

**ETLA** ELINKEINOELÄMÄN TUTKIMUSLAITOS

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**Timo Seppälä**

CONTEMPORARY DETERMINANTS AND GEOGRAPHICAL  
ECONOMY OF ADDED VALUE, COST OF INPUTS, AND  
PROFITS IN GLOBAL SUPPLY CHAINS

An Empirical Analysis





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ISBN 978-951-628-607-8  
ISBN 978-951-628-608-5 (PDF)  
ISSN 0356-7435

Printed in: Unigrafia Oy, Helsinki, 2014

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**Name of the dissertation:** Contemporary Determinants and Geographical Economy of Added Value, Cost of Inputs, and Profits in Global Supply Chains: An Empirical Analysis  
**Manuscript submitted:** 25.2.2014 **Manuscript revised:** 12.5.2014  
**Date of the defense:** 17.6.2014  
**School:** School of Science  
**Department:** Department of Industrial Management  
**Field of Study:** International Trade Economics, Global Value Chains, Offshoring, Outsourcing  
**Opponents:** Professor Mats Engwall, KTH Royal Institute of Technology, Professor Stefan Jonsson, Uppsala University  
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#### Abstract

The structures of industries, the economic geography of multinational enterprises (MNEs) and the global configurations of supply chains can be considered to be the three key factors essential to understanding contemporary globalization on a micro-level. In practice, the competitive position of a single nation as a geographic location of value-adding activity and its ability to attract new foreign direct investment (FDI) is a consequence of these behaviors. Hence, it is essential to understand how MNEs plan, implement, position, and execute their strategies in global supply chains and production networks and how these MNEs create value and capture profits in their respective industries and geographies.

This PhD dissertation is composed of five papers, each of which addresses a specific topic in the research domain of global value chains. Each of the dissertation's papers analyzes a selected micro-level problem from an industry, MNE, supply chain and/or national economy perspective. That said each of the papers focus on specific case study to explain the relation to the same contemporary phenomenon of globalization to provide a bridge between rich empirical narratives and mainstream research and public policy.

The five separate papers that constitute this dissertation use qualitative research methods combined with case studies; hence, qualitative research methods and case studies have seldom been used in economics research. It should be recognized that qualitative research methods and case studies have been used to develop theories on diverse topics. Furthermore it should also be emphasized that the methodology and the datasets for these case studies in this PhD dissertation are unique.

The dissertation, including all the specific papers, make a contribution in its academic, business and public policy domain, by addressing factors that have received limited attention in the existing research and contemporary public policy. Furthermore, it is notable that the extant literature is largely silent on interactions between these micro-level mechanisms of contemporary globalization perspectives.

**Key words:** Economic Geography, Multinational Enterprises, Global Supply Chains  
**ISBN (printed):** 978-951-628-607-8 **ISSN (printed):** 0356-7435  
**ISBN (pdf):** 978-951-628-608-5  
**Language:** English **Number of pages:** 38 p. + appendix 132 p.  
**Publisher:** ETLA/Taloustieto Oy  
**Print Distribution:** Industrial Engineering and Management

This dissertation can be read at: <http://urn.fi/URN:ISBN:978-951-628-608-5>



<b>Tekijä:</b>	Timo Seppälä
<b>Väitöskirjan nimi:</b>	Contemporary Determinants and Geographical Economy of Added Value, Cost of Inputs, and Profits in Global Supply Chains: An Empirical Analysis
<b>Käsikirjoituksen päivämäärä:</b>	25.2.2014
<b>Korjatun käsikirjoituksen päivämäärä:</b>	12.5.2014
<b>Väitöstilaisuuden ajankohta:</b>	17.6.2014
<b>Korkeakoulu:</b>	Perustieteiden korkeakoulu
<b>Laitos:</b>	Tuotantotalouden laitos
<b>Tutkimusala:</b>	Teollisuustalous
<b>Vastaväittäjät:</b>	Professori Mats Engwall, KTH Royal Institute of Technology, Professori Stefan Jonsson, Uppsala University
<b>Työn valvoja:</b>	Professori Eero Eloranta, Aalto yliopisto
<b>Työn ohjaaja:</b>	Professori Martin Kenney, University of California, Davis
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#### Tiivistelmä

