry,[59] is in this respect focused on coordination between national and EU-level initiatives and in developing policy actions, such as investments in digital innovations and infrastructure, accelerating the development of ICT standards, exploring regulatory conditions and adaptation of the workforce, including up-skilling. Moreover, EU industrial policy is well integrated into a number of other EU policies such as those relating to competition, consumers, trade, the internal market, research and innovation, employment, environmental protection and public health. This interleaving between industry and other policies logically affects the servitization trend as well. The majority of these fields are, however, not within exclusive competence of the EU, and even though regulation at the EU level will in most instances be crucial so as to prevent a myriad of different national approaches, which would create chaos and partitioning of the internal market, authorities at national and local level will, in line with the principles of subsidiarity and proportionality, need to get involved. Moreover, other constitutional and institutional settings will have to be respected in the regulatory process, including industry involvement and self-regulation in line with the "New Approach" so that the market itself defines the technical solutions while public authorities only set the general regulatory requirements.[60] In this respect, regulatory requirements will on the one hand restrict servitization, e.g. when certain entities are not permitted to provide particular services,[61] while boosting it on the other, e.g. when servitization is a response to environmental or consumer regulation.

3.2. *EU response to servitization trend in soft and hard law documents*

The awareness of the servitization process by the EU institutions is at this time mainly reflected in various soft law documents. Consequently, the

59. Commission Communication of 19 April 2016, cited *supra* note 28. This communication is accompanied by four further communications, i.e. on a European Cloud Initiative (COM(2016)178 final), on priorities for ICT standardization (COM(2016)176 final), the eGovernment Action Plan (COM(2016)179 final) and the Staff Working Document on the Internet of Things (SWD(2016)110/2).

60. See Commission Communication of 22 Jan. 2014 on a vision for the internal market for industrial product, COM(2014)25 final, at 5. See also Klindt et al., "Standardisierung und Produktkonformität" in Bräutigam and Klindt, op. cit. *supra* note 14, pp. 100–106; Weber and Weber, *Internet of Things: Legal Perspectives* (Springer-Verlag, 2010), p. 23.

61. E.g., a broader EU definition of shadow banking leads to decline of the provision of some services by non-deposit taking entities, such as leasing activities of car sellers; see Commission Communication of 4 Sept. 2013, "Shadow banking: Addressing new sources of risk in the financial sector", COM(2013)614 final and a response by Leaseurope, "Comments on the Green Paper on shadow banking" (June 2012).

Communication "For a European industrial renaissance" of 2014 is one of the few documents in which the Commission actually applied the term "servitization of industry", noting that the transformative power of digital technologies is redefining traditional business and production models.[62] The Commission claims that "manufacturing and services are two sides of the same coin" and that "in the modern economy, you cannot choose the one or the other . . . you must do both".[63] Servitization (or servicification) is also among the express motives for the Commission's work plans in the field of standardization of services, which should increase the quality of services and entail much better developed standardization of products.[64] It was also an integral part of the Commission's 2015 Trade Strategy, which focuses on liberalization of services at global level due to "the rise of services embedded in manufacturing".[65] Moreover, the importance of "servitization of industry", seen as a synonym for the fourth industrial revolution and as the symbiosis of manufacturing and services, is highlighted in various recent documents of the European Parliament[66] and the European Economic and Social Committee.[67]

From the soft law domain, however, servitization is slowly spreading to the legislative ground. It is thus one of the motivations for the Circular Economy Package, proposed by the Commission in March 2016. In this respect, the servitization trend in the business of organic fertilizers is mentioned, i.e. the increasing product customization based on analysis of the soil where the

62. Commission Communication of 22 Jan. 2014 for a European industrial renaissance, COM(2014)14 final, at 9. The first mention of servitization by the Commission seems to be in the Commission Staff Working Document of 14 Oct. 2011, "European Competitiveness Report 2011", SEC(2011)1188 final.

63. Bieńkowska, op. cit. *supra* note 5.

64. Commission Staff Working Document of 1 June 2016 tapping the potential of European service standards to help Europe's consumers and businesses, accompanying the Commission Communication, "European Standards for the 21st Century", COM(2016)358 final; Commission Communication of 28 Oct. 2015 on upgrading the Single Market, COM(2015)550 final, at 12. The term "servicification" was coined by the Swedish National Board of Trade (*Kommerskollegium*) and covers services along the entire value chain of production; see Johansson, op. cit. *supra* note 1; Aner and Rentzhog, "Everybody is in services: The impact of servicification in manufacturing on trade and trade policy", 6 *Kommerskollegium* (2012).

65. Commission Communication of 14 Oct. 2015, "Trade for all: Towards a more responsible trade and investment policy", COM(2015)497 final, at 11.

66. European Parliament, Economic and Scientific Policy Department, "EU industrial policy: Assessment of recent developments and recommendations for future policies", IP/A/ITRE/2014-03 (Feb. 2015); Davies, op. cit. *supra* note 53; Davies, "The Internet of Things: Opportunities and challenges", EPRS Briefing (May 2015).

67. Opinion of the EESC on the Impact of business services in industry, rapporteur Van Iersel, CCMI/121 (Oct. 2014).

fertilizer is to be used.[68] Moreover, there is a series of legislative acts already in force reflecting the servitization trend implicitly – perhaps most concretely in the Energy Efficiency Directive,[69] which calls for a common framework to give energy utilities the option of offering energy services to all final customers, therefore increasing competition in the energy market.[70] Energy services that include a variety of activities, such as energy analysis and audits, energy management, maintenance, monitoring and evaluation of savings,[71] are thus a response to a situation where a mere fuelling is no longer considered to comprise energy supply.[72] The EU Energy Efficiency Directive may hence be perceived as an instrument in support of servitization.

Additionally, broad EU policy on waste management is based on the principle of extended producer responsibility (EPR) that is closely related to the PSS philosophy and requires manufacturers of products containing toxic or environmentally unsustainable materials to take responsibility for management throughout key parts of their lifecycle, especially for management of post-consumer waste.[73] At the EU level, several directives are forcing product manufacturers to assume a physical or financial responsibility for post-consumer waste management.[74] This regulatory promotion of servitization is important considering the shift from products to services cannot be assumed to be eco-efficient and consists of a number of rebound effects.[75] Even though critics say that the implementation of EPR is not always successful in practice and that collection targets stipulated by the directives are not always as high as they could be,[76] the directives nevertheless

68. Commission Proposal of 17 March 2016 for a Regulation laying down rules on the making available on the market of CE marked fertilizing products, COM(2016)157 final, Explanatory Memorandum, at 2.

69. Directive 2012/27/EU on energy efficiency, O.J. 2012, L 315/1.

70. Ibid., Preamble and Recital 20.

71. Bertoldi et al., "Energy service companies in European countries: Current status and a strategy to foster their development", 34 *Energy Policy* (2006), 1818.

72. Benedetti et al., "A proposal for energy services' classification including a product service systems perspective", 30 *Procedia CIRP* (2015), 251–252.

73. Curtis et al., "Extended producer responsibility and product stewardship for tobacco product waste", 4 *International Journal of Waste Resources* (2014), 2.

74. E.g. Directive 94/62/EC on packaging and packaging waste, recently amended by the Directive (EU) 2015/720 as regards reducing the consumption of lightweight plastic carrier bags, O.J. 2015, L 115/11; Directive 2002/96/EC on waste electrical and electronic equipment (WEEE), O.J. 2003, L 37/24; Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators, O.J. 2006, L 266/1.

75. Bartolomeo et al., "Eco-efficient producer services: What are they, how do they benefit customers and the environment and how likely are they to develop and be extensively utilised?", 11 *Journal of Cleaner Production* (2003), 829.

76. Mayers et al., "Implementing individual producer responsibility for waste electrical and electronic equipment through improved financing", 17 *Journal of Industrial Ecology* (2013), 186; Sachs, "Planning the funeral at the birth: Extended producer responsibility in the European

encourage manufacturers to add corresponding services to their products. Although offering recycling services is the result of legal requirements for waste handling, it has become a source of income for many companies and has contributed to increased customer loyalties.[77]

Considering that servitization may also be perceived as a driver to foster innovation through public procurement,[78] it is important that the 2014 Public Procurement Directive emphasizes assessments on the basis of the best price-quality ratio, thereby advocating the life-cycle costing approach.[79] The latter is one of the foundations of servitization philosophy; however, in the past, failure to distinguish between direct purchasing cost and overall cost proved to be one of the most important barriers to innovative procurement.[80]

Although new legislative proposals in respect of the digitalization of manufacturing have already been announced, such as legislation on connected cars,[81] there is no consent on how fast EU institutions should react. While some commentators claim that since it is not yet known how exactly servitization will develop, the EU may not adopt legislation concerning digitizing industry too soon; others call for an immediate response to avoid distinct legislative activities by Member States, which would place the EU in an inferior position compared to other global superpowers such as the US and China, which have also developed their own manufacturing strategies.[82] In many aspects servitization makes sense and it is thus reasonable that it receives the regulatory support it needs to become fully mainstream. This, however, does not mean that new regulation should be adopted in a rush, especially when amending existing legislation would suffice. Many existing laws on goods are perfectly applicable to smart goods and many existing laws on services may also apply to servitization transactions. In line with this, the Commission announced in its 2016 Action plan on digitizing industry that it will clarify and adjust the relevant legislative framework as part of its Better

Union and the United States", 30 *Harvard Environmental Law Review* (2006), 51; Lindhqvist, "Policies for waste batteries", 14 *Journal of Industrial Ecology* (2010), 537.

77. Aner and Rentzhog, op. cit. *supra* note 64.

78. Edler et al., "Innovation and public procurement: Review of issues at stake", (2005) *ISI Fraunhofer Institute Systems and Innovation Research*.

79. Directive 2014/24/EU on public procurement, O.J. 2014, L 94/65, recitals 89–95 and 123.

80. Edler et al., op. cit. *supra* note 78, at 10.

81. Stupp, "EU accelerates to catch up on connected cars", *EurActiv* (21 Jan. 2015).

82. VDMA European Office, "Industrie 4.0: Mastering the transition" (Jan. 2016), 10. See also Braucher, "When your refrigerator orders groceries online and your car dials 911 after an accident: Do we really need new law for the world of smart goods", (2002) *Washington University Journal of Law & Policy*, 241.

Regulation (REFIT) programme to establish the necessary trust and legal certainty for EU industry.[83] The fourth industrial revolution is therefore not going to bring a series of new legislative acts, but for the most part provide clarification and adjustments of the existing rules. It is important, however, that different departments of the Commission respond to the new economic trend in a coherent way and that they systematically improve the rules that are relevant for the new business models. It finally needs to be admitted that legislatures cannot cover all possible problems that may arise in practice – the central regulatory role will thus be held by the EU and national courts, which need to be sufficiently flexible to recognize the need for balance between various interests involved.

3.3. *EU Competition law aspects of Servitization*

In respect of strategic motives for servitization, it is claimed that manufacturing companies that extend their operations into providing services may considerably improve their strategic positioning, gaining competitive advantage and imposing barriers to competitors,[84] thereby taking into account that product-service bundles are normally harder to imitate than pure products.[85] Servitization thus enables "locking-out" competitors, i.e. preventing or delaying competitors from increasing their market share, since customers are linked to their suppliers due to service contracts. Additionally, manufacturing companies can expect marketing advantages as servitization enables "locking-in" customers. By including a range of after sales services to customers, the latter will be more loyal than in case of merely purchasing the goods, while at the same time allowing manufacturers insight into their customers' needs.[86] Servitization thus helps to build longer-term client relationships, which may be enhanced to the point where customers become dependent on the supplier.[87] Both motivations for the servitization process, i.e.

83. COM(2016)180 final, cited *supra* note 28, at 12.

84. Mathieu, "Product services: From a service supporting the product to a service supporting the client", 16 *Journal of Business & Industrial Marketing* (2001), 39; Bustinza et al., "Servitization and competitive advantage: The importance of organizational structure and value chain position", 58 *Research-Technology Management* (2015), 53.

85. Oliva and Kallenberg, op. cit. *supra* note 19; Gebauer and Friedli, "Behavioral implications of the transition process from products to services", 20 *Journal of Business & Industrial Marketing* (2005), 70.

