

Adam A. Ambroziak*

Servitization or Reindustrialization of the EU in the Context of the Economic Crisis of 2008–2010¹

Abstract: *Recently, following the period of fascination with services, we can hear more and more often about the need for reindustrialization in the European Union, as an opposition to the rapid development of the service sector. As a result of economic crisis of 2008–2010, instead of introducing new business models which implement a concept of servitization that would facilitate the functioning of the EU internal market, we have witnessed reinforced protectionist and interventionist tendencies in both the manufacturing and service sectors. The aim of this paper is to verify whether the European Union is facing deindustrialization and/or servitization processes in the context of the economic crisis of 2008–2010. We therefore analyse and evaluate changes in the contribution of certain manufacturing and service sectors to the EU economy and internal/external EU trade in the period of 2004–2012. The research shows an increasing importance of the service sector, especially manufacturing-related services, and especially in the period of the economic crisis. It seems that the expansion of the service sector has allowed entrepreneurs to join servitization and improve their competitiveness in the EU internal market. Thus, servitization may lead to reindustrialization rather than deindustrialisation in Europe.*

Keywords: EU industrial policy, EU Internal Market, servitization, services, International trade, JEL codes: L50, L60, L88, H71, F13

* Prof. Adam A. Ambroziak, Ph.D. – Jean Monnet Chair of European Integration, Collegium of World Economy, Warsaw School of Economics, Poland, e-mail: adam.ambroziak@sgh.waw.pl.

¹ This article has been prepared within the framework of a research project conducted in the Collegium of World Economy at the Warsaw School of Economics.

Introduction

The economic crisis of 2008–2010 in the European Union revealed substantial problems in financial services in the US. Due to strong interlinkages between both global partners, the effects of financial crisis in the US, which was initiated by the bankruptcy of Lehman Brothers Bank, were immediately observed in the EU. The powerful position of the financial sector and its influence on the real economy resulted in abrupt problems in regular companies' access to finances. This slowed down the growth and development of the EU economy as a whole, but the manufacturing industry was one of the sectors which most experienced a stagnation. At the same time, we could observe a relatively stable increase in role of services in value added, as well as in internal EU trade.²

The European Union became interested in the value added of the service sector in the 2000s, even though based on the Treaties from the 1950s the freedom to provide services has been one of the four freedoms of the EU internal market. And although the service directive of 2006, after a very long and stormy discussion within the EU institutions, entered into force nearly a decade ago, many Member States have either still not implemented it fully and properly, or have imposed new barriers on service providers from other countries. Moreover, after the crisis protectionist and interventionist tendencies emerged in the European Union and many politicians have begun to ask for a reindustrialisation of the EU and for the adoption of a new EU industrial policy as a balance against service sector liberalisation. The main argument in favour of this demand is the decreasing share of industry in the EU's GDP.

Based on some research, the discussion on the EU industry, and the concept of a new industrial policy,³ as well as the implications and challenges of EU law,⁴ the aim of the paper is to verify whether the European Union faces deindustrialization or/and servitization following the crisis period of 2008–2010. Our main hypothesis is that the development of the service sector and its increased share in the EU economy and trade in

² A.A. Ambroziak, *Reindustrialization or servitization: trade tendencies in the European Union internal market* in: *Unia Europejska wobec wyzwań przyszłości. Aspekty prawne, finansowe i handlowe*, E. Małuszyńska, G. Mazur, P. Idziak (eds.), Poznań 2015, pp. 225–240.

³ Ibidem; A.A. Ambroziak, *Renaissance of the European Union's Industrial Policy*, "Yearbook of Polish European Studies", No. 17/2014, pp. 37–58; A.A. Ambroziak (ed.), *New Industrial Policy of the European Union*, Switzerland 2017; K. Gawlikowska-Hueckel, *Polityka przemysłowa i spójności wobec planów reindustrializacji Unii Europejskiej. Wnioski dla Polski*, „Gospodarka Narodowa”, No. 273(5)/2014, pp. 53–80.

⁴ J. Hojnik, *The servitization of industry: EU law implications and challenges*, "Common Market Law Review", No. 53/2016, pp. 1575–1623.

recent years has neither slowed down nor reduced the development of manufacturing and its importance to EU economic growth. To verify this, we analysed and evaluated changes in the contribution of certain manufacturing and service sectors into the EU economy and internal/external EU trade in the period 2004–2012.

The paper is structured as follows. First we explain the concept of servitization as a phenomenon connecting services and manufacturing sectors. Next, we present the data limitations, selection of sectors for research and the main indices used to evaluate their position in the EU economy and trade. This part of the paper is followed by an overview of the positions of many manufacturing and service sectors in the EU economy. Then we discuss the outcomes of our research and at the end offer some general conclusions.

1. The concept of servitization

Although interest in servitization has burgeoned recently, the roots of its evolution date back to the 1960s.⁵ At that time, products were seen mostly as combinations of the tangible and the intangible, and constituted a total package of benefits the customer received when he or she made a purchase.⁶ However, the modern approach recognises that services have dominated the global economy and are no longer a separate category. Many manufacturing companies have consciously shifted towards services to gain competitive ground, a move that already in 1988 came to be called the ‘servitization’ of business. Due to deregulation, technology, globalization, and competitive pressure, this phenomenon has been observed in almost all industries on a global scale.⁷

While there are several different types of servitization: a) product-oriented services, b) use-oriented services, c) and result-oriented services;⁸ from the manufacturing point of view the most important is a product service-system. This represents the evolution of traditional generic and standardised services towards targeted and personalised ones and the extension of the service component around products, going beyond manu-

⁵ H. Lightfoot, T. Baines, P. Smart, *The servitization of manufacturing*, “International Journal of Operations & Production Management”, No. 33(11/12)/2013, p. 1427.

⁶ T. Levitt, *Marketing Success through Differential of Anything*, “Harvard Business Review”, No. 58(1)/1980, pp. 84–85.

⁷ S. Vandermerwe, J. Rada, *Servitization of Business: Adding Value by Adding Services*, “European Management Journal”, No. 6(4)/1988, pp. 314–315.