Nykyistä globalisaatiota voidaan kuvata ja ymmärtää mikrotasolla tarkastelemalla kolmea avaintekijää: teollisuuden rakenteiden muutosta, monikansallisten yritysten talusmaantiedettä ja tuotteiden maailmanlaajuisia toimitusketjuja. Eri valtioiden rooli lisäarvon tuottajana ja niiden kyky houkuttaa ulkomaisia suoria investointeja (FDI) on seurausta näistä kolmesta avaintekijästä. Siksi on tärkeää ymmärtää, miten monikansallinen yritys suunnittelee ja toteuttaa strategiaansa osana globaaleja toimitusketjuja ja tuotannon verkostoja. Näistä strategioista seuraa, miten monikansalliset yritykset luovat arvoa ja saavat voittoa eri toimialoilla ja maantieteellisillä alueilla.

Tämä väitöskirjatutkimus koostuu viidestä artikkelista, joista kukin artikkeli käsittelee tiettyä aihealuetta maailmanlaajuisen arvoketjujen näkökulmasta. Kukin väitöskirjan artikkeli analysoi valittua mikrotason ongelmaa joko teollisuuden, monikansallisen toimitusketjun ja / tai kansantalouden kannalta. Lisäksi jokainen artikkeli tarkastelee tapauskohtaisesti nyky-globalisaatiota ja tarjoaa sille rikkaan empiirisen kertomuksen ja valtavirtatutkimuksen välille huomioiden julkisen politiikan näkökulman.

Väitöskirjan viisi erillistä artikkelia hyödyntävät laadullisia tutkimusmenetelmiä yhdistettyinä tapaustutkimuksiin. Laadullisia tutkimusmenetelmiä ja tapaustutkimusta on käytetty harvemmin talouden ilmiöiden tutkimisessa, mutta toisaalta niihin perustuen on kehitetty monia elinkelpoisia teorioita. Tässä tutkimuksessa ja sen yksittäisissä artikkeleissa kerätyt yritystasoiset empiiriset aineistot sekä niiden pohjalta luodut mallit ovat uusia ja ainutlaatuisia.

Väitöskirja, mukaan lukien kaikki sen artikkelit, tuo uutta tietämystä akateemiseen, liiketoiminnalliseen ja julkisen politiikan tutkimukseen nyky-globalisaation syistä, vaikutuksista ja seurauksista. Lisäksi on huomattava, että viimeaikaisessa tutkimuksessa on nyky-globalisaatiota tarkasteltu vain vähän yritysten arvoketjujen ja sisäisen päätöksenteon mekanismien näkökulmasta.

<b>Avainsanat:</b>	Talousmaantiede, Monikansalliset yritykset, Globaalit arvoketjut	
<b>ISBN (painettu):</b>	978-951-628-607-8	<b>ISSN (painettu):</b> 0356-7435
<b>ISBN (pdf):</b>	978-951-628-608-5	
<b>Kieli:</b>	Englanti	<b>Sivumäärä:</b> 38 s. + liitteet 132 s.
<b>Julkaisija:</b>	ETLA	<b>Kustantaja:</b> Taloustieto Oy
<b>Painetun väitöskirjan jakelu:</b>		Tuotantotalouden laitos





## PREFACE

Timo came to academe through a long circuitous route that took him through a business career followed by consulting at ETLA. In each new world he has had to learn new rules, while drawing upon his previous experiences. Now, with the completion of his PhD dissertation, he gets to start again in the academic world. The chapters in this dissertation are informed by his previous experiences, but offer new evidence-based studies of contemporary globalization. Most previous case studies of supply chains/value chains/production networks are based on interview data or commercial teardowns of various electronic gadgets. These are excellent first approximations, but tell us very little about key issues such as profits, transfer pricing, and cost of logistics. Timo's work takes us to the far granular level of invoices and cost accounting, where the real managerial decisions are made.