86. Vandermerwe and Rada, op. cit. *supra* note 16; Aurich et al., "How to design and offer services successfully", 2 *CIRP Journal of Manufacturing Science and Technology* (2010), 136; Baines et al., op. cit. *supra* note 19, at 558.

87. Manzini et al., "Product-service systems: Using an existing concept as a new approach to sustainability", 1 *Journal of Design Research* (2001).

locking-out competitors and locking-in consumers may, however, be in conflict with EU competition law.[88]

3.3.1. *Anti-competitive practices of tying and bundling*

Primarily, servitization as a strategy that promotes bundling of products and services most obviously and directly collides with rules on competition that consider the practice of selling two or more products and/or services jointly (i.e. tying and bundling) as (potentially) anti-competitive,[89] such as when a producer of large machines holding a dominant position on the market forces its machines purchasing customers to also hire its maintenance and repair services instead of selecting a cheaper independent service provider. Tying and bundling practices can sometimes lead to serious competitive harm if employed by a dominant firm.[90] A company that has market power in two goods, can, by bundling them together, make it harder for a competitor with only one of these goods to enter the market. Among the many reasons for offering a bundled product is price discrimination, market entry deterrence and cost savings.[91] Tying and bundling allow an incumbent to credibly defend both products without having to price low in each – a company that only has some components of a bundle will find it hard to compete against an incumbent who sells a package solution at a discount.[92] Reversed servitization of Xerox happened precisely due to the company's breach of US antitrust rules by way of bundled leasing of photocopying machines, high priced toners (called "black gold" at the time) and maintenance services.[93]

This is far from saying, however, that competition law prohibits every product-service bundle.[94] Advocates of tying claim that society often reaps benefits from bundling. An obvious explanation for a number of bundles is

88. For more on industrial policy within competition law, see Sokol, "Tensions between antitrust and industrial policy", 22 *George Mason Law Review* (2015), 1247.

89. For the distinction between tying and bundling, see e.g. Rousseva, *Rethinking Exclusionary Abuses in EU Competition Law* (Hart, 2010), p. 219; Jones and Sufrin, *EU Competition Law: Text, Cases, and Materials* (OUP, 2014), p. 485.

90. Nalebuff, "Bundling as an entry barrier", 119 *Quarterly Journal of Economics* (2004), 159; Peitz, "Bundling may blockade entry", 26 *International Journal of Industrial Organization* (2008), 41.

91. Salinger, "A graphical analysis of bundling", 68 *The Journal of Business* (1995), 85.

92. Nalebuff, op. cit. *supra* note 90.

93. Blackstone, "The copying-machine industry: Innovations, patents, and pricing", 6 *Antitrust Law & Economic Review* (1972), 105; Scherer, "Technological innovation and monopolization", KSG Working Paper No. RWP07-043.

94. As found by Carlton and Waldman, "a crucial aspect of tying from an antitrust perspective is that there is so much tying in real-world markets and most of that tying is driven by efficiency"; see Carlton and Waldman, "Tying", 3 *Issues in Competition Law and Policy* (2008), 1859.

that companies can integrate products better than its customers can.[95] Moreover, tying may be used to maintain the efficiency of the tying product or lead to lower prices.[96] Thus, an overly stringent tying law might prevent efficient product integration.[97] The Commission's and the EU Court's approach towards tying and bundling has been long criticized for being based on form and for ignoring the fact that tying may be undertaken with a view to attaining efficiency gains and delivering benefits to consumers.[98] Illustrative examples in this respect are *Hilti*[99] *and Tetra Pak II*,[100] concerning consumables in an aftermarket tied to a primary product, where tying was established as virtually a *per se* abuse.[101] In both cases the Commission found an abuse after very little analysis of the market – i.e. just by finding dominance, separate products and no objective justification – and both EU Courts confirmed the decisions, holding that a tie may constitute an abuse even if there is a natural link or the tied sale is in accordance with commercial usage.[102] This suggests that tying was subject to a form-based prohibition that may only be escaped by demonstrating objective justification.[103] However, in line with arguments that manufacturing activity, by its very nature, involves the bringing together of different components,[104] the Commission no longer maintains the presumption that tying normally causes competitive harm. Tying is thus no longer *per se* illegal. Instead, Article 102 Enforcement Guidance notes that "(t)ying and bundling are common practices intended to provide customers with better products or offerings in more cost effective

95. Nalebuff, op. cit. *supra* note 90.

96. Whish and Bailey, *Competition Law* (OUP, 2015), pp. 730–731; Rennhoff and Serfes, "The role of upstream-downstream competition on bundling decisions: Should regulators force firms to unbundle?", 18 *Journal of Economics & Management Strategy* (2009), 547; Evans and Salinger, "Why do firms bundle and tie? Evidence from competitive markets and implications for tying law", 22 *Yale Journal on Regulation* (2005), 37.

97. Faull and Nikpay (Eds.), *Faull and Nikpay: The EU Law of Competition* (OUP, 2014), p. 457. See also Weinstein, "Bundles of trouble: The possibilities for a new separate-product test in technology tying cases", 90 *California Law Review* (2002), 903.

98. Rousseva, op. cit. *supra* note 89, at 219.

99. Commission Decision of 22 Dec. 1987, *Eurofix-Bauco* v. *Hilti*, O.J. 1988, L 65/19; Case T-30/89, *Hilti* v. *Commission*, EU:T:1991:70; Case C-53/92 P, *Hilti* v. *Commission*, EU:C:1994:77.

100. Commission Decision of 24 July 1991, *Elopak Italia* v. *Tetra Pak*, O.J. 1991, L 72/1; Case T-83/91, *Tetra Pak* v. *Commission*, EU:T:1994:246; Case C-333/94 P, *Tetra Pak* v. *Commission*, EU:C:1996:436.

101. Jones and Sufrin. op. cit. *supra* note 89, at 459.

102. Case C-333/94 P, *Tetra Pak* v. *Commission*, para 37.

103. Østerud, *Identifying Exclusionary Abuses by Dominant Undertakings Under EU Competition Law: The Spectrum of Tests* (Kluwer Law International, 2010), p. 87.

104. Whish and Bailey, op. cit. *supra* note 96, at p. 730, maintain that "it would be perverse to suggest that, when engaged in by a dominant firm, such behaviour should be stigmatised as presumptively unlawful".

way".[105] This is considered as the biggest change in the Commission's "new approach" towards tying and bundling.[106] Accordingly, in *Microsoft*,[107] the most prominent case that was investigated on both sides of the Atlantic for technical bundling of two services – the Windows operating system (OS) with its Windows Media Player (WMP) – the EU General Court endorsed the view that the Commission "could not merely assume . . . that the tying of a specific product and a dominant product has by its nature a foreclosure effect".[108] While contractual tying has been subjected to form-based assessments, the technological integration of WMP into Windows OS was appraised using a more effects-based test.[109] Nevertheless, Microsoft was found to anti-competitively expanding its position in adjacent media-related software markets and weaken effective competition to the eventual detriment of consumers, in breach of Article 102 TFEU.[110] Similar investigations against *Google* in relation to its Android mobile OS and applications were recently launched, again both in the EU and in the USA.[111]

Although a more detailed examination of the conditions necessary for considering concrete tying and bundling practices as a breach of competition law is beyond the scope of this article, it may be concluded that Article 102 TFEU restricts those servitization models that concern dominant undertakings in the tying market, where it may be held that the tying and tied products and services are distinct and where the tying practice is likely to lead to anti-competitive foreclosure.[112] Although the Guidance only mentions tying of two products, the abovementioned case law confirms that the fact that servitization business models merge tangible products and intangible services does not save them from the application of Article 102 TFEU.[113]

105. Commission Communication of 24 Feb. 2009, "Guidance on its enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings", O.J. 2009, C 45/7, para 49.

106. Faull and Nikpay, op. cit. *supra* note 97, at p. 456.

107. Commission Decision of 24 March 2004, *Microsoft*, COMP/C-3/37.792, C(2004)900 final; Case T-201/04, *Microsoft* v. *Commission*, EU:T:2007:289.

108. T-201/04, *Microsoft* v. *Commission*, para 868.

109. For a comment, see Geradin, "Limiting the scope of Article 82 EC: What can the EU learn from the US Supreme Court's judgment in *Trinko* in the wake of *Microsoft, IMS* and *Deutsche Telekom*", 41 CML Rev. (2005), 1519; Kühn et al., "Economic theories of bundling and their policy implications in abuse cases: An assessment in light of the *Microsoft* case", 1 *European Competition Journal* (2005), 85.

110. Commission Decision of 24 March 2004, *Microsoft*, para 982.

111. Gibbs, "Reviewing Google's practices a high priority, says EU antitrust chief", *The Guardian* (26 Oct. 2015); Vesterdorf, "Theories of self-preferencing and duty to deal: Two sides of the same coin?", 1 *Competition Law & Policy Debate* (2015), 4.

112. Art. 102 Enforcement Guidance, cited *supra* note 105, para 50.

113. See also Case 22/78, *Hugin Kassaregister AB and Hugin Cash Registers* v. *Commission*, EU:C:1979:138.

3.3.2. *Competition law aspects of vertical and horizontal integration*

Considering that companies which adopt a servitization strategy have a strong focus on the aftermarket and derive significant value from sales of spares and repairs,[114] servitization business models may come in conflict with the EU rules controlling vertical integration.[115] Since the 1960s and *Consten and Grundig*,[116] it is acknowledged that vertical agreements, formal or informal, written or unwritten, can entail restrictions of competition, so-called "vertical restraints", which merit competition law scrutiny.[117] With the paradigmatic shift towards an economic approach in 1999, EU law on vertical restraints has migrated from a "form-based approach" to a so-called "effects-based approach".[118] Pursuant to Regulation 330/2010[119] and the Guidelines,[120] the core of the matter is to determine whether a vertical agreement has actual or potential anti-competitive effects that are not outweighed by pro-competitive effects. Article 101 TFEU thus restricts servitization models that enforce the company policy of "going downstream" in an anti-competitive way and without objective justifications. On the other hand, however, the Guidelines recognize that vertical restraints may have positive effects by, in particular, promoting non-price competition and improved quality of services, they may help the introduction of new complex products, which protect relationship-specific investments or which facilitate the transfer of know-how.[121] In this case, "going downstream" is thus desirable or at least acceptable. For similar reasons, the Commission is open to certain servitization models under its merger review; it has, for example, cleared several joint ventures in the field of car sharing.[122] Stricter rules, however, apply for the motor vehicle sector. Regulation 461/2010 applies to vertical agreements relating to the motor vehicle aftermarket, including the purchase,

114. Neely, "Making the shift to services", (2014) *Institute for Manufacturing Review*, 12–13.

115. Cooper et al., "Vertical antitrust policy as a problem of inference", 23 *International Journal of Industrial Organization* (2005), 639.

116. Joined Cases 56 & 58/64, *Consten and Grundig* v. *Commission,* EU:C:1966:41.

117. Cf. Hawk, "System failure: Vertical restraints and EC competition law", 35 CML Rev. (1995), 973.

118. Petit and Henry, "Vertical restraints under EU competition law: Conceptual foundations and practical framework" (Dec. 2010), 4, available at <ssrn.com/abstract=1724891>.

119. Commission Regulation (EU) 330/2010 on vertical agreements and concerted practices, O.J. 2010, L 102/1.

120. Commission notice of 10 May 2010, "Guidelines on vertical restraints", SEC(2010)411 final.

121. Ibid., para 108.

122. See Case COMP/M.6402, O.J. 2011, C 356/07; Case COMP/M.7266, *D'Ieteren/Continental/JV*, C(2014)5739 final; Case COMP/M.6148, *BMW/SIXT/DRIVENOW JV*, O.J. 2011, C 129/7.

sale or resale of spare parts or provision of repair and maintenance services.[123] It ensures that car producers allow independent garages adequate access to repair information and strengthens repairers' access to alternative spare parts, while car manufacturers are not allowed to use certain warranty conditions.