⁸ A. Tukker, *Eight Types of Product-Service System: Eight Ways to Sustainability? Experiences from Suspronet*, “Business Strategy and the Environment”, No. 13(4)/2004, pp. 248–249.

facter's traditional product-oriented core offerings.⁹ Therefore entrepreneurs may offer a service and an additional good, or a good and an additional service, with all components of the set being equally important for achieving full functionality.¹⁰ It seems that, rather than transitioning from products to services, firms expand their business by adding new, and bundling existing, services to their portfolio, and infusing higher levels of services into their offering.¹¹ Consequently, there are many examples of companies operating in different sectors of economy, e.g. both manufacturing and services (the phenomenon of an 'industry as a service provider'¹²). New services are either embodied in the utility of material artefacts, or need material artefacts to enable service delivery.¹³ It is worth observing that the dematerialisation of physical products is merging the trends in digitization and servitization in the offers of product firms.¹⁴

The concept of servitization responds to the trend existing in industrialised lifestyles, including shortened product lifetime, increased individualisation, and property ownership by finding solutions for the extension of a product's lifetime, increased collective/shared use, and using, not owning, a product.¹⁵ These new tendencies force companies to compete by either providing 'solutions' rather than individual products or services¹⁶ or selling a product's function rather than a product's ownership.¹⁷ Consequently, in servitization the emphasis is on the 'scale of use' rather

⁹ N. Morelli, *Product service-systems, a perspective shift for designers: a case study – The design of a telecentre*, "Design Studies", No. 24(1)/2003, p. 74; O. Benedettini, A. Neely, M. Swink, *Why do servitized firms fail? A risk-based explanation*, "International Journal of Operations and Production Management", No. 35(6)/2015, p. 947.

¹⁰ M. Goedkoop, C. van Halen, H. te Riele, P. Rommes, *Product Services Systems, Ecological and Economic Basics. Report 1999/36*, VROM, Den Haag 1999, p. 18.

¹¹ Ch. Kowalski, Ch. Windahl, D. Kindström, H. Gebauer, *What service transition? Rethinking established assumptions about manufacturers' service-led growth strategies*, "Industrial Marketing Management", No. 45(2)/2015, p. 65.

¹² G. Lay (ed.), *Servitization in Industry*, Cham, Heidelberg, New York, Dordrecht, London 2014, p. 2.

¹³ M.B. Cook, T.A. Bhamra, M. Lemon, *The transfer and application of Product Service Systems: from academia to UK manufacturing firms*, "Journal of Cleaner Production", No. 14(17)/2006, p. 1456.

¹⁴ F. Vendrell-Herrero, O.F. Bustinza, G. Parry, N. Georgantzis, *Servitization, Digitization and supply chain interdependency*, "Industrial Marketing Management", No. 60, p. 69.

¹⁵ O.K. Mont, *Product-Service Systems, Final Report*, The International Institute of Industrial Environmental Economics, Lund University 2000, p. 36.

¹⁶ T. Brady, A. Davis, D.M. Gann, *Creating value by delivering integrated solutions*, "International Journal of Project Management", No. 23(5)/2005, p. 360.

¹⁷ A. Plepys, E. Heiskanen, O. Mont, *European policy approaches to promote servitizing*, "Journal of Cleaner Production", No. 97(15)/2015, p. 117.

than the 'sale of a product',¹⁸ which may affect the structure of a country's Gross Domestic Product and its international trade.

There are many reasons why manufacturers include more services in their total offerings. First, competition in traditional product sectors, including from low-cost ones, together with decreased sales margins due to commoditisation, are driving companies to extend their businesses with new offerings that include a relatively high degree of service content,¹⁹ technological improvements,²⁰ as well as intellectual property, product image and brand name, and aesthetic designs and styling that only services can create,²¹ all with the aim of facilitating the sales of their goods, creating growth opportunities in mature markets, balancing the effects of economic cycles with different cash-flows, lengthening customer relationships, and responding to demand.²² Thus, it seems that servitization satisfies a very popular piece of advice to manufacturers, no matter which sector they represent: to remain competitive they should 'move up the value chain' and focus on delivering knowledge intensive goods and services.²³

As regards customer relationships, on one hand by offering different product services during various stages of the lifecycle, a supplier can accommodate to the needs of customers²⁴ through product/service bundles,²⁵ while on the other hand the value added in product and service operations can be enhanced through implementing mass customization, which recognizes each customer as an individual, all the while extracting maximum reusability to achieve the economy of scale.²⁶ It seems that servitization can ensure more and longer-term client relationships and better feedback

¹⁸ T.S. Baines et al., *State-of-the-art in product-service systems*, "Journal of Engineering Manufacture", No. 221(10)/2007, p. 1543.

¹⁹ D. Kindström, *Towards a service-based business model – Key aspects for future competitive advantage*, "European Management Journal", No. 28(6)/2010, p. 479.

²⁰ J.B. Quinn, T.L. Doorley, P.C. Paquette, *Beyond Products: Services-Based Strategy March–April*, 1990, pp. 58–59.

²¹ O.K. Mont, *Product-Service Systems...*, op.cit., p. 32.

²² S. Brax, *A manufacturer becoming service provider – challenges and a paradox*, "Managing Service Quality: An International Journal", No. 15(2)/2005, p. 142.

²³ T.S. Baines, et al., op.cit., p. 1544.

²⁴ R.T. Frambach, I. Wels-Lips, A. Gündlach, *Service Strategies. An Application in the European Health Market*, "Industrial Marketing Management", No. 26(4)/1997, p. 343.

²⁵ S. Stremersch, S. Wuyts, R.T. Frambach, *The Purchasing of Full-Service Contracts: An Exploratory Study within the Industrial Maintenance Market*, "Industrial Marketing Management", No. 30(1)/2001, pp. 1–2.

²⁶ J. Jiao, Q. Ma, M.M. Tseng, *Towards high value-added products and services: mass customization and beyond*, "Technovation", No. 23(10)/2003, p. 819.

on consumer needs, which should make it possible to meet their expectations, thus reducing unnecessary costs of product marketing²⁷ and receiving valuable information from the market.²⁸

As regards the overall consequences of servitization, it is worth noting that increases in the sales of services can offset initial reductions in goods sold, therefore employment lost in manufacturing can be balanced by jobs created in services.²⁹ Nevertheless, some direct benefits for manufacturing sectors can also be expected: a) additional value to a product; b) a growth strategy based on innovation in a mature industry; c) improvement of relationships with customers; d) improvement of the total value for the customer.³⁰ However, it seems that the effects of the sales of services sales on firm value are highly contingent on the firm and industry; the transition to services is substantially more effective for firms that offer services related to their core production business³¹ and it is mainly limited to services that are closely related to products, such as project design, consultation and planning, development, technical documentation and maintenance.³²

2. Methodology and data limitations

Due to the fact that the EU internal market is a key factor for EU competitiveness, we compared both the positions and changes in the shares of selected sectors in value added with their importance and changes in their shares in internal and external EU trade. However, the results should be read bearing in mind that they may contain certain errors arising from different classifications and complications in attributing goods and services traded in the internal market to selected sectors which manufacture or provide them. Data concerning the value added of selected sectors were broken down by statistical classification of economic activities in the European Union (NACE), and data concerning trade in goods were classified according to the Combined Nomenclature (CN) while data concerning trade in services were grouped according to codes of the balance

²⁷ A. Tukker, C. van Halen (eds.), *Innovation Scan Product Service Combinations*, Manual. PricewaterhouseCoopers, Utrecht, the Netherlands 2003, pp. 24, 32.