Timo's PhD dissertation unpacks the organization of global value creation by MNEs at three different levels of analysis: 1) the competitive dynamics of global industries; 2) the dynamics of existing configurations of global supply chains; and 3) the dynamics of where value is added and profits are accounted for across different national economies and between different supply chain participants. He addresses the above issues in his PhD dissertation using sophisticated and original methods, unique data sets, and interviews with practitioners. With these new empirics and their respective findings and descriptions, he makes a number of significant and novel contributions to the dynamics of global value chains and international trade literature. Moreover, many of his case studies and datasets are more applicable to the European industries, such as precision machinery, than the U.S.-centric studies of personal computers and iPhones.

This book is Timo's PhD dissertation at Aalto University, Department of Industrial Engineering and Management Espoo. Its findings will have valuable insights for researchers, policy-makers, and corporate managers. For the reasons stated above, I strongly recommend it to practitioners and academics alike. As I see it, the methodologies and datasets that Timo has developed promise new empirical insights to enrich our theories of how firms operate their global supply chains and the implications to this for key firms, their suppliers, and the nations within which they operate.

Davis, CA, 12<sup>th</sup> May, 2014

Professor Martin Kenney



## ACKNOWLEDGEMENTS

I would like to take this opportunity to thank all those who have assisted me with this doctoral dissertation.

First, I would like to thank my mentor, Professor Martin Kenney, of the University of California at Davis, for challenging me throughout my learning process. Without his guidance, this doctoral dissertation would not have been the same. I am also indebted to him for co-authoring two papers that support this dissertation.

Second, I would like to thank my closest colleagues at ETLA, The Research Institute of Finnish Economy, Jyrki Ali-Yrkkö, Petri Rouvinen and Pekka Ylä-Anttila, for their encouraging support and participation in numerous discussions. If I had not met Jyrki in April, 2009 while I was walking away from a company board meeting, just having been fired from my CEO position, I would not be here right now! I am also indebted to all of them for providing me with this learning opportunity and co-authoring three papers that support this dissertation.

Third, I would like to thank my supervisor, Professor Eero Eloranta, of Aalto University, for making all this possible. It has been one of my childhood dreams to graduate from the most distinguished university and department in Finland: old TKK, Industrial Management.

Forth, I also thank Professor Gary Gereffi, DUKE University, and Professor Torben Pedersen, Bocconi University for providing excellent comments on the strengths and weaknesses of this PhD dissertation in their role as pre-examiners.

Furthermore, I would like to thank the whole team at ETLA, The Research Institute of Finnish Economy, especially Matias Kalm, Martti Kulvik, Olli Martikainen, Tuomo Nikulainen, Mika Pajarinen, and Antti Tahvanainen for sharing their thoughts and giving me valuable feedback during these last two years. I would also like to thank Kimmo Aaltonen and Antti Kauhanen for challenging me at badminton every Thursday.

I would also like to thank my former boss and mentor, Christer Härkönen, at Elcoteq SE and beyond, and my former global core team at Elcoteq SE, Christian Christensen, Ilari Jaakkola, Kalle Kuusik, Eddie Lee, Andrus Pedai, Riku Riikonen, and Timo Salomäki: they have always been available to share their knowledge, comments and discussions. This dissertation is also their dissertation because it recounts our history together at Elcoteq and beyond. I made this commitment nine years ago in 2005 in public and now the “book” is available. Goal – Enjoy the Difference!

For their financial support, I would like to thank the Foundation for Economic Education, the Emil Aaltonen foundation, and the Finnish Society of Electronics Engineers. Without their support, the finalization of this dissertation would not have been possible.

Finally, I would like to thank my family: my wife Minna, my son Kim-Kristian, and my daughter Karolina for their enduring support during these past three years! I would also like to thank my father Juhani, my mother Katriina and my two sisters Titta and Tiia for their encouraging support during these 46 years of my life. I love you all from the bottom of my heart.

Helsinki, 12<sup>th</sup> May, 2014

Timo Seppälä

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## LIST OF PUBLICATIONS

This dissertation consists of a summary article and the following papers:

1. Seppälä, T. & Kenney, M. (2012). “Building Complementary Assets in a Unified TCP/IP World”, Berkeley Roundtable on the International Economy (BRIE) Working Paper Series No. 204, University of California, Berkeley.

*Contributions: Based on the original concept of Seppälä and Kenney. Seppälä was mainly responsible for building the analytical framework, conducting the empirical analyses, managing the data and reporting.*

2. Seppälä, T., Kenney, M. & Ali-Yrkkö, J. (2014) (forthcoming). “Global Supply Chains and Transfer Pricing: Insights from a Case Study”, Supply Chain Management: An International Journal, Volume 19, issue 4.