On the other hand, solution-orientated servitization models increasingly force manufacturers into partnering with their competitors for the purpose of executing certain business activities – so called co-opetition.[124] This is particularly important when product-service delivery requires the incorporation of products from other vendors (i.e. multi-vendor products) or in respect of developing technological innovation.[125] Although such cooperation risks being categorized as a cartel under Article 101 TFEU, there is clear scope for legitimate cooperation between competitors, ranging from joint production and specialization agreements[126] to joint undertaking and subsequent exploitation of R&D, promoting technical and economic progress, particularly where companies contribute complementary skills.[127]

3.3.3. *Competing with free: Services provided without a charge*

Servitization also challenges competition law when it comes to the market definition of services offered without a charge. According to some studies, services on average account for ten percent of manufacturers' total revenues. While some are charged for through fixed price contracts, by performance-based agreements, or on a pay-by-use basis, it is reported that one third of the companies earned nothing from services. This shows that many services are provided for free, without an explicit charge. In reality, however, this means that a great share of services offered are indirectly invoiced (i.e. included in the product's price) rather than directly.[128] This has direct implications on competition law, as it may be a sign of abuse of a dominant position – particularly when services are tied to products in such a way that the supplier quotes a price for the product which includes the service and if the customer does not want the service, (s)he normally still has to pay

123. Commission Regulation (EU) 461/2010 on vertical agreements and concerted practices in the motor vehicle sector, O.J. 2010, L 129/52.

124. Brandenburg, Nalebuff, *Co-opetition* (Crown Business, 1996); Bengtsson and Kock, "Co-opetition: *Quo vadis*? Past accomplishments and future challenges", 43 *Industrial Marketing Management* (2014), 180; Zhang and Frazier, "Strategic alliance via co-opetition: Supply chain partnership with a competitor", 51 *Decision Support Systems* (2011), 853.

125. Gnyawali and Park, "Co-opetition between giants: Collaboration with competitors for technological innovation", 40 *Research Policy* (2011), 650.

126. Commission Regulation (EU) 1218/2010 on the application of Art. 101(3) of the TFEU to certain categories of specialisation agreements, O.J. 2010, L 335/43-47.

127. Commission Regulation (EU) 1217/2010 on the application of Art. 101(3) of the TFEU to certain categories of research and development agreements, O.J. 2010, L 335/36-42.

128. Tether and Bascavusoglu-Moreau, op. cit. *supra* note 29, at 11.

the full price.[129] When services are offered for free, competition authorities often argue that where there is no price, there is no market. This conclusion follows from the observation that the SSNIP test,[130] which is used for the assessment of substitutability between products and services, becomes inoperable when services are offered for free.[131] Opponents of this approach claim, however, that this should not lead to the conclusion that there is no market.[132] Several authors have suggested modifications of the traditional SSNIP test in order to incorporate indirect network effects between the two sides of the market.[133] The argument that there is no market where there is no price also fails to recognize that some services offered for free compete with price-based services and that consumers may pay a price in other forms, such as in the form of nuisance stemming from being exposed to advertisements or by providing their data.[134] Servitization models that merge products with services that are offered for free – as well as free products that need regular maintenance or a complementary offering – therefore require further Article 102 TFEU scrutiny in the future, so as to prevent the new business models unfairly drawing value out of the local economy.

3.3.4. *Data dimension of servitization*

Another competition law aspect closely related to servitization concerns data. Collecting and analysing data has, until now, largely been in the domain of software companies; this area is, however, progressively spreading also to manufacturing companies, which have started to exploit the possibilities arising from collection and exploitation of data in order to create added value.[135] In this sense data has become the raw material of

129. See Bryce et al., "Competing against free", 89 *Harvard Business Review* (2011), 104; Jones and Sufrin, op. cit. *supra* note 89, at p. 455.

130. "Small but Significant and Non-transitory Increase in Price".

131. Evans, "Antitrust economics of free", 7 *Competition Policy International* (2011); Newman, "Antitrust in zero-price markets: Applications", 94 *Washington University Law Review* (2016).

132. European Parliament, Economic and Scientific Policy Department, "Challenges for competition policy in a digitalised economy" (July 2015), IP/A/ECON/2014-12, p. 55.

133. Filistrucchi et al., "Market definition in two-sided markets: Theory and practice", 10 *Journal of Competition Law and Economics* (2014), 293; Evans and Noel, "Defining antitrust markets when firms operate two-sided platforms", (2005) *Columbia Business Law Review*, 702; Hesse, "Two-sided platform markets and the application of the traditional antitrust analytical framework", 3 *Competition Policy International* (2007), 191.

134. European Parliament, "Challenges …", cited *supra* note 132, at 55. This has already been recognized in the Consumer Rights Directive in relation to contracts on digital content; see *infra* section 3.4.3.

135. Bessis and Dobre, *Big Data and Internet of Things: A Roadmap for Smart Environments* (Springer, 2014); Opresnik and Taisch, "The value of big data in servitization",165 *International Journal of Production Economics* (2015), 174.

production.[136] To derive more value from servitization, and to avoid the "service paradox" in particular, a data orientation arises as the next strategic step after adopting servitization.[137] Information obtained from customers may be used to develop new systems that improve product performance and the company's position in the value chain, as well as increase its innovation potential.[138] Such data constitute a competitive advantage towards smaller or newer competitors who cannot afford to build up the same information systems. This is particularly accentuated in situations of ICT-enabled servitization, where sensors on products support automatic data collection. With respect to automatic data collection, the concept of "Big Data" has been developed – referring to data collections so large or complex that traditional data processing applications are inadequate.[139] IoT together with Big Data technology therefore presents manufacturers with an opportunity to repackage their offerings into services adding new value for their customers. On the other hand, this information explosion (or "data deluge")[140] unlocks various legal concerns that could stimulate a regulatory backlash.

To prevent the obstruction of data economy and innovation, regulation needs to establish a balance between beneficial uses of data and the protection of privacy, non-discrimination and other legally protected values. In light of this, it is broadly debated that, when considering new forms of Internet worms that target IoT devices such as industrial machines, smart ovens and Internet-connected security cameras, privacy and security concerns are increased.[141] Consequently, an updated regulatory framework on data protection entered into force in May 2016, including a new EU Data

136. Polonetsky and Tene, "Privacy in the age of big data: A time for big decisions", 64 *Stanford Law Review Online* (2012), 63. Opresnik and Taisch, op. cit. *supra* note 135, at 175.

137. Polonetsky and Tene, op. cit. supra note 136, at 63. "Service paradox" refers to the situation where companies made the transition into services in order to increase their profit margins without getting the expected high returns; see Brax, "A manufacturer becoming service provider: Challenges and a paradox", 15 *Managing Service Quality* (2005), 142; Gebauer et al., "Overcoming the service paradox in manufacturing companies", 23 *European Management Journal* (2005), 14; Kohtamäki and Helo, "Industrial services: The solution provider's stairway to heaven or highway to hell?", 22 *Benchmarking* (2015), 170.

138. Sundin, "Life-cycle perspectives of product/service-systems: In design theory" in Sakao and Lindahl (Eds.), *Introduction to Product/Service-System Design* (Springer, 2009); Tukker and Tischner (Eds.), *New Business for Old Europe: Product-Service Development, Competitiveness and Sustainability* (Greenleaf, 2006).

139. Mohak Shah, "Big data and the Internet of Things" in Japkowicz and Stefanowski (Eds.), *Big Data Analysis: New Algorithms for a New Society* (Springer, 2016); Miller, op. cit. *supra* note 44.

140. "The data deluge", *The Economist* (25 Feb. 2010).

141. Peppet, "Regulating the Internet of Things: First steps toward managing discrimination, privacy, security, and consent", 93 *Texas Law Review* (2014), 133; Tran, "The Internet of Things and potential remedies in privacy tort law" (March 2016), available at <ssrn.com/abstract=2769675>. See also Art. 29 Data Protection Working Party, "Opinion

Protection Regulation[142] which explicitly recognizes "Privacy by Design", i.e. a general principle requiring privacy to be taken into account from the start.[143] Moreover, with the aim of preventing hackers from unlocking digital doorways leading to data, the Network and Information Services (NIS) Directive as the first EU-wide legislation on cyber security entered into force in summer 2016.[144] What is less discussed, however, is that Big Data is proving to be a potentially "big" competition law problem for the EU. Problems may arise in situations where Big Data present a significant and durable entry barrier. On this aspect, it is felt that large companies should face competition law liability for refusing to provide user data in their possession to competitors or for collecting additional user data by expanding into new product lines. Although there are strong opponents of such competition law enforcement, claiming that Big Data rarely has anything to do with market definition or competitive effects,[145] supporters claim that considering the importance of data in digitized industry as well as the tendency for data concentration, competition law may not ignore the correlated problems.[146] In line with the latter arguments, the Commissioner in charge of competition, Margrethe Vestager, has revealed EU plans to "take a harder look at whether the collection of vast troves of consumer data by big Internet companies violates competition rules".[147] She explained this plan by holding that "(i)f just a few companies control the data you need to satisfy customers and cut costs, then you can give them the power to just drive rivals out of the market".[148] Although the Commissioner denied that Big Data problems have been overlooked by the Commission in past competition law proceedings, she

8/2014 on the on recent developments on the Internet of Things" (Sept. 2014), and Commission Communication of 18 June 2009, "Internet of Things: An action plan for Europe", COM(2009)278 final.

142. Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, O.J. 2016, L 119/1.

143. Hustinx, "EU data protection law: The review of Directive 95/46/EC and the proposed General Data Protection Regulation", Transcript of a lecture at EUI's Academy of EU Law, 24th Session on EU Law, (July 2013), at 26. See also Reding, "The upcoming data protection reform for the European Union", 1 *International Data Privacy Law* (2011), 3; Koops and Leenes, "Privacy regulation cannot be hardcoded: A critical comment on the 'privacy by design' provision in data-protection law", 28 *International Review of Law, Computers & Technology* (2014), at 159, 160 and 167.

144. Directive (EU) 2016/148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the union, O.J. 2016, L 194/1.

145. Tucker and Wellford, "Big mistakes regarding big data", 14 *Antitrust Source* (2014).

146. Birnstiel et al., "*Kartell- und Beihilfenrecht*" in Bräutigam and Klindt, op. cit. *supra* note 14, pp. 153–178, p. 169.

147. "EU competition chief to eye 'big data' concerns in merger probes", *Reuters* (17 Jan. 2016).

148. Ibid.

admitted that future development on the market should be carefully observed. In addition, regulatory framework in the field of data and consumer protection may be applied to reduce the risk of competition law abuse.[149]

It may be concluded that current competition law is in general sufficiently flexible to address most of the challenges of new technology products and services. Dynamic new technology markets are in this respect likely to receive greater competition law scrutiny: as new innovations in mobile technologies appear, new competitive harms may arise.[150] This extends to manufacturing companies that increasingly offer technology-based products integrating Internet-based services. Digitalization of manufacturing brings a danger that successful companies could become giants with considerable market power. Car manufacturers, producers of consumer electronics, or energy grid operators are well aware of the digitalization of their industry and have the resources to open up new innovation paths and to use Big Data to gain competitive advantages. This pushes the incumbents to compete on the basis of innovation as well. However, there could be concerns when certain companies gain control over an essential facility, information or platform.[151] New technologies also bring new challenges for competition authorities regarding rapid changes in technological products and services and their prices, as well as the widespread bundling of not just one, but numerous services into a product,[152] disabling price transparency of individual parts of the package. Moreover, when manufacturers put sensors on their products and offer maintenance and repair services on the basis of remote control of the product, lock-in effects for both parties are easily created, with services becoming a part of the product, and consumers rarely switching to an independent service provider. When considering whether any of this is a competition law problem, reference to the objectives and principles of competition law might prove useful, considering that competition policy is primarily a public policy aimed at ensuring that "competition in the marketplace is not restricted in a way that is detrimental to society".[153] Caution is needed as overextension of competition law to emerging products can stymie innovation and decrease consumer welfare, while on the other

149. Birnstiel et al., op. cit. *supra* note 146, p. 171. See further joint papaer by Autorité de la Concurrence and Bundeskartellamt, "Competition law and data", 10 May 2016.

150. Au, "Anticompetitive tying and bundling arrangements in the smartphone industry", 16 *Stanford Technology Law Review* (2012), 188. See also García Zaballos, "Impact of bundling of ICT services on regulation", 15 *Info* (2013), 69.

151. European Parliament, "Challenges …", cited *supra* note 132, at 31–32.

152. Au states that there are over half a million applications on the iPhone; see Au, op. cit. *supra* note 150, at 189. This is called economies of aggregation; see Bakos and Brynjolfsson, "Bundling and competition on the internet", 19 *Marketing Science* (2000), 63.