²⁸ S. Brax, K. Jonsson, *Developing integrated solution offerings for remote diagnostics*, "International Journal of Operations & Production Management", No. 29(5)/2009, p. 556.

²⁹ M. Goedkoop, C. van Halen, R. te Riele, P. Rommes, op.cit., p. 11.

³⁰ O.K. Mont, *Clarifying the concept of product-service system*, "Journal of Clearer Production", No. 10(3)/2002, pp. 239–240.

³¹ E. Fang, R.W. Palmatier, J.B. Steenkamp, *Effect of service transition – strategies on firm value*, "Journal of Marketing", No. 72(5)/2008, p. 11.

³² G. Lay (ed.), op.cit., p. 9.

of payments. Using the correspondence tables developed by Eurostat, the World Trade Organisation, and the United Nation Statistics Division, for four-digit NACE Rev.2, ISIC, CPC, HS and CN codes or, alternatively, three-digit codes of items of the balance of payments; we correlated trade in goods and services with value added of the manufacturing and service sectors.

In this research we decided to analyse only selected manufacturing and service sectors, i.e. those which are directly linked to a) the real economy (which excludes financial and insurance services) without agriculture, b) manufacturing, or c) constitute separate business industries. Moreover, we excluded from our further analysis the mining sector and services not intended to be offered across European borders within the EU internal market, such as: electricity, gas, steam and air conditioning supply, water supply; sewerage, waste management and remediation activities; accommodation and food service activities; publishing activities; real estate activities; other professional, scientific and technical activities; veterinary activities; public administration; defence; education; human health and social work activities; arts, entertainment and recreation; other service activities; and activities of households and extra-territorial organizations and bodies. Finally, in order to reduce the number of potential errors we aggregated similar or closely-interrelated sectors into bigger and broader categories. Consequently, we received twelve manufacturing and fifteen service activities (Table 1) and termed them collectively the Internal Market Business Activities (IMBA).

The above mentioned IMBA sectors constitute 47.4 per cent of the total value added of the EU-28 in 2012 (compared to 50 per cent in 2004). In order to distinguish the sectors of the highest and the lowest importance to the EU economy, we analysed changes in their nominal values and shares in value added in the period 2004–2012. Based on the above, we created four groups of economic sectors of the EU economy. Then we analysed their position and export dependence in internal and external EU export, and in order to assess the competitiveness of the above-mentioned sectors we calculated RCA³³ for internal EU export, Corrected Revealed Comparative Advantage (CRCA) for external EU exports (adjusted for total trade imbalances³⁴) for the period of 2004–2012.

³³ B. Balassa, *Trade Liberalization and “Revealed” Comparative Advantage*, “The Manchester School of Economic and Social Studies”, No. 33(2)/1965, pp. 99–123.

³⁴ D. Neven, *Trade liberalisation with Eastern nations: Some distribution issues*, “European Economic Review”, No. 39(3–4)/1995, pp. 622–632.

Table 1. The Internal Market Business Activities

Manufacturing sectors	Service sectors
C10-12 – Manufacture of food products; beverages and tobacco products	F – Construction
C13-15 – Manufacture of textiles, wearing apparel, leather, and related products	G – Wholesale and retail trade; repair of motor vehicles and motorcycles
C16-18 – Manufacture of wood, paper, printing and reproduction	H49 – Land transport and transport via pipelines
C19 – Manufacture of coke and refined petroleum products	H50 – Water transport
C20 – Manufacture of chemicals and chemical products	H51 – Air transport
C21 – Manufacture of basic pharmaceutical products and pharmaceutical preparations	H52 – Warehousing and support activities for transportation
C22-23 – Manufacture of rubber and plastic products and other non-metallic mineral products	H53 – Postal and courier activities
C24-25 – Manufacture of basic metals and fabricated metal products, except machinery and equipment	J59-60 – Motion picture, video, television programme production; programming and broadcasting activities
C26-28 – Manufacture of computer, electronic and optical products, manufacture of electrical equipment and machinery	J61 – Telecommunications
C29-30 – Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment	J62-63 – Computer programming, consultancy, and information service activities
C31-32 – Manufacture of furniture; other manufacturing	M69-70 – Legal and accounting activities; activities of head offices; management consultancy activities
	M71 – Architectural and engineering activities; technical testing and analysis
	M72 – Scientific research and development
	M73 – Advertising and market research
	N79 – Travel agency, tour operator reservation service and related activities
	C33 – Repair and installation of machinery and equipment

Source: own elaboration.

Box 1. Indices computed in the research

Traditional trade theory postulates that countries should specialize in the production and exports of goods in which they have comparative advantage. We expressed this by Balassa's Revealed Comparative Advantage:

$$RCA_{inEU,i}^{EU} = \frac{x_{inEU,i}^{EU} / \sum_{i=1}^n x_{inEU,i}^{EU}}{x_{inEU,i}^W / \sum_{i=1}^n x_{inEU,i}^W} \quad (1)$$

where:

$x_{inEU,i}^{EU}$ – value of EU internal export of i sector

$x_{inEU,i}^W$ – value of World export to the EU of i sector,

n – number of sectors within the Business Activities of the Internal Market.

A value above 1 indicates the existence of a comparative advantage in internal EU export versus World export, while a value below 1 means a disadvantage in trade. However, in order to ensure that it is not biased by significant imbalances in trade flows, we used the Corrected Revealed Comparative Advantage indicator (CRCA) which was developed by Neven^a and Brodzicki^b:

$$CRCA_{exEU,i}^{EU} = \frac{x_{exEU,i}^{EU}}{\sum_{i=1}^n x_{exEU,i}^{EU}} - \frac{m_{exEU,i}^{EU}}{\sum_{i=1}^n m_{exEU,i}^{EU}} \quad (2)$$

where:

$x_{exEU,i}^{EU}$ – value of EU external export of i sector

$m_{exEU,i}^{EU}$ – value of EU external import of i sector,

n – number of sectors within the Business Activities of the Internal Market.

A value above 0 represents the presence of a comparative advantage in external EU export, while a value below 0 means a disadvantage in trade.