*Contributions: Based on the original concept of Seppälä, Kenney and Ali-Yrkkö. Seppälä was mainly responsible for building the analytical framework, conducting the empirical analyses, managing the data and reporting.*

3. Seppälä, T. & Ali-Yrkkö, J. (under review). “Changing Geographies of Value Creation in Global Supply Chains: Evidence from Mobile Telecommunications”.

*Contributions: Based on the original concept of Seppälä and Ali-Yrkkö. Seppälä was mainly responsible for building the analytical framework, conducting the empirical analyses and reporting.*

4. Ali-Yrkkö, J., Rouvinen, P., Seppälä, T. & Ylä-Anttila, P. (2011). “Who Captures Value in Global Supply Chains? Case Nokia N95 Smartphone”, Journal of Industry, Competition and Trade, Issue 11, pp. 263–278.

*Contributions: Based on the original concept of Ali-Yrkkö, Rouvinen, Seppälä and Ylä-Anttila. Seppälä was mainly responsible for conducting the empirical analyses and reporting.*

5. Seppälä, T. (2013). Tracking Offshoring and Outsourcing Strategies in Global Supply Chains. In Offshoring Challenge: Strategic Design and Innovation for Tomorrow’s Organization; Pedersen, T., Bals, L., Ørberg Jensen, P. D., Møller Larsen, M. (Eds.), pp. 57–76, Springer-Verlag London.





## INTRODUCTION TO THE DISSERTATION



# 1 BACKGROUND

Analyses related to industry dynamics and the concept of the global value chain have been my particular topics of interest for the last four years as contemporary globalization persistently progresses. Furthermore, analyses of global value chains link research to international trade-related policy making and the internationalization of multinational enterprises, which constitute two facets of the same phenomenon. Moreover, the catch-up effect to balance the inequalities between advanced and emerging economies represents another facet of this discussion. Hence, all three facets, international trade policies, the internationalization of multinational enterprises, and economic inequality are essential to creating a greater understanding of contemporary globalization.

As globalization persistently progresses, many economists are calling for more active and modern policies because many advocates of state intervention often point to the fact that there is innovation and higher knowledge in technology but not in manufacturing (Sperling, 2012; Marzinotto, 2012, Baldwin & Evenett, 2012). Hence, future manufacturing will require a fundamentally different approach to government support and changes to policies (Zysman et al., 2012; Baldwin & Evenett, 2012). As Baldwin and Evenett (2012) note, policy makers still view the world from the perspective of trade theory based on the first unbundling. The first unbundling refers to viewing globalization through the eyes of the trade theory that was designed to understand the effects of the industry clusters where firms were located at close proximity to one another (Baldwin, 2006, 2009, 2011; Baldwin & Evenett, 2012). This calls for the systematic understanding of the causes and effects of contemporary industry dynamics and the economic geography of refined global value chains and production networks.

Fewer barriers in international trade allow for the greater relocation of different product life cycle processes related to technology, design and manufacturing (Baldwin & Venables, 2010; Baldwin & Evenett, 2012). These organizational decisions made by multinational enterprises have not been sudden; relocation to lower the costs of research, design and manufacturing locations has been gradually occurring over the last decades (Vernon, 1966, 1971; Quinn, 1969, Teece, 1977, Seppälä, 2010, 2013). Lower coordination and contracting costs and new information and communication technology has enabled this separation in time and space to occur in a controlled manner. Baldwin (2006) calls this current stage of a globalization a second unbundling.

Industry dynamics and the economic geography of the global value chains and production networks of multinational enterprises are key elements to understanding contemporary globalization (Buckley & Ghauri, 2004; Picard et al.,

2004). For a more detailed understanding of these changes, this PhD dissertation addresses factors related to the micro-level involvement of multinational enterprises in global trade and discusses the economic geography of global value chains and the subsequent offshoring and outsourcing of different processes and tasks. The perspectives of both industries and multinational enterprises are highlighted to identify the elements that should be considered when creating a new international trade theory.