153. Motta, *Competition Policy: Theory and Practice* (CUP, 2004), p. 30.

hand, declining to extend competition law to these products may lead to higher prices and thereby decrease consumer welfare.[154]

Considering the conceptual link between competition and consumer law, the latter is logically the next field of law that is intensely challenged by servitization.

3.4. *Consumer law challenges of servitization process in the EU*

3.4.1. *From quarter-inch drills to quarter-inch holes*

A key feature of servitization strategies is a transition from a culture of product centricity to a strong consumer centricity. In traditional manufacturing customers were remote from the manufacturer and the manufacturer had little knowledge about how its product was being used.[155] In servitization, however, customers are not just provided with products through a single transaction, but with holistic, more tailored "solutions".[156] The trend from offering products to solutions puts an emphasis on the *outcome* the customer desires, rather than on the physical product itself.[157] In this respect Levitt famously claimed: "People don't want quarter-inch drills, they want quarter-inch holes".[158] A goods-dominant logic to value creation has thus been replaced by a service-dominant logic and producers have been replaced by solution providers.[159]

Assuming that consumers want solutions that are ready to go, servitization is inherently positive for consumers.[160] If a manufacturer wants to keep a long-term relationship with a customer to attain a return on its investment, it has to be responsive to the customer's needs. Consequently, the servitization strategy, as a side effect (i.e. for business motives of the manufacturer rather than for regulatory coercion) responds to the interests of the consumer. The servitization process forces manufacturers to develop concern for the length

154. Hatch, "Antitrust in the digital age" in Eisenach and Lenard (Eds.), *Competition, Innovation and the Microsoft Monopoly: Antitrust in the Digital Marketplace* (Springer, 1999), p. 20; Choi, "Tying and innovation: A dynamic analysis of tying arrangements", 114 *The Economic Journal* (2004), 83.

155. Baines, op. cit. *supra* note 7, at 9.

156. Miller et al., "The problem of solutions: Balancing clients and capabilities", 45 *Business Horizons* (2002), 3.

157. Neely, op. cit. *supra* note 114, at 13.

158. Freeman, "Buying quarter inch holes: Public support through results", 25 *Archival Issues* (2000), 91.

159. Smith et al., "Servitization and operations management: A service dominant-logic approach", 34 *International Journal of Operations & Production Management* (2014), 242; Vargo and Lusch, "Evolving to a new dominant logic for marketing", 68 *Journal of Marketing* (2004), 1; Schnürmacher et al., "Providing product-service-systems: The long way from a product OEM towards an Original Solution Provider (OSP)", 30 *Procedia CIRP* (2015), 233.

160. Neely, op. cit. *supra* note 114, at 12.

of their product's functionality since they have taken on the risk of guaranteeing the latter as well as regular maintenance. The protection of the consumer as the weaker party in this respect no longer plays the leading role of consumer law – at least at the conceptual level. At the same time, ICT is changing the role of the consumer "from isolated to connected, from unaware to informed, from passive to active".[161] Nevertheless, the change is so rapid that pre-Internet generations are struggling to follow suit, while new manufacturing methods and business models open up new consumer safety concerns. Consequently, it is important that the servitization process is embedded in the consumer law framework.

3.4.2. *Challenges for EU rules on product and service liability and safety*

The multifaceted character of servitization primarily brings challenges to the field of regulating liability of product-service systems. The new focus of the EU and the Member States on servitization might lead to new momentum in respect of the adoption of a directive on service supplier liability, as already proposed by the Commission in 1990,[162] considering that the Product Liability Directive[163] does not apply to intangible goods – inadequate services, careless advice, erroneous diagnostics and flawed information are as such thus not included in this Directive. It should be noted, however, that if damage is caused by a defective product used in the provision of a service, it will be recoverable under the Product Liability Directive.[164] Many servitization transactions will thus come within the ambit of this Directive, including flawed software that is stored on a tangible medium, in particular in smart objects, faulty 3D printed objects and car sharing services with a defective car. This means that a consumer whose car causes an accident due to malfunctioning software, or a consumer who purchases a 3D printed house that later collapses, may bring a claim under the Product Liability Directive.[165] In cases when software is supplied over the Internet (so-called non-embedded software) or digital design files for 3D printed objects are sold to customers

161. Prahalad and Ramaswamy, "Co-creating unique value with customers", 32 *Strategy & Leadership* (2004), 4.

162. Commission Proposal of 20 Dec. 1990 for a Council Directive on the liability of suppliers of services, COM(90)482 final. See further Weatherill, *EU Consumer Law and Policy* (Edward Elgar, 2013), pp. 186–187.

163. Council Directive 85/374/EEC on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products, O.J. 1985, L 210/29.

164. Grubb and Howells, *The Law of Product Liability* (Butterworths, 2007), pp. 292–297. See also Case C-203/99, *Veedfald* v. *Arhus Amtskommune*, EU:C:2001:258, and Case C-495/10, *Dutrueux*, EU:C:2011:869.

165. Wuyts, "The Product Liability Directive: More than two decades of defective products in Europe", 5 *Journal of European Tort Law* (2014), 5.

who later print the object themselves, potential defects, however, do not fall under the scope of this Directive. This problem has been recognized by the Commission also in its 2016 Action plan on digitizing industry, where it announced to initiate work on the safety of applications and other non-embedded software not covered by sectoral legislation, assessing a possible need for further action at the EU level.[166] In this respect, an analysis of the suitability of the existing liability and safety regulations in relation to software-based product functions that can increasingly be modified after delivery is in this respect needed.[167]

A situation comparable to the field of product liability exists in the field of product safety regulation. Although Article 2(1) of Directive 2001/95 on general product safety[168] defines the reach of the product safety regime to include any product intended for consumer use or likely use "including in the context of providing a service", there is no directive counterpart in the field of safety of services.[169] It is hence for the Member States to adopt legislation setting safety standards for services – that is not the preferred solution in times of expanding servitization, which (enabled by ICT) calls for a border-free market.

Moreover, servitization and industry digitalization bring new challenges to the concept of a defect.[170] Various liability and safety issues may arise in relation to automated systems despite the fact that manufacturers and robot designers are focused on perfecting their systems for 100 percent reliability, thereby making liability a non-issue.[171] It is essential to understand that the more autonomous systems are, the less they can be considered simple tools in the hands of other actors,[172] and that overly stringent regulation, expecting perfection instead of acceptable robot behaviour, may discourage manufacturers from investing money in innovations, such as self-driving cars and automated machines.[173] It can happen that robotic technology fails, either unintentionally or by design, resulting in economic loss, property damage,

166. COM(2016)180 final, cited *supra* note 28, Chapter 4.3.

167. VDMA European Office, cited *supra* note 82, at 12.

168. Directive 2001/95/EC of 3 Dec. 2001 on general product safety, O.J. 2002, L 11/4.

169. Weatherill, op. cit. *supra* note 162, at p. 282.

170. Fairgrieve et al., "The Product Liability Directive: Time to get soft?", 4 *Journal of European Tort Law* (2013), 1.

171. Kirkpatrick, "Legal issues with robots", 56 *Communications of the ACM* (2013), 17–18.

172. Commission Action Plan for digitizing European industry, Draft of 23 Dec. 2015, p. 59. See also Sheriff, "Defining autonomy in the context of tort liability: Is machine learning indicative of robotic responsibility?" (Dec. 2015), available at <ssrn.com/abstract=2735945>.

173. More on this in Richards and Smart, "How should the law think about robots?" (May 2013), available at <ssrn.com/abstract=2263363>; Chopra and White, *A Legal Theory for Autonomous Artificial Agents* (University of Michigan Press, 2011).

injury, or loss of life.[174] For some robotic systems, traditional product liability law will apply, meaning that the manufacturer will bear responsibility for a malfunctioning part; however, the more difficult cases will certainly be referred to courts. Such a case could be where a self-driving car appears to be doing something unsafe and the driver overrides it – does the fault lie with the manufacturer or with the individual who took over?[175] Moreover, if it is a software malfunction, it needs to be clarified whether the application developer should be held accountable, or when an accident is caused by network interruptions, whether the telecom companies might be held liable for the accident. Considering that the news has already reported of a killing of a driver by his self-driving car[176] these questions are no longer futuristic. Without clear rules in this respect, however, insurance companies will not know when they can lawfully claim the damages, and companies will not be able to assess their own liability.[177] The Commission therefore announced in its 2016 Action plan on digitizing industry that it will explore the legal frameworks for autonomous systems and IoT applications, in particular safety and liability rules and the legal conditions to allow large scale testing in real life environments.[178]

Similar difficulties may also arise in relation to remotely piloted aircrafts (drones).[179] Harmonized rules at the EU level would in this respect be welcome to safeguard the single market of the drone industry. The Commission has thus called for "tough standards" to cover *inter alia* safety, insurance and liability[180] and the Transport Committee of the European Parliament adopted a report calling for Europe to "do its utmost to boost its strong competitive position" in this field.[181]

174. Kirkpatrick, op. cit. *supra* note 171. Cf. Hilgendorf, *Robotik im Kontext von Recht und Moral* (Nomos Verlag, 2014), p. 27.

175. Schellekens, "Self-driving cars and the chilling effect of liability law", 31 *Computer Law & Security Report* (2015).

176. Woolf and Levin, "Tesla driver killed while using autopilot was watching Harry Potter, witness says", *The Guardian* (1 July 2016).

177. Lengton et al., op. cit. *supra* note 55.

178. COM(2016)180 final, cited *supra* note 28, Chapter 4.3.

179. More on technical aspects of drones in Miller, op. cit. *supra* note 41.

180. Commission, "European Commission calls for tough standards to regulate civil drones", Press release IP-14-384 of 8 April 2014. In Dec. 2015, the Commission proposed a basic legal framework for the safe development of drone operations in the EU as part of the new Aviation Strategy for Europe, COM(2015)613 final of 7 Dec. 2015.

181. Motion for a European Parliament Resolution on safe use of remotely piloted aircraft systems (RPAS), commonly known as unmanned aerial vehicles (UAVs), in the field of civil aviation, Doc. No. 2014/2243(INI). The regulatory work in this field is entrusted to the European Aviation Safety Agency (EASA), which is developing the necessary security requirements as well as a framework for liability and insurance.

Particular challenges for liability and safety rules derive from the fact that servitization may change the roles in the production cycle.[182] In 3D printing, the borderline between manufacture and service provision is blurred due to uncertainty as to who should be assumed to be the manufacturer of the product, particularly when a 3D printer has been used somewhere in the value chain.[183] Wide availability of 3D printers makes it much easier for individuals (particularly hobbyist inventors) to become manufacturers.[184] Since the latter are not familiar with product liability rules, the strict product liability framework may be forced to change in order to accommodate such new technology.[185] Without this regulatory change, the manufacturers may attempt to evade liability by arguing that they are merely "services providers",[186] renting out 3D printers to clients during the printing process (with the printer remaining at the manufacturer's premises throughout) and selling raw material to clients in advance thereby disclaiming product responsibility.

Additionally, 3D printing turns traditional service providers into manufacturers. Specific regulatory challenges in this respect arise in the medical field where 3D printing enables the printing of replacement body parts, organs, bones and even skin.[187] In this sense, besides providing ordinary patient treatment, medical doctors and dentists provide services, such as constructing a digital design of the implant and printing it in their office on a 3D printer.[188] Low price and high functionality 3D printed medical devices may save lives and have important consequences on social security systems; however, the regulatory framework must contemplate the risks involved and maintain patient safety standards.[189] Under the current EU Medical Devices

182. Commission, Business Innovation Observatory, "Web-based design services as a new business model in the design world", Ref. Ares(2015)4645055 (Oct. 2014).

183. Kommerskollegium, Swedish National Board of Trade, "Servicification on the internal market: A regulatory perspective: The case of customisation by 3D printing" (Stockholm, 2015), p. 23.

184. Regulation (EC) 765/2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products, O.J. 2008, L 218/30.

185. Engstrom, "3-D printing and product liability: Identifying the obstacles", 162 *University of Pennsylvania Law Review* (2013); Berkowitz, "Strict liability for individuals: The impact of 3D printing on products liability law" 92 *Washington University Law Review* (2014), 1019.