^a Ibidem.

^b T. Brodzicki, *Structural adjustments in trade relations of the Visegrad group countries, Proceedings of the thirteen annual conference*, ETSG 2011, Copenhagen 2011.

Source: B. Balassa, *Trade Liberalization and "Revealed" Comparative Advantage*, "The Manchester School of Economic and Social Studies", No. 33(2)/1965; D. Neven, *Trade liberalisation with Eastern nations: Some distribution issues*, "European Economic Review", No. 39(3-4)/1995, M.G. Plummer, D. Cheong, S. Hamanaka, *Methodology for Impact Assessment of Impact of Free Trade Agreements*, Mandaluyong City, Philippines 2010.

We decided to focus on the years of 2004–2012 because they cover the big EU enlargement, the whole crisis period, and a few years afterwards. Moreover, according to Eurostat, as regards trade in services only up to the reference year 2012 was the methodological framework followed in the compilation of the Balance of Payments the one defined in the fifth edition of the International Monetary Fund Balance of Payments Manual (BPM5). The 6th edition of the IMF Balance of Payments and International Investment Position Manual (BPM6) was established as new international standards entered into force in 2014,³⁵ however, from the reference year 2013 all data are reported merely under the BPM6 methodology.

3. Manufacturing goods and services in the EU economy

In the period covered by the research the respective shares of manufacturing and services changed substantially in favour of the service sector (by 1.7 percentage points) and amounted respectively to 31.3 per cent and 68.7 per cent of the IMBA value added in 2012. Trade in manufacturing goods retained its very strong position in the internal EU trade, however, its share decreased by 1.7 percentage points to 81.5 per cent, while the share of services rose to 18.5 per cent in the period 2004–2012. The Services also increased their regional orientation index, which amounted to 0.8, although it was still substantially lower in comparison to manufacturing (1.1), which confirmed that internal EU trade was much more important for manufacturing than for services. At the same time, we observed an improvement in the RCA index for services, which amounted to 1.1, while the manufacturing RCA index slightly decreased and reached circa 1.0. Although both sectors' shares in total IMBA exports to third countries remained at the same level in 2012 in comparison to 2004, services increased their comparative advantage in external EU exports (CRCA amounted to 5.3).

In order to grasp the potential differences within and between both sectors we classified them into four groups according to the increase in their added value in 2004–2012, their share in added value in 2012, and the change in their share in 2004–2012.

³⁵ European Commission, *Commission Regulation (EU) No 555/2012 of 22 June 2012 amending Regulation (EC) No 184/2005 of the European Parliament and of the Council on Community statistics concerning balance of payments, international trade in services and foreign direct investment, as regards the update of data requirements and definitions*, OJ L 166/22.

Table 2. Position of manufacturing and service sectors in the EU economy and trade (NACE Rev.2)

	IMBA value added			IMBA internal EU trade					IMBA external EU trade				
	Change in IMBA value added 2012/2004	Share in IMBA value added in 2012	Change in share in IMBA value added 2012-2004	Change in IMBA intra EU export (2012/2004)	Share in IMBA internal EU export (2012)	Change in share in IMBA internal EU export (2012-2004)	IMBA Internal EU trade RCA (2012)	Change in IMBA internal EU trade RCA	Change in IMBA external EU export (2012/2004)	Share in IMBA external EU export (2012)	Change in share in IMBA external EU export (2012-2004)	IMBA external EU trade CRCA (2012)	Change in IMBA external EU export CRCA
J62-63	1.444	4.7%	0.95	2.23	2.1%	0.80	2.24	0.29	2.88	2.2%	0.01	1.29	0.57
H52	1.391	3.5%	0.60	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
M69-70	1.293	6.7%	0.72	2.12	1.1%	0.39	0.95	0.22	2.17	1.4%	0.00	0.27	0.07
M71	1.298	2.9%	0.32	1.45	0.5%	0.02	1.03	0.13	1.86	1.3%	0.00	0.74	0.10
H49	1.209	4.7%	0.22	1.74	1.5%	0.31	2.31	0.41	1.57	0.6%	0.00	-0.08	-0.10
C29-30	1.202	4.1%	0.17	1.06	11.0%	-3.32	2.26	0.33	1.80	12.2%	0.12	7.39	2.62
G	1.156	23.5%	0.05	2.44	1.7%	0.72	1.75	0.85	2.06	2.2%	0.00	1.28	0.39
C33	1.438	1.4%	0.27	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
M72	1.332	1.6%	0.21	1.67	0.6%	0.09	0.48	-0.01	1.89	1.2%	0.00	-0.01	-0.15
C21	1.266	1.9%	0.16	1.61	4.3%	0.60	1.75	-0.05	2.18	5.1%	0.01	2.66	0.52
N79	1.220	0.5%	0.03	1.14	5.8%	-1.23	1.27	0.21	1.52	4.5%	-0.01	-0.08	1.25
C26-28	1.149	7.1%	-0.03	1.20	20.9%	-3.13	1.04	0.10	1.60	25.2%	-0.03	5.11	2.35
C24-25	1.116	4.2%	-0.14	1.52	9.4%	0.86	1.06	-0.06	2.04	8.4%	0.01	-0.50	-0.21
C10-12	1.109	4.3%	-0.17	1.65	4.8%	0.77	1.94	0.30	2.01	3.2%	0.00	0.70	0.32
F	1.105	11.6%	-0.50	1.44	0.4%	0.02	1.04	0.25	1.72	0.8%	0.00	0.40	0.07
J59-60	1.127	1.2%	-0.03	1.84	0.4%	0.09	1.17	0.65	1.58	0.4%	0.00	0.10	0.16
C20	1.115	2.2%	-0.08	1.49	7.1%	0.53	1.49	0.10	1.58	6.6%	-0.01	1.81	-0.89
C31-32	1.103	1.5%	-0.07	1.32	2.2%	-0.10	1.04	0.09	1.56	1.6%	0.00	-0.47	0.07
M73	1.102	1.0%	-0.05	1.77	0.5%	0.10	0.77	0.18	2.32	0.6%	0.00	0.01	0.15
H51	1.054	0.6%	-0.06	1.47	1.4%	0.08	0.72	0.16	1.47	2.3%	0.00	0.34	-0.05
H50	1.034	0.6%	-0.07	1.37	1.4%	-0.01	0.49	0.07	1.58	3.9%	-0.01	0.92	-0.02
C22-23	0.991	2.6%	-0.43	1.40	6.5%	0.08	2.26	-0.03	1.66	3.9%	0.00	1.08	-0.37
J61	0.908	3.1%	-0.85	1.43	0.6%	0.02	0.91	-0.23	2.88	0.7%	0.01	0.11	0.13
C13-15	0.892	1.1%	-0.33	1.14	4.4%	-0.95	0.74	-0.03	1.42	3.0%	-0.01	-2.91	0.25
H53	0.963	0.9%	-0.18	4.22	0.4%	0.26	0.70	-0.22	8.81	0.6%	0.00	0.05	0.07
C19	0.922	0.5%	-0.12	2.64	7.9%	3.77	0.30	0.04	3.80	6.0%	0.03	-20.84	-7.40
C16-18	0.885	2.0%	-0.61	1.09	3.1%	-0.84	2.47	0.46	1.32	2.0%	-0.01	0.71	0.01

Source: own calculations based on Eurostat data.