The aim of this dissertation is to shed light on the specific components of industrial dynamics, as well as global value chains and their respective industrial networks, with a particular emphasis on the importance of all these aspects, while considering the value creation and value capture mechanisms in the world of the second unbundling: *i*) the usefulness of complementary assets in the case of macro-level innovation or, in Schumpeter's terms, the opening of a "new economic space" (Appendix 1); *ii*) the importance of separating the input costs and profits of multinational enterprise as two distinct measures while considering international trade theory, trade statistics, the second unbundling and the economic geography of added value (Appendix 2); *iii*) the relationship between the changes in economic geography, the geographical dispersion of added value, and the changes in the locations of research-, design- and manufacturing-related tasks (Appendix 3); *iv*) the significance of services while considering international trade theory, trade statistics and the second unbundling (Appendix 4); and *v*) the connection between changes in a leading firm's business environment and the strategy and responses of its global supply chains and industrial networks (Appendix 5).

The context for the empirical analyses in this PhD dissertation is the global mobile telecommunication industry, which consists of larger established multinational enterprises and their respective industrial networks and supply chains (Appendices 1, 2, 3, and 5). Furthermore, the context for the empirical analyses in article 4 is the global precision machinery industry because empirical details related to global supply chains were unavailable for the multinational enterprises in the global mobile telecommunication industry. These two communities are well-established and recognized globally. To provide more insights into the context of this PhD dissertation, it is worthwhile to briefly describe these two industries.

The mobile telecommunications industry is engaged in the technological application of both hardware and software (e.g., networks, mobile devices, services, content, and the respective service and network systems) that wirelessly transmit information through electromagnetic signals. Mobile telecommunications emerged in the early 1980s in the USA, when telephone services were deregulated

and liberalized (Li & Whalley, 2002). It then became a global phenomenon with the continuing deregulation and liberalization of telecommunications (Li & Whalley, 2002). However, the mobile telecommunications industry has changed somewhat in recent years in that it has become a mobile Internet industry (West & Mace, 2010; Kenney & Seppälä, 2012; Seppälä & Kenney, 2012).

The precision machinery industry is associated with a diversified manufacturing base that produces highly engineered machine components to customer specifications using a variety of materials (e.g., steel, stainless steel, aluminum), parts, complete assemblies and capital goods to be incorporated into finished goods such as automobiles, aircraft, heavy trucks, medical devices, and appliances, among others. The precision machinery industry is a significant exporter in many advanced economies (Masao, 2011; Kenney, 2012). Due to fewer barriers to international trade, the precision machinery industry has followed the example of the mobile telecommunications industry by relocating its industrial networks to emerging economies.

The remainder of this introduction is structured as follows. Section 1.1 introduces all five papers of this PhD dissertation in short. Section 2 discusses the research questions put forth in each of the 5 dissertation papers. Section 3 introduces the key results of the individual papers and positions the papers in relation to the extant research by indicating their contributions to the existing body of knowledge. Section 4 addresses the study's implications for research, public policy and practice. Section 5 discusses the limitations of this dissertation. Finally, in Section 6, conclusions are drawn and directions for future research are presented.

## 1.1 INTRODUCTION TO THE PAPERS

The first paper in this dissertation discusses why the contemporary competition in the smartphone industry is an ideal setting for studying Schumpeterian creative destruction. This current creative destruction is particularly interesting because the convergence of previously separate industries is pitting firms with differing business models from the old telecommunications world against the operating system winners of the old personal computer world and competitors from the new internet world. This paper utilizes insights from the literature on complementary assets and technology platforms to understand the competition in smartphone industry. This paper contributes to a broadened understanding of the contemporary industry convergence that is has the Internet and cloud computing at its unifying center, and intelligent communications devices at its

edges. Furthermore, this paper extends the current academic discussion of the changes in the mobile telecommunications industry to consider the possibility that cloud computing will integrate a plethora of new devices that will include personal computers, smartphones, Internet-enabled televisions, and a nearly infinite number of other devices that will provide data to the cloud.