186. Nielson, "Manufacturing consumer protection for 3D printed products", 57 *Arizona Law Review* (2015), 609, at 616.

187. Michalski and Ross, "The shape of things to come: 3D printing in medicine", 312 *JAMA* (2014), 2213.

188. Kommerskollegium, op. cit. *supra* note 183, at 20.

189. Magriñá, "3D printing regulation: Should governments intervene?", *Inlinepolicy* (19 June 2014); Vancraen, "Innovation outpacing EU regulation: The case for medical 3D printing", *Medtech Views* (30 Sept. 2014).

Directive,[190] 3D printed medical devices fall into the category of "custom-made medical devices",[191] similar to orthopaedic shoes which are not strictly regulated. In relation to 3D printed medical implants (such as prosthetic limbs, hips or teeth), however, it is widely accepted that they require more stringent quality requirements to address the needs and potential risks.[192] Nevertheless, it seems that EU regulators support the *status quo*, as the Explanatory Memorandum to the future Medical Devices Regulation states that: "Manufacturers of medical devices for an individual patient, so called 'custom-made devices', must ensure that their devices are safe and perform as intended, but their regulatory burden remains low".[193] What is thus needed to assure patient safety is to subject the manufacturers of higher risk 3D custom printed devices to a conformity assessment and to require CE marking of input material (in the same way as it is currently required of dental filling materials).[194] Maintaining current uncertainties could lead to different national interpretations of risks related to 3D printed medical devices and a fragmentation of the internal market, harming the consumers and industry alike.

3.4.3. *Contracts for selling product-service systems to consumers*

Another legal aspect that is inherently linked to servitization refers to consumer contracts. In general it may be observed that servitization makes contract drafting increasingly demanding and complex for practising lawyers, who have to respond to the so-called service ladder, referring to the high number of components and their interrelation within the service provision.[195] These contracts come under different labels, ranging from performance based contracts and contracts for availability to contracts for capability and outcome-based contracts and allow the customer to pay only after the

190. Council Directive 93/42/EEC of 14 June 1993 concerning medical devices, O.J. 1993, L 169/1.

191. Defined as "any device specifically made in accordance with a written prescription of a doctor of medicine, of a dental practitioner or of any other person authorized by national law by virtue of this person's professional qualifications which gives, under his responsibility, specific design characteristics, and is intended for the sole use of a particular patient"; see Art. 2 of the Proposal of 26 Sept. 2012 for a Regulation on medical devices, COM(2012)542 final – known as the proposed MDR.

192. Wende, "Gesundheitswirtschaft 4.0" in Bräutigam and Klindt, op. cit. *supra* note 14, p. 211. See also Vollebregt, "3D printing of custom medical devices under future EU Law", *Medical Devices Legal* (3 March 2014).

193. The proposed MDR, cited *supra* note 191, para 3.2.

194. Vollebregt, op. cit. *supra* note 192.

195. Neely et al., "Complex service systems: Identifying drivers, characteristics and success factors", 7 *Proceedings of the 18th European Operations Management Association Conference* (2011); Kreye et al., "Servitizing manufacturers: The impact of service complexity and contractual and relational capabilities", 26 *Production Planning & Control* (2014), 1233.

company delivers the outcome, for example when the buyer uses the product.[196]

From the business-to-consumer (B2C) point of view, servitization models may essentially be classified into two groups. The first group consists of servitization transactions where ownership of the product is transferred to the consumer (i.e. the product is sold) with some services being added to the product to enhance its value. These services may either be traditional (such as maintenance and repair) or digital, embedded in smart products connected to the Internet (e.g. smart machines that enable remote control by the manufacturer). Conversely, the second group of servitization models comprises of transactions where ownership of the product remains with the trader and only the service is transferred to the consumer (e.g. a machine is rented out, a car is leased or shared among several users).

Subsuming this classification of servitization transactions under the contractual forms provided by the EU Consumer Rights Directive[197] leads to the conclusion that the first group of transactions falls under sales contracts. According to the definition in Article 2(5) of the Directive, the criterion for classifying a contract as a "sales contract" is the transfer of ownership of goods to the consumer against payment of the price thereof. The last part of the definition under Article 2(5), however, provides that a sales contract also includes "any contract having as its object both goods and services". Consequently, if a contract's *main purpose* is the transfer of ownership of certain goods, it should be classified as a sales contract even if it also covers related services provided by the seller, such as installation, maintenance or any other processing, irrespective of the relative value of the goods and services.[198] It may in this aspect be predicted that the production of a unique piece in accordance with customers' specific requirements – even when such a product is produced by smart machines as a standardized (mass) product – will also be covered by a sales contract, despite the fact that it is not possible to speak of a pure sales transaction, but a combination of the latter with the provision of services, similar to producing tailor-made clothes.[199] A sales contract will also apply to transactions such as the one developed by Volvo, offering mobile fuel top-ups. This contract form further expressly applies to

196. Caldwell and Settle, "Incentives and contracting for availability: Procuring complex performance" in Ng et al. (Eds.), *Complex Engineering Service Systems* (Springer, 2011), p. 150.

197. Directive 2011/83/EU of 22 Nov. 2011 on consumer rights, O.J. 2011, L 304/64.

198. Commission, DG Justice Guidance Document concerning Consumer Rights Directive (June 2014), p. 6.

199. Burrer, "Prozessrecht" in Bräutigam and Klindt, op. cit. *supra* note 14, p.148, wonders whether this situation would be covered by a sales contract, service contract or some new, atypical form of contract.

digital content supplied on a tangible medium.[200] However, if a separate contract is concluded for the services part of the product-service bundle (e.g. a contract for repair), it should be classified as a service contract due to its main purpose.[201] Service contracts are defined as those under which the trader supplies or undertakes to supply a service to the consumer and the consumer pays the price thereof (Art. 2(5)). It follows that service contracts cover the second group of servitization transactions where ownership of products remains with the trader and only their use is transferred.

Due to the advance of ICT a specific group of services is escalating within the second group of servitization transactions, that is the supply of digital content that is not on tangible mediums, such as e-books, music, apps or even a computer aided design (CAD) of shoes, jewellery or a house, intended for 3D printing. Sale of such services presupposes that the customer already owns the necessary product (equipment), like a computer, a smart phone or a 3D printer, to make use of the digital content sold. Although the ECJ established an EU wide definition of the term sale, i.e. "an agreement by which a person, in return for payment, transfers to another person his rights of ownership on an item or tangible or intangible property belonging to him",[202] the Consumer Rights Directive has introduced specific rules for these types of contracts, distinguishing them from sales and service contracts.[203] As recognized by the Commission in the Digital Strategy, the problem with these contracts is, however, that "when it comes to remedies for defective digital content purchased online (such as e-books) no specific EU rules exist at all, and only few national ones". Accordingly, the Commission proposed the adoption of clear contractual rules for online sales of physical goods and digital content.[204] In line with this, a proposal for a directive was published in December 2015,[205] recommending the regulation of supplier's liability for defects with a reversed burden of proof in accordance with which it would be up to the supplier to prove that no defect existed and not vice versa. Consumers would

200. Consumer Rights Directive, Recital 19.

201. Ibid., Recital 26.

202. Case C-128/11, *UsedSoft GmbH* v. *Oracle International Corp*., EU:C:2012:407, para 42.

203. Consumer Rights Directive, Recital 19. This also clarifies that the Directive considers digital content supplied on a tangible medium, such as a CD or a DVD, as goods. This is in line with the EU Court's decision in Case C-244/06, *Dynamic Medien Vertriebs GmbH* v. *Avides Media AG*, EU:C:2008:85.

204. Commission Communication of 6 May 2015, "A Digital Single Market strategy for Europe", COM(2015)192 final.

205. Proposal of 9 Dec. 2015 for a Directive on certain aspects concerning contracts for the supply of digital content, COM(2015)634 final and Proposal of 9 Dec. 2015 for a Directive on certain aspects concerning contracts for the online and other distance sales of goods, COM(2015)635 final.

have the right to terminate long-term contracts and contracts to which the supplier makes considerable changes, without a time limit for the supplier's defect liability "because – unlike goods – digital content is not subject to wear and tear".[206] Considering that a defect in respect of digital content can come in a variety of forms, and Article 6 of the proposed directive defines it as any flaw that does not conform to "what was promised in the contract", an important role will be given to the courts to determine defects of digital content in individual cases.[207]

Moreover, while it is claimed that manufacturers have "their heads in the cloud"[208] and the Commission is promoting the rapid adoption of cloud computing in order to boost productivity,[209] it is also obvious that many related legal issues need to be considered in order to avoid difficulties, ranging from security to data ownership issues[210] – i.e. who owns data once it is placed in a cloud and what happens if the cloud provider encounters operating difficulties or even goes bankrupt. At the EU level it was foreseen that the proposed Common European Sales Law (CESL)[211] would offer the general regulatory framework also for contractual issues of cloud computing. With the withdrawal of CESL however, the proposed directive on contracts for the supply of digital content,[212] presented in December 2015, should *inter alia* cover cloud storage services. Additionally, the Commission set up an Expert

206. Commission Fact Sheet, "Digital contracts for Europe: Q&A", MEMO 15-6265 (9 Dec. 2015).

207. Cf. the Dutch case Rb Arnhem, *Silicon Biomedical Instruments B.V.* v. *Erich Jaeger GmbH*, 82879/HA ZA 02-105, where District Court Arnhem observed defects of the software sold to hospitals (attaching data to wrong patient, unattainability of data, abnormal system ends) and concluded that these defects were so serious that normal and elementary use of the software for the purpose it was designed for (use in a busy medical environment) was prevented. Although the court found that it has to be tolerated that new developed software may have "teething troubles" or "start-up problems" in the beginning, it must be possible to use the software in a normal way right from the beginning. More in Fiss, *Die Haftung Für Fehlerhafte Software Im Wettbewerb Der Rechtsordnungen: Eine Rechtsvergleichende Analyse* (Peter Lang, 2013).

208. Hodges, "Collaboration is job No. 1 in manufacturing", *Microsoft Blog* (24 June 2010).

209. In Sept. 2012, the Commission adopted a strategy for "Unleashing the potential of cloud computing in Europe", COM(2012)529 final and a year later it proposed a legislative package for a "Connected continent: Building a Telecoms Single Market", COM(2013)634 final, to boost the cloud computing market in Europe and improve the quality of service that cloud computing can offer.

210. Evans, "Much ado about data ownership", 25 *Harvard Journal of Law & Technology* (2011), 69. Cloud computing is covered by the Network and Information Services (NIS) Directive, which entered into force in Aug. 2016 (COM(2013)48 final).

211. Commission Proposal of 11 Oct. 2011 on a Common European Sales Law, COM(2011)635 final.

212. COM(2015)634 final, cited *supra* note 205. See also DLA Piper UK LLP, "Comparative study on cloud computing contracts", Final Report (March 2014).

Group on Cloud Computing Contracts to identify safe and fair contract terms and conditions for cloud computing services for consumers and small firms, thereby enabling the development of model contract terms.[213]

Finally, the occurrence of free services does not only pose a challenge to competition law, as noted above, but also to consumer law. Indirect invoices diminish price transparency for the consumer who might not be informed about the services share in the price. When long-term warranties are presented by the seller as a free service for the consumer, the latter could encounter difficulties enforcing this warranty if the seller fails to observe it, since the Consumer Rights Directive does not apply to services provided by the trader for free. Nevertheless, the situation should be covered by the Unfair Commercial Practices Directive, which prevents traders from falsely describing their products as free where, in fact, they are not.[214] Moreover, a consumer might be unaware of the real currency in which (s)he is paying for the service.[215] It is nowadays a widespread occurrence that consumers are offered digital content in exchange for personal data which are monetized and even considered as "the crude oil of the digital revolution".[216] In this respect it is important that the Directive on Consumer Rights does not mention "payment" as an essential part of online digital content contracts. The same applies to contracts for free downloading from an application store. The 2015 proposal for a directive concerning contracts for the supply of digital content continues along this path by regulating contracts established in exchange for data, thereby providing that if a consumer has obtained digital content or services in exchange for personal data, the supplier must refrain from using such data if the contract is terminated.[217]

While the servitization process may bring numerous useful solutions to consumers, it also entails dangers for inattentive or uninformed consumers. Quickly developing business models – be it in the form of car-sharing applications, robots, 3D printed hips, houses or pizzas – are challenging legislatures and courts to adapting consumer law to the new industrial

213. COM(2012)529 final, cited *supra* note 209, at 12. See also Art. 29 Data Protection Working Party, "Opinion 05/2012 on cloud computing", adopted 1 July 2012, as well as Expert Group on Cloud Computing Contracts website, available at <ec.europa.eu/justice/contract/cloud-computing/expert-group/index_en.htm>.