Group 'A'

The first group of EU economic sectors consists of six service sectors and one manufacturing sector, which recorded sky-rocketing increases in their value added in the period 2004–2012. The highest increase in value

added was observed in computer programming, consultancy, and information service activities (J62-63), which recorded an increase of 44.4 per cent, which not surprisingly allowed them to report the highest increase in their relatively high shares (up to 4.7) in the IMBA value added. It shows the impact of the implementation of new techniques and technologies, as well as translates servitization in EU manufacturing on the dynamic growth of the sector. IT activities provide necessary tools and measures to manufacturers to offer their goods together with services. This sector also noted a crucial increase in the value and share in total IMBA internal EU exports in 2012 compared to 2004.

The next service sector which should be analysed more thoroughly covers legal and accounting activities, activities of head offices, management consultancy activities (M69-70). It witnessed a vital increase in its value added in the period under research (29.3 per cent), of which its share in the IMBA value added amounted to 6.7 per cent. The very fast growth of legal and managerial services, combined with their absence within the EU internal market and low comparative advantage, allows us to conclude that the products of this sector are in demand, however, due to national constraints their scope is limited to domestic providers. Therefore, they should be allowed to expand their activities within the EU internal market to be part of the servitization process and to directly support the development of manufacturing and other service sectors in the EU.

Taking into consideration the rapid growth of online trade within new business models, as well as the expansion and emergence of new distribution channels operated by retailers and wholesalers (G), one could expect very optimistic prospects for this sector. It recorded a strong increase of 44 per cent in value added, as well as 106 per cent and 175 per cent in respectively internal and external EU28 exports in 2012 in comparison to 2004. Although its share in both value added and international trade was rather moderate, if liberalisation of the internal market continues this sector can be treated not only as a vehicle to deliver goods to customers, but also as a tool for obtaining more information on customer expectations and needs. Consequently, some of these activities can be taken over by manufacturers, who will join the servitization process in the near future. Then manufacturers would be able to more quickly adjust their products based on the feedback from the market and establish direct relations and contacts with end-users/customers, which is crucial for servitization.

As regards the car manufacturing sector, the substantial rise in value added by 20.2 per cent resulted in an increase in the share in the IMBA added value up to 4.1 per cent. This sector recorded a negligible increase in internal EU trade, which reflected in a decline in its share of internal

EU exports to the still high value 11.0 per cent, although its competitiveness index rose slightly and RCA amounted to 2.26. However, taking into account the high and increasing value and its position in external EU exports, as well as a rising CRCA index, we can state that motor vehicle manufacturers boosted their trade with third countries while remaining strong intra-EU players. It is worth noting the observations of Gaiardelli et al. on changes in the sales of cars strengthened by aging demographics (which lowered the demand for new cars), changes in young people's priorities, and the increasing efforts towards sustainable mobility and safeguarding environmental tendencies. Therefore, according to their research, apart from after sales services, manufacturers offer long-term leasing, car sharing, and carpooling, which substitute product ownership and also improve the control of vehicles' reliability, vehicle utilisation, safety, and quality of life.³⁶ Taking the above-mentioned arguments into consideration, we can expect a lower value added generated by car-producers and much larger increase in case of car service providers (probably these are the same companies). It seems that the transition to servitization in the motor vehicle industry is far from being achieved, and a further elimination of barriers to trade in services within the internal market can assist car producers in their reorientation of their activities.

Group 'B'

The second group of economic activities under our research consists of three service and two manufacturing sectors. One of them is repair and installation of machinery and equipment activities (C33). It recorded an increase in value added by almost 44 per cent in 2012 in comparison to 2004, which produced a raise in its relatively low share in the IMBA value added up to 1.4 per cent. It seems that these are effects of the growing and expanding servitization in the economy, including industry. Manufacturers, instead of selling only goods, offer their products together with a complex service, including installation and maintenance.

The next service sector undoubtedly important to the EU economy is scientific research and development (M72). Although the increase in its value added amounted to 33.2 per cent in the years 2004–2012, its share in total IMBA value added remained relatively small (1.6 per cent). A similar situation was observed in trade flow within and outside the EU. Although its value in internal and external EU exports increased by 67 per cent and

³⁶ P. Gaiardelli, L. Songini, N. Saccani, *The Automotive Industry: Heading Towards Servitization in Turbulent Times* in: *Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014, pp. 55–57, 71.

89 per cent respectively, its shares remained almost unchanged and represented 0.6 per cent and 1.2 per cent of the IMBA exports in the internal market and with third countries. The negative effects of the inclusion of R&D in international trade intensify when we analyse the negative and declining comparative disadvantage indices in internal and external EU exports. Although R&D activities are crucial for economic and social development, their position in the EU is still relatively very weak, and favours the inflow of innovation solutions from third countries. This is clearly connected with servitization: the development of new services is not compatible with the development of new technical products: product innovations are usually triggered by R&D activities, while the need for new customer-oriented solutions is mostly driven by the market or even by single customers.³⁷

A group of important sectors also consisted of manufacturing, including *inter alia* the manufacture of basic pharmaceutical products and preparations (C21) and manufacture of computers, electronic, electrical products and machinery (C26-C27-C28). Thanks to the increase in their value in 2012 in comparison to 2004 (respectively by 26.6 per cent and 14.9 per cent), their shares in the IMBA value added also raised to 1.9 per cent and 7.1 per cent respectively in 2012. Much higher changes were observed when analysing trade in goods offered by both industries: exports of pharmaceutical products increased substantially, by 61 per cent, and reached a 5.8 per cent share in the total IMBA internal EU exports; and while exports in computer, electronic and optical products, electrical equipment and machinery grew by only 20 per cent, their share was nevertheless 20.9 per cent. Similar figures were observed in external EU exports. Moreover, both sectors recorded competitive advantages, revealed in RCA for internal EU exports and CRCA for external EU exports. The increase in their value added and in their position in the EU economy thus results from competitive trade not only within the EU, but also with third countries.