The second paper in this dissertation elaborates on and identifies the importance of understanding the unique characteristics of transfer pricing and cost accounting as part of the economic geography of value generation and profit capture in MNEs. In the extant literature, transfer pricing is considered to be the key determinant of an MNE's profits, but the question of how MNEs capture profits from global supply chains remains unanswered. This paper contributes to the existing literature on international trade theory and trade statistics by explaining the economic consequences of the increasing dispersion of added value, input costs and profits in global supply chains. The empirical evidence suggests that MNEs have many choices regarding where to geographically allocate their profits. Furthermore, translating this into concrete policy and trade statistics measures is of great relevance to understanding the contemporary phenomenon of globalization.

The third paper in this dissertation emphasizes the changes and transformation in the geographical distribution of value creation and the transition of business services from advanced economies to emerging economies in global supply chains during the last ten years. The existing research on global value chains at the industry and MNE levels primarily consists of single-point-of-time type studies, whereas this paper takes a longitudinal study approach. This paper contributes to the existing literature by describing how emerging economies are gaining from global competition, global supply chains and the associated manufacturing and services that have moved from advanced economies to emerging economies. Hence, advanced economies continue to manage the most valuable intangible assets.

The fourth paper in this dissertation identifies and elaborates on the links between international trade and firm-level data for trade in goods and trade in services. To investigate the issue, we perform grass-roots investigative work to uncover the geography of added value for a smartphone circa 2007. The smartphone was assembled both in Finland and China. When the smartphone was assembled and distributed in Europe, the value-added share of Europe rose dramatically. Even when the smartphone was assembled in China and distributed in the United States, Europe captured more than half of the added value because most of the service functions and intangible assets of the case company were geographically located in Europe. Our analysis illustrates that international

trade statistics can be misleading; the capture of added value is largely detached from the flow of physical goods. Instead, services and other intangible aspects of the supply chain are dominant. Although final assembly – which commands two percent of the added value in our case – has increasingly moved offshore, developed countries continue to capture most of the added value generated by global supply chains.

The fifth paper in this dissertation tracks and describes the linkages between changes in a MNE's business environment and changes in its strategic offshoring and outsourcing actions and decisions in terms of its global supply chain. The case firm is one of the market leaders in mobile telecommunications network equipment. Furthermore, the paper explains how these transformations reflect the strategy and respective offshoring decisions of suppliers. The increasing amount of highly skilled labor in emerging markets enables industrial business networks to rearrange themselves along shorter life cycles. Furthermore, I find that different firms typically react to their customers' strategies with the same approach but implement and schedule their implementation in different ways. These differences in offshoring and outsourcing execution and implementation patterns also differ among industries.

## 2 RESEARCH QUESTIONS

The key objectives of all five papers introduce new perspectives into the existing body of literature and empirical evidence on creative destruction, economic geography, global value chains, and strategic thinking related to MNEs. For these purposes, in the following subsections, the research questions of each of the five papers are introduced, explained, and discussed. All five papers draw on integral and related but diverse streams of literature, thus providing brief theoretical and empirical background for each of the four topics of creative destruction, economic geography, global value chains, and the strategic thinking of MNEs.

The first paper focuses on the role of complementary assets in dynamic business environments facing creative destruction, the next three papers focus on the economic geography and global value chain perspectives, and the fifth paper focuses on the role of strategic thinking in MNEs. All of the papers provide empirical findings for the current understanding of the contemporary determinants and geographical economy of added value, cost of inputs, and profits in global supply chains. Papers two, three, and four especially provide micro-level evidence and contributions to the existing literature by exploring the linkages between international trade theory, global trade statistics, national economies and global MNE supply chains through several cases and descriptive analysis.

### **Research question 1:**

**What are the strategies of the most powerful entrants and platform providers in the mobile Internet industry and what implications do their platform models have for a key group of partners, the mobile phone operators, which are the firms that actually provide connectivity to the mobile internet?**

The first study is motivated by the lack of empirical evidence on current creative destruction, the role of complementary assets, and technology platforms in the contemporary mobile internet context. In particular, these three aspects are being ignored in the existing literature and current academic discussion. This current creative destruction is particularly interesting because current industry convergence is pitting firms and paradigms for the old telecommunications world against the operating system winners of the old personal computer and competitors from the new internet world (for an introduction to this topic, see Schumpeter, 1947; West & Mace, 2010; Kenney & Pon, 2011; Kenney & Sepälä, 2012).