214. Directive 2005/29/EC concerning unfair business-to-consumer commercial practices in the internal market, O.J. 2005, L 149/22; Commission Communication of 14 March 2013 on the application of the Unfair Commercial Practices Directive, achieving a high level of consumer protection and building trust in the internal market, COM(2013)138 final, at 3.

215. Sidak, "Do free mobile apps harm consumers?", 52 *San Diego Law Review* (2015), 619.

216. BEUC, "Digital products: EU consumers need clear rights", BEUC position paper (10 Dec. 2012), p. 7; Šefčovič, "Europe 4.0", *EurActiv* (28 Jan. 2016).

217. See Commission Fact Sheet, MEMO 15-6265, cit. *supra* note 227.

revolution. Despite the fact that modern technology can go as far as developing smart refrigerators that warn consumers in shops and at home of the expiry date of food items as well as of their fat and sugar content, this does not mean that technology can take over the protective function of consumer law.

3.5. *Cross-border trade with product-service systems*

Significant challenges for regulatory authorities, entrepreneurs and consumers arise when combinations of products and services are offered across borders. As found by the Commission, the internal market for products has been a frontrunner in EU economic integration.[218] Nowadays the internal market is considered to be "an excellent basis for the digitalization of industry and an advantage in international competition" as well as "the only way to achieve the necessary economies of scale that justify investment and secure the competitiveness of European companies".[219] Nevertheless, as the complexity of servitization solutions increases, companies may find themselves in situations where they are permitted to sell one part of the product-service bundle across the border, but not the entire package. Considering the still existing differences in regulation of free movement of goods and services, a question that arises is whether product-service combinations move across borders under the provisions on free movement of goods or services and furthermore whether it is possible to adapt these rules to the newly developed integrated solutions where boundaries between goods and services are blurred. Additionally, with the fast development of new ICT based servitization models, new national restrictions on cross-border movement of certain technological products may be anticipated.

3.5.1. *From "product or service" to "product and service" approach*

Servitization challenges the established delineation between economic transactions that fall under the TFEU provisions on free movement of goods and services respectively. The servitization movement argues that this distinction is no longer relevant and that one must see a combination or a bundle of products *and* services (so called product-service systems) rather than products *or* services.[220] From the EU law perspective, distinguishing

218. Commission Communication of 22 Jan 2014 on a vision for the internal market for industrial product, COM(2014)25 final, p. 2.

219. VDMA European Office, op. cit. *supra* note 82, at 11.

220. See Vandermerwe and Rada, op. cit. *supra* note 16, at 314, for their claim that it is no longer valid "to draw simplistic distinctions between goods and services" and that it is necessary to move from "the old and outdated focus on goods or services to integrated 'bundles' or systems . . . with services in the lead role".

between goods and services will not always have great practical importance; nevertheless, since there are still some important legal consequences of the distinction, such as the issue of horizontal direct effect and applicability of the selling arrangements exemption,[221] the delineation between goods and services remains. As highlighted by Snell, the differentiating characteristic for the ECJ has been that goods are material objects, whereas services are not.[222] This is in line with Advocate General Fennelly's observation that goods, in the general sense of the word, have tangible physical properties and services do not.[223] In situations of product-service combinations, the ECJ's established approach has been to determine whether within a certain product-service bundle goods or services dominate *(the dominance approach)*. This is evident from the ECJ's ruling in *Burmanjer*, where it stated that an economic activity should be examined in the context of either the free movement of goods or the freedom to provide services, if one of these elements "is entirely secondary in relation to the other and may be considered together with it".[224] Consequently, the production of goods was categorized under goods, not services. In *Commission* v. *France,* the ECJ held that "printing work cannot be described as a service, since it leads directly to the manufacture of a physical article".[225] By contrast, in *Van Schaik*[226] the Court held that a car repair contract constituted the performance of services and not goods since the supply of spare parts was only ancillary to the provision of services. Similarly, restrictions on leasing contracts between Member States were also assessed in light of free movement of services,[227] while in recent VAT cases *Commission* v. *Luxembourg and France*,[228] the Court considered digital books as considerably different from books on physical means of support. Finally, while the decision in *Schindler*, where the ECJ held that lottery activities are

221. Cf. Case C-159/00, *Sapod Audic* v. *Eco-Emballages SA*, EU:C:2002:343; Case C-41/05, *Laval*, EU:C:2007:809 on the one hand and Joined Cases C-267 & 268/91, *Keck and Mithouard,* EU:C:1993:905; C-384/93, *Alpine* Investments, EU:C:1995:126 on the other. For comments, see Krenn, "A missing piece in the horizontal effect 'jigsaw': Horizontal direct effect and the free movement of goods", 49 CML Rev. (2012), 177; Leczykiewicz and Weatherill, The Involvement of EU Law in Private Law *Relationships* (Bloomsbury, 2013); Wenneras and Moen, "Selling arrangements, keeping *Keck*", 35 EL Rev. (2010), 387; Andenæs and Roth, *Services and Free Movement in EU Law* (OUP, 2002).

222. Snell, *Goods and Services in EC Law: A Study of the Relationship between the Freedoms* (OUP, 2002), p. 4.

223. Opinion of A.G. Fennelly in Case C-97/98, *Jägerskiöld*, EU:C:1999:315, paras. 21–23.

224. Case C-20/03, *Marcel Burmanjer*, EU:C:2005:307, paras. 34–35; see also Case C-108/09, *Ker-Optika*, EU:C:2010:725, para 43.

225. Case 18/84, *Commission* v. *France*, EU:C:1985:175, para 12.

226. Case C-55/93, *Van Schaik*, EU:C:1994:363.

227. Case C-451/99, *Cura Anlagen* v. *Auto Service Leasing GmbH*, EU:C:2002:195.

228. Case C-479/13, *Commission* v. *France*; Case C-502/13, *Commission* v. *Luxembourg*.

services within the meaning of Article 56 TFEU, since movement of goods was only ancillary to the provision of services,[229] was no surprise, it is perhaps more unexpected that a recent case concerning Hungarian legislation, which prohibited the operation of slot machines outside casinos, was decided on the basis of the rules on services, not goods.[230]

Cross-border servitization transactions that include a transfer of product ownership will mostly fall under the free movement of goods, while transactions where ownership is kept by the trader will fall under the rules on free movement of services. In the digital era, however, the dominance approach to product-service systems is more problematic, since it is not always easy to establish, which part is "entirely secondary" to the other. Although smart products enabled by the IoT will usually be categorized as goods (e.g. a connected car or a smart phone), it can be claimed that the intangible part of the smart product is not at all secondary in relation to the hardware. In respect of 3D printing, it may be assumed that if a trader sends the customer a printed product, rules on free movement of goods should apply; however, if only the digital design (CAD) is sold and the purchaser prints the product him or herself, rules on free movement of services will most likely apply, considering that the ECJ's approach to digital content depends on the medium: if digital content is not related to a tangible entity, rules on services will apply; if it is, rules concerning goods will apply.[231] Nevertheless, the *UsedSoft*[232] case was decided using the free movement of goods principles even though it referred solely to downloading and storing of software on customers' computers. The ECJ made a number of arguments about the *principle of equivalence* between digital and physical goods, ruling that it made no difference whether a copy of a computer program was made available to the customer by means of downloading or by means of a CD or DVD[233] and that the online transmission method was the "functional

229. Case C-275/92, *H.M. Customs and Excise* v. *Schindler*, EU:C:1994:119, para 27.

230. Case C-98/14, *Berlington Hungary*, EU:C:2015:386. In para 31, the EU Court held: "Without there being any need to regard the importation of slot machines as ancillary to their use, it must be noted that, even though the use of such devices is linked to operations to import them, the former activity comes under the provisions of the Treaty relating to the freedom to provide services and the latter under those relating to the free movement of goods". Conversely, Case C-124/97, *Läärä* v. *Finland*, EU:C:1999:435, concerning national legislation that granted to a single public body exclusive rights to operate slot machines in the national territory, was determined in view of the free movement of goods provisions.

231. Case 155/73, *Giuseppe Sacchi*, EU:C:1974:40; Case C-244/06, *Dynamic Medien Vertriebs*, EU:C:2008:85; Joined Cases C-403 & 428/08, *Football Association Premier League and Others*, EU:C:2011:631; Case C-479/13, *Commission* v. *France*; Case C-502/13, *Commission* v. *Luxembourg*.

232. Case C-128/11, *UsedSoft*.

233. Ibid., para 47.

equivalent" to the supply of a material medium.[234] *UsedSoft* thus moves away from the dominance approach and takes a step towards the *integration approach*, supported by the servitization movement.[235] This is further sustained by the "dynamic" or "evolving" interpretation of Directive 2006/115 on lending rights related to copyright,[236] recently adopted by Advocate General Szpunar, who considered lending of electronic books as "the modern equivalent of the lending of printed books".[237]

The "functional equivalents" approach may be seen as another tile in a mosaic, supported by many authors, who advocate a unified approach to goods and services under EU free movement law, mostly as part of the re-conceptualization of the market freedoms as economic rights to which all EU citizens are entitled.[238] The servitization trend that blurs the distinction between goods and services with many forms of overlapping is thus another potential motivation for the ECJ's acceptance of a more convergent approach between the freedoms. It is true that the Court will not be able to fully abandon the divergent approach as long as there are two separate systems of rules behind this distinction, one for goods and the other for services (and potentially a third for digital content). Nevertheless, many of the differences between the freedoms are not a consequence of EU law, but of the Court itself acting with different degrees of judicial activism.[239] The Treaty proclaims that the freedoms are guaranteed; however, the Court was given and has in fact effectively played the role of the master of the freedoms, determining their scope and limitations. The ECJ thus does not merely apply these sets of rules, but actively co-creates EU law, placing it in a position to contribute to progressive convergence of rules on goods and services into an integrated system of rules thus enabling simplified trade with combinations of products and services.

234. Ibid., para 61. For a plea of the principle of equivalence, see also Braucher, op. cit. *supra* note 82.

235. More in Dreier, "Online and its effect on the "goods" versus "services" distinction",44 *IIC – International Review of Intellectual Property and Competition Law* (2013), 137.

236. Directive 2006/115/EC of 12 Dec. 2006 on rental right and lending right and on certain rights related to copyright in the field of intellectual property, O.J. 2006, L 376/28.

237. Opinion of A.G. Szpunar in Case C-174/15, *Vereniging Openbare Bibliotheken*, EU:C:2016:459, para 30.

238. Maduro, "Harmony and dissonance in free movement", 4 CYELS (2001), 315; Tryfonidou, "Further steps on the road to convergence among the market freedoms", 35 EL Rev. (2010), 36; Andenæs and Roth, op. cit. *supra* note 221. Cf. Oliver, "Goods and services, two freedoms compared" in *Mélanges en hommage à Michel Waelbroeck Vol. II* (Bruylant, 1999), p. 1377. See also Opinion of A.G. Poiares Maduro in Joined Cases C-158 & 159/04, *Alfa Vita Vassilopoulos* v. *Greece,* EU:C:2006:212.

239. Maduro, ibid.

3.5.2. *True (digital) single market for product-service systems*

Despite some existing differences between rules on free movement of goods and services, and considering that the EU Treaties promote both freedoms, barriers to cross-border movement of combinations of products and services should in principle be incompatible with the Treaties. This may lead to a conclusion that integrated product-service solutions that are the result of servitization may use benefits of the single market, regardless of the precise form of the product-service bundle. In line with this, the ECJ ruled in a number of cases that Member States must remove barriers to cross-border servitization transactions.[240] Conversely, any form of mandatory servitization, where national legislation obliged manufacturers to offer services in addition to the product, e.g. by imposing certain guarantees that are beyond sellers' EU obligations, would be considered as a measure having equivalent effect to quantitative restrictions.[241] Furthermore, the servitization trend increases the importance of European services standards to complement the products standards, and consequently remove another aspect of current restrictions on the sale of product-service combinations.[242] Services standards would give the customer an assurance of the degree of professionalism, speed and suitability of the service provider; however, they are currently still underdeveloped.[243] The reasons for this lie in the intangibility of services causing non-transparency – which makes it difficult to demonstrate quality to the customers.[244] This situation restricts sale and leads to market fragmentation, especially when services are linked or even indispensable to the provision of standardized goods; however, they are not covered by the relevant product standards, nor there is any service standard developed.[245] EU law commitments to raising quality of services under the Services Directive[246] may in this respect serve as the necessary legal basis for EU action in the field of services standardization that has been announced in recent policy documents of the Commission.