It seems that servitization is one of the solutions that could improve the position of these sectors in the EU economy. For example, referring to one of machinery sectors (machine tool industry C29.4), Copani observed that the infusion of services into the machine tool industry is a key competitive factor for the future of this strategic sector and for manufacturing companies which use machine tools for production. While traditional product-oriented services are offered by nearly all machine tool compa-

³⁷ Ch. Lerch, *Servitization as in Innovation Process: Identifying the Needs for Changes in: Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014, p. 180.

nies, the most advanced type of services, considered the most promising ones in terms of benefits to customers and suppliers, are not widely diffused in practice.³⁸

Group ‘C’

The third group of sectors consists of four services (including construction and some modes of transport, which are separately presented in this paper) and four manufacturing sectors. Although their value added increased up to 15 per cent in 2012 in comparison to 2004, their share in the total IMBA value added declined.

While we might expect advertising and market research activities (M73) to be one of the most promising sectors among business-related services, even though they recorded an increase in value added in 2012 in comparison to 2004 (by 10.2 per cent), their share in the IMBA value added remained nearly unchanged and amounted to only 1.0 per cent. Moreover, their presence in international trade was also almost negligible, albeit its value increased by 77 per cent in the IMBA internal EU trade and over 132 per cent in external EU exports. Its very low shares in both the IMBA international trade and competitiveness indices demonstrate little interest on the part of the advertising and market research sector in internationalization.

As regards manufacturing sectors, the third group consists of the manufacture of basic metals and fabricated metal products, except machinery and equipment (C24-25), manufacture of food products; beverages and tobacco products (C10-12), manufacture of chemicals and chemical products (C20), manufacture of furniture; and other manufacturing (C31-32). These sectors recorded similar increases in value added (by 10.3–11.6 per cent in 2012 compared to 2004), however their shares in the total IMBA value added slightly decreased and recorded 1.5–4.3 per cent).

Despite the fact that their increase in the IMBA external EU export was higher than the IMBA internal EU export, it is worth noting that all aforementioned sectors revealed a strong orientation toward the EU market, as well as comparative advantage in it, while only C20 was oriented toward trade with countries outside of the EU. This means that deep trade liberalisation in industrial goods allowed these sectors to develop within the EU internal market. However, with the exception of manufacturing of chemicals they faced bigger problems in the global market. The very good performance of the chemical industry may be the result of changes in man-

³⁸ G. Copani, *Machine Tool Industry: Beyond Tradition?* in: *Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014, p. 109, 125.

ufacturers' behaviour. As Buschak and Lay noted, in traditional chemical industry business models products are sold by volume, therefore chemical manufacturers have traditionally had no strong incentives to help customers use their chemicals more efficiently. However, several years ago, the growing environmental concerns predominantly led to encouraging the development of innovative business models that help avoid chemical waste. They promote servitization in this sector by linking physical offers of chemical companies with the provision of additional services to customers. Consequently, remuneration provided to chemical manufacturers as suppliers is no longer entirely linked to the amount of chemicals sold, but to successful delivery and management of chemicals.³⁹

Group 'D'

The last group of internal market business activities sectors included in the current research comprises four industrial sectors: manufacturing of rubber and plastic products (C22-23), manufacture of textiles, wearing apparel, leather and related products (C13-15), manufacture of coke and refined petroleum products (C19), and manufacture of wood, paper and reproduction (C16-18); and two service sectors: postal and courier activities (H53) and telecommunication (J61).

Referring first to the service sectors (telecommunication and postal-courier services) their very weak outcomes in terms of changes in value added did not correspond to their results in international trade. They recorded respectively 43 per cent and 322 per cent increases in the IMBA internal EU exports and 188 per cent and 781 per cent increases in external EU exports. However, these phenomena did not substantially impact their very small shares in the IMBA internal and external EU exports (below 0.7 per cent). As regards telecommunication services, due to development of modern technologies their importance as a means of communication substantially decreased, together with their contribution to the EU economy and trade. However, postal and courier services (and particularly the latter), may develop very fast. New business models, new distribution channels, including growing Internet sales, new expectations and needs of customers have forced a sharp increase in the development of courier services, including in international trade. Their small contribution to value added may result from the fact that they had to reduce their costs, improve efficiency, and began their expansion into the EU Internal Market.

³⁹ D. Buschak, G. Lay, *Chemical Industry: Servitization in Niches* in: *Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014, pp. 132–133.

As regards the manufacturing sectors, their value added declined in 2012 in comparison to 2004, causing a drop in their shares in the total IMBA value added. However, two of them (manufacturing of rubber and plastic products and manufacturing of wood and paper) still substantially contributed to the EU economy. Manufacturing of rubber and plastic products retained its important position in the IMBA internal and external EU exports and achieved comparative advantages, as shown by increases in their RCA and CRCA indices. Their linkages to servitization may be seen as similar to those described for the chemical industry.

A slightly different approach was observed in the pulp and paper industry. Witell et al. observed that this sector is experiencing a pronounced development because digitalisation has changed the behaviour pattern and fewer people use print media, instead favouring the Internet and other digital platforms. Up until now, pulp and paper manufacturers offered their products in tandem with free services throughout the entire life cycle of the equipment. Nowadays it seems that the most advanced business model is to stop selling capital equipment and to sell the output, or guarantee a specific production volume of paper.⁴⁰ Another very good example of this approach is the printing industry – the forerunner of servitization. As Visintin observed, original equipment manufacturers of photocopiers have profited from the sales of services and consumables. This phenomenon is closely linked to new business models based on the sale of the products' usage instead of the products themselves and the delivery of integrated solutions and outsourcing services.⁴¹

Two other sectors: manufacturing of textiles and manufacturing of coke and refined petroleum products, although making a small contribution to the EU economy, still represented an important part of both the internal and external EU export. Therefore, some doubts were raised as to whether the EU should invest in these industries, especially in the manufacturing of textiles, which is very expensive in terms of value (and therefore has a substantial share in value added and trade), but not competitive in comparison to imported products.

⁴⁰ L. Witell, P. Myhrén, B. Edvardsson, A. Gustafsson, N. Löfberg, *Servitization of Capital Equipment Providers in the Pulp and Paper Industry* in: *Servitization in Industry*, G. Lay (ed.), Springer, Cham 2014, pp. 152, 157–158.

⁴¹ F. Visintin, *Photocopier Industry: At the Forefront of Servitization* in: *Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014, p. 23.