240. Case C-239/90, *SCP Boscher* v. *SA British Motors*, EU:C:1991:180; Case C-451/99, *Cura Anlagen* v. *Auto Service Leasing GmbH*, EU:C:2002:195.

241. Cf. formal Commission notice addressed to Slovenia for improperly implementing Directive 1999/44/EC on the sale of consumer goods and associated guarantees (O.J. 1999, L 171/12), infringement No. 2009/2126.

242. Commission Staff Working Document of 8 Jan. 2016 on the annual Union work programme for European standardisation for 2016, SWD(2015)301 final.

243. "Business balks at EU plans for services 'standardisation'", *EurActiv* (18 April 2011).

244. Blind, "Opportunities and challenges for service standardisation", 15th EURAS Conference (1 July 2010).

245. Commission Staff Working Document, cited *supra* note 64.

246. Legal basis for EU action in the field of services standardization is provided by Art. 26(5) of Directive 2006/123/EC on services in the internal market, O.J. 2006, L 376/36. See also Recital 102 of the Preamble.

EU free movement law is, however, not only concerned with traditional services that are added to products, but increasingly also with digital services. The fact that the EU digital single market (DSM) has still not been completed poses significant difficulties for manufacturers, particularly those engaged in the digitalization of industry. Considering that the new industry is based on data, free flow of the latter is essential for the digitizing industry. Reinhold Festge from the German Engineering Association (VDMA) is critical towards the delay in the establishment of the DSM, saying that "legislators tend to treat machines from the digital age like machines from the industrial revolution, but connected to the Internet, somehow" and warns that "if the single market is not ready in time, the digitalization of industry will be shaped by companies outside the EU, notably the US".[247] Nevertheless, the DSM Strategy[248] provides a strategic framework for digital economy including smart objects, such as connected cars, and focuses *inter alia* on providing better access to online goods and services for consumers and businesses. As emphasized by the Commission, its aim is "to achieve a single market for the Internet of Things, where any device can plug and play in a trusted way without hindrance from national borders";[249] in its 2016 Action plan on digitizing industry, the Commission announced proposing the initiative on free flow of data within the EU in order to remove or prevent unjustified localization requirements in national regulation.[250] It is thus widely believed that the DSM is "all about time".[251] It is necessary, though, for the single market and the DSM strategies to be coherent and combined into a single strategic growth initiative in order for the new interconnected economy to function.[252]

Moreover, there are some specific fields, where EU harmonization will be needed to prevent the fragmentation of the single market by Member States. The first situation concerns (semi-) autonomous cars. Until recently, a significant obstacle that needed to be dealt with was amending the UN (Vienna) Convention on Road Traffic of 1968, which required that a human driver must be in control of a vehicle at all times. In April 2014, however, the Convention was amended to provide that a driver needs to be able to take

247. Festge, "'Industry 4.0': How European companies can really benefit", *EurActiv* (7 April 2015).

248. COM(2015)192 final, cited *supra* note 204, at 3.

249. See Commission, "An action plan for digitising European industry", Draft (23 Dec. 2015), p. 67.

250. COM(2016)180 final, cited *supra* note 28, p. 13.

251. Valero, "Kaja Kallas: Digital Single Market 'is all about time'", *EurActiv* (19 Jan. 2016).

252. VDMA European Office, op. cit. *supra* note 82, at 12.

control of the car at all times, instead of operating it at all times.[253] This means that fully autonomous cars that do not contain a steering wheel, such as the Google car currently under development, are not allowed on the road in Europe. However, in respect of semi-autonomous cars, various EU Member States already allow road tests and are in the process of developing legislation that will allow road use of such vehicles. Some other Member States are, however, more reluctant and might claim road safety justifications for their potential prohibition of such cars on the roads on their territory.[254] Considering the compartmentalized EU territory and increased mobility of EU population, it is thus paramount that EU develops a harmonized legal framework that addresses concerns on liability and self-driving functionality on time.[255]

Secondly, while the masses are amazed by the advancements and astonishing developments in the 3D printing sector, this new technology also enables home production of 3D printed guns, exactly like the one developed by a law student at the University of Texas.[256] Although there were initial doubts as to the shortcomings of such guns, it is now evident that they are sound and fully operational.[257] Further concerns arise from the fact that only two days after this Texas student released his blueprint on Pirate Bay, it was downloaded over 100,000 times.[258] The US Bureau of Explosives issued a public warning that 3D printed firearms "can defeat normal detection such as metal detectors" and could therefore "present a problem to public safety".[259] The Commission warned about threats connected to 3D printed guns already

253. Miles, "Cars could drive themselves sooner than expected after European push", *Reuters* (19 May 2014).

254. Stupp, "Member States divided over driverless car agreement", *EurActiv* (13 April 2016). Cf. Case C-639/11, *Commission* v. *Poland*, EU:C:2014:173, and Case C-61/12, *Commission* v. *Lithuania*, EU:C:2014:172, where the EU Court held that the obligation imposed by Poland and Lithuania to reposition the steering-wheel of right-hand drive passenger vehicles to the left-hand side infringed EU law, as such a measure went beyond what is necessary in order to ensure road safety.

255. Lengton et al., op. cit. *supra* note 63; Kim et al., "Comparative analysis of laws on autonomous vehicles in the US and Europe" in *AUVSI Unmanned Systems 2014 Vol. 1,* (Orlando, 2014), pp. 740–751.

256. Greenberg, "Meet the liberator: Test-firing the world's first fully 3D-printed gun", *Forbes* (5 May 2013).

257. Johnson, "Plastic guns made With 3-D printers pose new security concerns", NPR (14 Nov. 2013).

258. Greenberg, "3D-Printed Gun's Blueprints Downloaded 100,000 Times In Two Days (With Some Help From Kim Dotcom)", *Forbes* (May 2013).

259. Johnson, op. cit. *supra* note 257; Lee, "Where Gutenberg meets guns: The liberator, 3D-printed weapons, and the First Amendment", 92 *North Carolina Law Review* (2013), 1393; Dubin, "Guns, sex, and freedom" (Dec. 2013), available at <ssrn.com/abstract=2385701>.

in its Communication of October 2013,[260] and made a commitment to follow the development in its proposal on amending the EU Firearms directive from November 2015.[261] Considering the lack of express prohibition of 3D printed guns at the EU level, the UK recently made a decision to make "the manufacture, sale or possession" of 3D printed guns illegal.[262] Other Member States are likely to follow and would probably be successful in raising public security justification in case of claims against restrictions on free trade of such products.

Similar fragmentation of the internal market might also arise in relation to the so-called "social robots". These are designed to personally interact with their human owners and are almost indistinguishable from their human counterparts.[263] Despite their appearance, however, they are not afforded with legal protection similar to human beings, but are considered as simple chattels, just like an umbrella. This becomes problematic when such social robots are manufactured for purposes of sexual exploitation of children. The new technology enables the transformation of lifeless sex dolls, which may already be purchased over the Internet, into complex machines that look and act like real human beings.[264] Regulation in respect of social robots is mostly limited to property law provisions, affording their owner full control, even though robots look like children and are intended for sexual use, without any special protection that is for example nowadays afforded to animals.[265] It is subject to discussion whether this is appropriate; however, from the EU internal market perspective one may quickly make an analogy to *Conegate*,[266] in which the UK unsuccessfully relied on public morality concerns to restrict free movement of "love-dolls", considering that the UK did not object to domestic production of those same products. Had this protectionism not occurred, the ECJ would probably have approved the restriction on free movement.[267] Without EU harmonizing legislation concerning trade with driverless cars, 3D printed guns and social robots, Member States will be able to restrict access of these products to their national markets, claiming public morality, security and road safety as imperative requirements in public interest that justify these derogations.

260. Commission Communication of 21 Oct. 2013, "Firearms and the internal security of the EU: Protecting citizens and disrupting illegal trafficking", COM(2013)716 final.

261. See Art. 17 of the Proposal of 18 Nov. 2015 for a Directive amending Directive 91/477/EEC on control of the acquisition and possession of weapons, COM(2015)750 final.

262. UK Home Office, Guide on Firearms Licensing Law (Dec. 2015), at 24.

263. Dubin, op. cit. *supra* note 259, at 14.

264. Bowler, "Will we ever want to have sex with robots?", *BBC News* (27 Aug. 2013).

265. Darling, "Extending legal rights to social robots" (April, 2012), available at <ssrn.com/abstract=2044797>.

266. Case 121/85, *Conegate Limited* v. *HM Customs & Excise*, EU:C:1986:114.

267. As the ruling in Case 34/79, *Henn and Darby*, EU:C:1979:295, affirms.

3.5.3. *Servitization v. globalization*

EU regulatory responses to servitization may not, however, ignore the other modern day economic megatrend, i.e. globalization. Since EU-wide harmonization cannot attain all business aims related to the new economy, it is essential to invest effort into achieving regulatory counterparts at an international level. New ways of more accurate measuring of trade show that services' share of exports is "significantly greater" than previously believed, particularly when services provided by manufacturing companies are also taken into account.[268] At the same time, however, placement of product-service combinations on the international market is facing restrictions due to barriers on free movement of goods and services at a global level. As an illustration, even though Japan has no tariffs on cars imported from the EU, it imposes a range of barriers to delivery of associated services, such as distribution, insurance, financial solutions, maintenance and repair of vehicles. Due to the higher costs of services associated with owning a foreign vehicle compared to a Japanese one, a study has shown that in Japan popular European cars are sold at a 90 percent mark-up compared to European listed prices.[269] Several other types of servitization transactions are not possible at an international level, as the liberalization of services provided by means of temporary movement of individuals is one of the most restricted areas of international trade.[270] Stringent restrictions apply to temporary staff relocation between company subsidiaries as well as to temporary relocation of independent service providers closer to their clients.[271] Such movement of professionals is particularly important for knowledge-intensive sectors and the current lack of liberalization prevents the development of proximity between manufacturer and consumer.[272] In this respect, it should be noted, however, that since July 2014 the EU and 16 other WTO members have been negotiating an Environmental Goods Agreement (EGA), whose aim is to

268. High-Level Group on Business Services, Final Report (April 2014), Ref. Ares(2014)1095851, p. 25. The Commission has estimated in its Communication, COM(2015)497 final, cited *supra* note 65, p. 10, that services now make up almost 40 % of the value of goods exported from Europe.

269. Lee-Makiyama, "FTAs and the crisis in the European car industry", ECIPE Policy Brief No. 02/2012, p. 11; Aner and Rentzhog, op. cit. *supra* note 64.

270. Lee-Makiyama, "Future-proofing world trade in technology: Turning the WTO IT Agreement (ITA) into the International Digital Economy Agreement (IDEA)", ECIPE Working Paper No. 04/2011, p. 21.

271. Conversely, in order to facilitate multinational companies to temporarily assign highly skilled third country nationals to subsidiaries situated in the EU, the EU adopted Directive 2014/66/EU on the conditions of entry and residence of third-country nationals in the framework of an intra-corporate transfer, O.J. 2014, L 157/1, which the 25 participating EU Member States need to transpose by 29 Nov. 2016.

272. Aner and Rentzhog. op. cit. *supra* note 64, at 21.

remove barriers to trade in environmental or "green" goods. As a world leader in import and export of environmental goods, the EU has ambitions to include services related to exports of environmental goods (e.g. repair and maintenance of wind turbines or solar panels) in the EGA. Once this is adopted its benefits will be applied to all WTO members using the Most Favoured Nation (MFN) principle[273] and will thus liberalize international trade in the environmental product-service systems.