Specific sectors: construction and construction-related services

There are specific sets of interrelated sectors: construction and construction-related as well as transport and transport-related. As regards the first pair, it recorded a high increase in value added (29.8 per cent) and strengthened its position in the EU economy (6.7 per cent share in IMBA value added). However, their share in IMBA internal and external EU exports remained low. On the other hand, the co-paired construction sector (F) recorded a much smaller increase in IMBA value added (10.5 per cent), while still retaining a relatively high share in IMBA value added (11.6 per cent). Developments in the IMBA internal EU exports most probably resulted from strong competition from Central and Eastern European Union Member States, which enjoyed low labour costs, while the lower position of architectural and engineering activities in EU trade resulted probably from existing barriers in the EU Internal Market.

As regards the transportation and transport-related services, an uncommon situation was observed in warehousing and support activities for transportation (H52). On one hand, it recorded a crucial increase in both value added and its share in IMBA value added (up to 3.5 per cent in 2012), however on the other hand it retained a negligible position in the internal and external EU trade (0.1 per cent), which derives from the unique character of this sector, providing services to trans-border transportation: the land (H49), air (H51) and water (H50) transport sectors.

The first of them recorded a spectacular rise in value added (by 21 per cent in 2012 in comparison to 2004), which resulted in an increase in its share in IMBA value added (up to 4.7 per cent in 2012). At the same time, air and water transport noted much lower growth in value added (respectively only 3–5 per cent in 2012 compared to 2004). Nonetheless all three of these transport sectors improved their positions in both IMBA internal and external EU trade. Therefore we can confirm a high and growing importance of the transport sector in combination with warehousing and support activities for transport. This phenomenon can be strengthened by servitization in the aircraft industry. In the late 1990s, one of engine manufacturers offered a ‘Total Care’ package to its customers, who paid simply for hours flown by the engine. Nowadays, services are a big part of the forward strategy for manufacturers of aircrafts within the framework of the power-by-the-hour service option.⁴²

⁴² T.A. Baines, H. Lightfoot, *Servitization in the Aircraft Industry: Understanding Advanced Services and the Implications of Their Delivery* in: *Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014, pp. 46–51.

Conclusions

On the basis of our research we can state that the majority of manufacturing-related services increased their added value and their position in the EU economy in the years 2004–2012, which covered the crisis period. This paradoxically proves that manufacturing sectors still exist in the European Union. Services, such as computer programming, consultancy, information, telecommunication, research and development, and advertising and market research are an obvious part of the servitization process, which can be carried out by manufacturers within the internal market. According to the concept of the smile curve of EU industrial policy,⁴³ they generate the highest value added in a relatively short time period of the production cycle, because they are directly related to the innovativeness of the EU economy. Therefore, in order to improve the competitiveness of the EU manufacturing sector, innovation activities should be undertaken not only in the production of goods, but also through manufacturers being involved in servitization.

This concerns innovative producers of goods, which generate substantial added value and whose role in the EU economy is currently increasing. It seems that the expansion of the service sector may allow EU entrepreneurs to join servitization, which could improve their competitiveness *vis-à-vis* third countries. The group of frontrunners and innovative manufacturing sectors includes the manufacture of basic pharmaceutical products, computers, electronic, electrical products and machinery and motor vehicles. Therefore, we can expect an even greater development in the aforementioned manufacturing sectors after the crisis period, as only they will be more engaged in servitization. We may speculate that thanks to servitization in the internal market, manufacturing has been gradually coming back to its pre-crisis position and role in the EU economy.

However, it seems, that in the case of the declining manufacturing sectors, the reduction in their importance to the EU economy and trade was not the result of substantial increases in shares of other sectors (including services). Companies from third countries outside the EU exerted strong competitive pressure on EU producers, who had to decrease their costs and improve production efficiency. There is no doubt that this is the cur-

⁴³ J.-P. Rodrigue et al., *The geography of transport systems*, Hofstra University, Department of Global Studies and Geography, 2013, <http://people.hofstra.edu/geotran> (last visited 1.07.2017); M. Ye, B. Meng, S. Wei, *Measuring Smile Curves in Global Value Chains*, “IDE Discussion Paper”, No. 530/2015; R. Mudambi, *Location, control and innovation in knowledge-intensive industries*, “Journal of Economic Geography”, No. 8/2008, pp. 699–725; A.A. Ambroziak (ed.), *New Industrial Policy...*, op.cit.

rent challenge for many of them, due to the fact that they operate in a very restrictive EU legal framework in terms of social, environmental, energy efficiency requirements. Moreover, the crisis made their position in the EU even harder due to the stronger competition from third countries. It seems that some sectors, such as manufacturing furniture, wood and paper, textiles and leather, and coke and refined petroleum products, face many obstacles to be able to successfully compete with producers from outside the EU. And this is not because of the expansion of the service sector, but due to higher price competitiveness of manufacturers from other continents.

Summing up, servitization may lead to reindustrialization rather than deindustrialisation in Europe. Moreover, thanks to services, especially business ones, manufacturing sectors could come back to their development paths faster and with better outcomes after the crisis period. It seems that servitization can improve the competitiveness of the European companies *vis-à-vis* third countries, however this issue needs further research.

Bibliography

- Ambroziak A.A., *Renaissance of the European Union's Industrial Policy*, "Yearbook of Polish European Studies", No. 17/2014.
- Ambroziak A.A., *Reindustrialization or servitization: trade tendencies in the European Union internal market* in: *Unia Europejska wobec wyzwań przyszłości. Aspekty prawne, finansowe i handlowe*, E. Małuszyńska, G. Mazur, P. Idziak (eds.), Poznań 2015.
- Ambroziak A.A. (ed.), *New Industrial Policy of the European Union*, Switzerland 2017.
- Baines T.A, Lightfoot H., *Servitization in the Aircraft Industry: Understanding Advanced Services and the Implications of Their Delivery* in: *Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014.
- Baines T.S., Lightfoot H.W., Benedettini O., Kay J.M., *The servitization of manufacturing*, "Journal of Manufacturing Technology Management", No. 20(5)/2009.
- Baines T.S., Lightfoot H. W., Evans S., Neely A., Greenough R., Peppard J., Roy R., Shehab E., Braganza A., Tiwari A., Alcock J.R., Angus J.P., Bastl M., Cousens A., Irving P., Johnson M., Kingston J., Lockett H., Martinez V., Michele P., Tranfield D., Walton I.M., Wilson H., *State-of-the-art in product-service systems*, "Journal of Engineering Manufacture", No. 221(10)/2007.
- Balassa B., *Trade Liberalization and "Revealed" Comparative Advantage*, "The Manchester School of Economic and Social Studies", No. 33(2)/1965.

- Benedettini O., Neely A., Swink M., *Why do servitized firms fail? A risk-based explanation*, "International Journal of Operations and Production Management", No. 35(6)/2015.
- Brady T., Davis A., Gann D.M., *Creating value by delivering integrated solutions*, "International Journal of Project Management", No. 23(5)/2005.
- Brax S., *A manufacturer becoming service provider – challenges and a paradox*, "Managing Service Quality: An International Journal", No. 15(2)/2005.
- Brax S., Jonsson K., *Developing integrated solution offerings for remote diagnostics*, "International Journal of Operations & Production Management", No. 29(5)/2009.
- Brodzicki T., *Structural adjustments in trade relations of the Visegrad group countries, Proceedings of the thirteen annual conference*, ETSG 2011, Copenhagen 2011.
- Buschak D., Lay G., *Chemical Industry: Servitization in Niches in: Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014.
- Cook M.B. Bhamra T.A., Lemon M., *The transfer and application of Product Service Systems: from academia to UK manufacturing firms*, "Journal of Cleaner Production", No. 14(17)/2006.
- Copani G., *Machine Tool Industry: Beyond Tradition? in: Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014.
- European Commission, *Commission Regulation (EU) No 555/2012 of 22 June 2012 amending Regulation (EC) No 184/2005 of the European Parliament and of the Council on Community statistics concerning balance of payments, international trade in services and foreign direct investment, as regards the update of data requirements and definitions*, OJ L 166/22.
- Fang E., Palmatier R.W., Steenkamp J.B., *Effect of service transition – strategies on firm value*, "Journal of Marketing", No. 72(5)/2008.
- Frambach R.T., Wels-Lips I., Gündlach A., *Service Strategies. An Application in the European Health Market*, "Industrial Marketing Management", No. 26(4)/1997.
- Gaiardelli P., Songini L., Sacconi N., *The Automotive Industry: Heading Towards Servitization in Turbulent Times in: Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014.
- Gawlikowska-Hueckel K., *Polityka przemysłowa i spójności wobec planów reindustrializacji Unii Europejskiej. Wnioski dla Polski*, „Gospodarka Narodowa”, No. 273(5)/2014.
- Goedkoop M., van Halen C, te Riele H., Rommes P., *Product Services Systems, Ecological and Economic Basics. Report 1999/36*, VROM, Den Haag 1999.
- Hojnik J., *The servitization of industry: EU law implications and challenges*, "Common Market Law Review", No. 53/2016.
- Jiao J., Ma Q., Tseng M.M., *Towards high value-added products and services: mass customization and beyond*, "Technovation", No. 23(10)/2003.

- Kindström D., *Towards a service-based business model – Key aspects for future competitive advantage*, “European Management Journal”, No. 28(6)/2010.
- Kowalski Ch., Windahl Ch., Kindström D., Gebauer H., *What service transition? Rethinking established assumptions about manufacturers’ service-led growth strategies*, “Industrial Marketing Management”, No. 45(2)/2015.
- Lay G. (ed.), *Servitization in Industry*, Cham, Heidelberg, New York, Dordrecht, London 2014.
- Lerch Ch., *Servitization as in Innovation Process: Identifying the Needs for Changes in: Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014.
- Levitt T., *Marketing Success through Differential of Anything*, “Harvard Business Review”, No. 58(1)/1980.
- Lightfoot H., Baines T., Smart P., *The servitization of manufacturing*, “International Journal of Operations & Production Management”, No. 33(11/12)/2013.
- Mont O.K., *Product-Service Systems, Final Report*, The International Institute of Industrial Environmental Economics, Lund University 2000.
- Mont O.K., *Clarifying the concept of product-service system*, “Journal of Cleaner Production”, No. 10(3)/2002.
- Morelli N., *Product service-systems, a perspective shift for designers: a case study – The design of a telecentre*, “Design Studies”, No. 24(1)/2003.
- Mudambi R., *Location, control and innovation in knowledge-intensive industries*, “Journal of Economic Geography”, No. 8/2008.
- Neven D., *Trade liberalisation with Eastern nations: Some distribution issues*, “European Economic Review”, No. 39(3–4)/1995.
- Plepys A., Heiskanen E., Mont O., *European policy approaches to promote servicizing*, “Journal of Cleaner Production”, No. 97(15)/2015.
- Plummer M.G., Cheong D., Hamanaka S., *Methodology for Impact Assessment of Impact of Free Trade Agreements*, Mandaluyong City, Philippines 2010.
- Rodrigue J.-P. et al., *The geography of transport systems*, Hofstra University, Department of Global Studies and Geography, 2013, <http://people.hofstra.edu/geotran>.
- Schmenner R.W., *Manufacturing, service, and their integration: some history and theory*, “International Journal of Operations and Production Management”, No. 29(5)/2009.
- Stremersch S., Wuyts S., Frambach R.T., *The Purchasing of Full-Service Contracts: An Exploratory Study within the Industrial Maintenance Market*, “Industrial Marketing Management”, No. 30(1)/2001.
- Tukker A., *Eight Types of Product-Service System: Eight Ways to Sustainability? Experiences from Suspronet*, “Business Strategy and the Environment”, 13(4)/2004.
- Tukker A., van Halen C (eds.), *Innovation Scan Product Service Combinations. Manual*. PricewaterhouseCoopers, Utrecht, the Netherlands 2003.

- Quinn J.B., Doorley T.L., Paquette P.C., *Beyond Products: Services-Based Strategy March–April*, 1990.
- Vandermerwe S., Rada J., *Servitization of Business: Adding Value by Adding Services*, “European Management Journal”, No. 6(4)/1988.
- Vendrell-Herrero F., Bustinza O.F., Parry G., Georgantzis N., *Servitization, Digitization and supply chain interdependency*, “Industrial Marketing Management”, No. 60/2017.
- Witell L., Myhrén P., Edvardsson B., Gustafsson A., Löfberg N., *Servitization of Capital Equipment Providers in the Pulp and Paper Industry* in: *Servitization in Industry*, G. Lay (ed.), Springer, Cham 2014.
- Visintin F., *Photocopier Industry: At the Forefront of Servitization* in: *Servitization in Industry*, G. Lay (ed.), Cham, Heidelberg, New York, Dordrecht, London 2014.
- Ye M., Meng B., Wei S., *Measuring Smile Curves in Global Value Chains*, “IDE Discussion Paper”, No. 530/2015.