Furthermore, requirements for local establishment often severely restrict access of foreign product-services providers to the market. Norway for example requires registrants for the ".no" domain, which makes an online service more visible to Norwegian consumers, to establish a local company or a branch in the country.[274] Moreover, current rules on technical barriers to trade (TBT) focus on barriers to goods in the form of regulations, standards, testing and certification procedures; however, when services are embedded in the product or delivered together with the product, services barriers can be like TBT barriers and have TBT-like effects.[275] Consequently, the Commission emphasized in its 2015 trade strategy that "the rise of services embedded in manufacturing calls for still greater focus on liberalizing services both within the EU and with the rest of the world", underlining that it is increasingly essential to improve market access for manufacturing and services in conjunction with each other, thereby moving beyond the traditional separation of liberalization commitments for goods and services in trade negotiations.[276]

Additionally, the servitization process enhanced by the Internet gives rise to new types of trade barriers.[277] The Internet economy is radically transforming international trade, making it increasingly possible for companies of all sizes to sell their products to customers around the world and not just for the large ones which have the resources to open international offices and deal with numerous related challenges.[278] However, a *conditio sine qua non* for such transactions is an open Internet. In this context, European companies are still encountering significant barriers worldwide, such as non-transparent rules, government interference, unjustified data localization and data storage requirements. Although the WTO rules govern all trade in goods and services, including international trade over the Internet, barriers to the latter arise due to the fact that governments worldwide are adopting increasing restrictions on

273. Commission, "The Environmental Goods Agreement (EGA): Liberalising trade in environmental goods and services", *News archive* (8 Sept. 2015).

274. Gerwin, op. cit. *supra* note 50, at 5.

275. Aner and Rentzhog, op. cit. *supra* note 64, at 23.

276. COM(2015)497 final, cit. *supra* note 65, at p. 11.

277. Lee-Makiyama, op. cit. *supra* note 270, at 24, claims the Internet is "perhaps the most important innovation for globalization since the maritime shipping lanes".

278. See also COM(2015)497 final, cited *supra* note 65, p. 12.

the Internet and digital trade.[279] Data protectionism may be justified by privacy and national security issues; however, it is often directly driven by economic protectionism.[280] The fact that free flow of data is thus far not comprehensively regulated by any trade agreements,[281] presents a serious problem for the digitizing industry and for EU competitiveness in general.[282] In this respect it is promising that on 19 December 2015, at the WTO ministerial conference in Nairobi, members confirmed the expansion of product coverage of the Information Technology Agreement (ITA),[283] which should lead to the removal of customs duties on 201 high-tech products by 2019. This is, according to the WTO Director General, part "of the biggest reforms in global trade policy for 20 years",[284] while the EU Trade Commissioner Cecilia Malmström commented that the agreement "clearly shows that countries around the world can work together to achieve solutions that benefit everyone".[285] Considering that topics of digital trade and IoT are also on the negotiation table, further progress may be hoped for, but expectations should not be too high – at least when considering the worldwide response to the EU's regulation of global privacy in the recently adopted Data Protection Regulation.

Finally, it is noteworthy that specific legal challenges arise in relation to dual-use products that are still subject to export control with the purpose of preventing the proliferation of nuclear, chemical and other forms of arms.

279. Gerwin, op. cit. *supra* note 50, at 4.

280. Hindley and Lee-Makiyama, "Protectionism online: Internet censorship and international trade law", ECIPE Working Paper No. 12/2009.

281. Although there is growing debate over it, particularly in negotiations on TTIP; see "U.S. boosted by digital trade but internet barriers remain: Report", *Reuters* (15 Aug. 2013); Stupp, "Officials call for TTIP digital trade boost as US-EU tech tensions linger", *EurActiv* (24 July 2015). Also the 2016 World Economic Summit in Davos was titled "Mastering the Fourth Industrial Revolution"; see Georgi, "Davos Pitches 'tech revolution' in the face of mounting pessimism", *EurActiv* (20 Jan. 2016).

282. Meltzer, "The internet, cross-border data flows and international trade", 2 *Asia & the Pacific Policy Studies* (2015), 90; Commission Communication, COM(2015)497 final, cit. *supra* note 65, at 12.

283. "WTO members secure 'historic' Nairobi Package for Africa and the world", 10th Ministerial Conference, (19 Dec. 2015), available at <www.wto.org/english/news_e/news15_e/mc10_19dec15_e.htm>. More in Anderson and Mohs, "The Information Technology Agreement: An assessment of world trade in information technology products", (2010) *Journal of International Commerce & Economics*; Dreyer and Hindley, "Trade in information technology goods: Adapting the ITA to 21st century technological change", ECIPE Working Paper No. 06/2008.

284. Speech of Azevêdo, "Build on historic success of Nairobi to tackle urgent challenges facing the WTO", (19 Jan. 2016), available at <www.wto.org/english/news_e/spra_e/spra109_e.htm>.

285. Commission, "Trillion-euro global high-tech trade deal agreed", *News archive* (24 July 2015).

Under EU legislation controlled dual-use items may not leave the EU customs territory without an export authorization issued by the relevant authority of the Member State in which the exporter is registered.[286] The list of dual-use products includes cryptography products that are essential for secure operation of nearly all organizations and that are fundamental for the protection of individuals' privacy worldwide. Cryptography allows for the protection of sensitive information either in storage or in communication.[287] Many IT products, services and businesses depend on strong cryptography. E-commerce would not have flourished had customers feared that every time they made an online purchase, they were placing their credit card information at risk of compromise. However, by controlling the use of cryptography, countries hinder the development of their IT and e-commerce markets in general.[288] Restrictions on importation and use of cryptography also have substantial effects on the operations of multinational companies.[289] Forcing disclosure of source codes or keys thus presents a problem for the digitizing economy in general[290] and there is a rising pressure to remove trade barriers of this kind.[291] Despite such pressure, Banisar's prediction from nearly two decades ago that "the battle will continue for the foreseeable future because the stakes are too high for everyone"[292] still stands.

To conclude, although servitization and globalization are two distinct megatrends of modern society, they cannot be treated separately when discussing amendments to existing trade rules within and outside the EU single market. Although servitization was at first considered to be a concept restricted to a limited number of developed countries, it is nowadays increasingly relevant also for companies in developing countries.[293] The former and the latter will thus need to find a way to come to an understanding on trade regulation concerning new product-service systems. In this respect the Commission stated that "regulatory cooperation, mutual recognition and

286. Regulation (EC) 428/2009 of 5 May 2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, O.J. 2009, L 134/1.

287. Saper, "International cryptography regulation and the global information economy", 11 *Northwestern Journal of Technology and Intellectual Property* (2012), 673.

288. Ibid., at 684.

289. Ibid., at 685. See also Messmer, "Encryption restrictions", *Network World* (14 March 2004); McNulty, "Encryption's importance to economic and infrastructure security", 9 *Duke Journal of Comparative & International Law* (1998), 427.

290. Sachs, "Handelsbeschränkungen für Dual-Use-Güter" in Bräutigam and Klindt, op. cit. *supra* note 14, p. 140.

291. VDMA European Office, op. cit. *supra* note 82. See also Valero, "Ansip: 'I Am strongly against any backdoor to encrypted systems'", *EurActiv* (23 Feb. 2016).

292. Banisar, "Stopping science: The case of cryptography", 9 *Health Matrix: Journal of Law-Medicine* (1999), 253.

293. Bao and Toivonen, "Cultural differences in servitization: Nordic manufacturers in China", 6 *Journal of Science & Technology Policy Management* (2015), 223.

harmonization of standards are the best tools to address the challenges of the digital economy"[294] – a statement with which EU's trading partners probably agree – but the devil is in the detail.

4. Conclusion: People's dimension of servitization

Although the word may be new, servitization and related concepts promoting the idea that it is not necessary to buy products in order to access the benefits they provide are not new. Wilson gives an example of pineapples, which were first introduced to Europe in the 17th century and were so expensive that poorer middle-class families would even take to hiring pineapples for occasions when they wished to entertain, in order to appear impressive.[295] Since then Europe has walked a long road. As found by the EU High-Level Group on Business Services, servitization "offers opportunities to revolutionize the manufacturing sector".[296] In this competition to attract private investment it will be challenging, however, to achieve coherent development of all the Member States and to avert further disparities between large and small companies.

EU law needs and probably can adjust quite quickly to this hasty development of industry and technology. All the stakeholders involved will, however, have to consider whether society can adjust to this development equally fast – will people be able to develop the necessary working skills; will this "technological tsunami" make us safe?[297] The Commission finds that about 40 percent of EU workers, in particular women, have an insufficient level of digital skills; it has already outlined a need for re-skilling the work force as one of the main challenges of the EU digitizing industry strategy, claiming that "all jobs will change and many will disappear".[298] True, the digitizing industry will not replace people in production, but it will allow for a new division of labour between people and machines, where routine physical and mental tasks will increasingly be replaced by coordination and

294. COM(2015)497 final, cited *supra* note 65, at 12.

295. Wilson, "Canned Truth", *The Times* (30 Nov. 2005).

296. High-Level Group on Business Services, op. cit. *supra* note 268, at 28.

297. See e.g. The Digital Economy and Society Index (DESI) that monitors the digital development of EU society; Chappell, "Tech transformation: 4th industrial revolution 'tsunami' warning in Davos", *Euronews* (20 Jan. 2016).

298. See Lamborelle and Fernandez, "Women in ICT: How do EU Member States measure up?" *EurActiv.com* (28 April 2016) and Commission, DG Connect, "Action Plan for Digitising European Industry", Draft (23 Dec. 2015), p. 11. Thus: 90 % of jobs in digitizing industry require some level of digital skills, 40 % of companies trying to recruit ICT professionals have difficulty doing so, estimating 800,000 vacancies for ICT professionals in the EU by 2020. See also High-Level Group on Business Services, op. cit. *supra* note 268, at 63–75.

control roles.[299] Servitization will thus have a direct impact not only on EU companies and consumers, but also on a large proportion of EU students and workers.

To conclude: we are in the midst of a *servitization-digitalization-globalization* hurricane. While some may fear and attempt to stop this, it is unlikely that such attempts will yield substantial results. It seems a lot more constructive to try and make the best of it and accept it as a development that is working to our benefit. A smart regulatory response, involving all stakeholders, may in this respect offer a crucial contribution in curtailing the negative implications of the new industrial wave for the European economy and society.

299. VDMA European Office, op. cit. *supra* note 82, at 4; Van Est and Kool (Eds.), *Working on the Robot Society: Visions and Insights from Science Concerning the Relationship between Technology and Employment* (Rathenau Instituut, 2015).

COMMON MARKET LAW REVIEW

Subscription information
2017 Online Subscription Price Starting at EUR 788/ USD 1119/ GBP 566.
2017 Print Subscription Price Starting at EUR 834/ USD 1180/ GBP 595.

Personal subscription prices at a substantially reduced rate are available upon request. Please contact our sales department for further information at +31 172641562 or at lrs-sales@wolterskluwer.com.

Payments can be made by bank draft, personal cheque, international money order, or UNESCO coupons.

Subscription orders should be sent to:

Kluwer Law International
c/o Turpin Distribution Services Ltd
Stratton Business Park
Pegasus Drive
Biggleswade
Bedfordshire SG18 8TQ
United Kingdom
e-mail: lrs-sales@wolterskluwer.com

All requests for further information and specimen copies should be addressed to:

Kluwer Law International
P.O. Box 316
2400 AH Alphen aan den Rijn
The Netherlands
fax: +31 172641515

or to any subscription agent

For Marketing Opportunities please contact lrs-marketing@wolterskluwer.com

Please visit the Common Market Law Review homepage at http://www.kluwerlawonline.com for up-to-date information, tables of contents and to view a FREE online sample copy.

Microfilm and Microfiche editions of this journal are available from University Microfilms International, 300 North Zeeb Road, Ann Arbor, MI 48106, USA.

The Common Market Law Review is indexed/abstracted in Current Contents/Social & Behavioral Sciences; Current Legal Sociology; Data Juridica; European Access; European Legal Journals Index; IBZ-CD-ROM: IBZ-Online; IBZ-lnternational Bibliography of Periodical literature on the Humanities and Social Sciences; Index to Foreign Legal Periodicals; International Political Science Abstracts; The ISI Alerting Services; Legal Journals Index; RAVE; Social Sciences Citation Index; Social Scisearch.