This study sheds light on the usefulness of complementary assets and technology platforms in a situation in which macro-level innovation, or, in Schumpeter's words, a "new economic space", is opening, within which there can be many innovations. However, the entering firms are incumbents and therefore, by definition, have legal protection, scale and scope, and complementary assets. In the literature, complementary assets, technology platforms and the ability to combine these assets have been associated with firm performance and success (for reviews, see Teece, 1986; Tushman & Anderson, 1996; Cusumano & Yoffie, 1998; Cusumano & Gawer, 2002; Cusumano, 2010).

The contribution of this paper broadens the understanding of the currently occurring industry convergence that centers around the Internet and cloud computing and incorporates intelligent communication devices at its edges (for comparison, see Armbrust et al., 2009; Murray & Zysman, 2011). Furthermore, this paper extends the current academic discussion on the mobile telecommunications industry, which used to be controlled by incumbent telecommunications networks, mobile device makers, and carriers. Due to recent changes in industry dynamics, the contemporary mobile internet is now controlled by the multinational enterprises in the computer and Internet sectors; i.e., multinational enterprises from North America (for comparison, see West & Mace, 2010; Funk, 2012). Moreover, this paper contributes to the existing literature on competitive dynamics and the role of complementary assets in global value chains (for comparison, see Teece, 1986; Cusumano, 2010) by taking all these arguments into account when discussing the outcomes of the paper and their respective analyses.

### **Research question 2:**

#### **Where do multinational enterprises locate their costs and profits in global production networks?**

The second paper is motivated by the fact that globalization is causing the disaggregation of production networks and investigates how these segregated rents of added value are geographically distributed among different national economies. The division of added value into input costs and profits, and how these two elements of added value are geographically distributed, is predominantly disregarded in the existing literature and theoretical discussion. The division of added value into input costs and profit is noteworthy because many national economies are trying to attract multinational enterprises to relocate their tangible and intangible resources to their national economies (for introductions on this topic, see Baldwin, 2006, 2009, 2011; Baldwin & Venables, 2010; Ali-Yrkkö, 2010; Ali-Yrkkö et al., 2011; Baldwin & Evenett, 2012).

This paper highlights the value of understanding the structures of multinational enterprises under specific global value chain governance models and transfer pricing mechanisms. In the literature, the global value chain governance models and transfer pricing mechanisms and the aptitude of using these associated theories creates a moderated way to capture the logic behind how multinational enterprises operate in disaggregated production networks (for reviews, see Eccles, 1985; Kogut, 1985; Porter, 1986, 1990; Hopkins & Wallerstein, 1986; Gereffi, 1994, 1999; Gereffi et al., 2005 for global value chains, and Kaplan & Atkinson, 1989; Edlin & Reichelstein, 1995, and Shelanski, 2004 for transfer pricing mechanisms).

The available trade statistics reveal little about the economic consequences of the increasing dispersion of input costs and profits because a multinational enterprise can distribute profits between all its business units or intangible assets or allocate the profits to one single business unit or intangible asset. The contribution of this paper broadens the existing literature on international trade theory and trade statistics by explaining the importance of separating the geographical distribution of input cost and profit analyses while considering the value added reporting of international trade (for comparison, see Baldwin & Evenett, 2012). In this paper, this separation of costs of inputs and profits is taken into account when discussing the outcomes for public policy.

### **Research question 3:**

#### **How have globalization and the disaggregation of value chains occurred in the mobile telecommunications industry between 2000 and 2007?**

The continuation of geographical dispersion and the distribution of added value in global supply chains are correlated with increasing knowledge in emerging economies. The third article explores how multinational enterprises have responded to this change. This transformation in the transfer of knowledge was recognized several decades ago, and as knowledge flows to new economies, the added value of entire industries and single products or services is increasingly created in numerous countries instead of within single national economies. Furthermore, these developments impact where different technological and product development, prototyping, component manufacturing and final assembly activities take place. However, most of the technological and product development, prototyping and market-related knowledge have historically been located in advanced economies (for introductions on this topic, see Vernon, 1966, 1971; Quinn, 1969; Teece, 1977; Döring & Schnellenbach, 2005; Antràs & Rossi-Hansberg, 2009).

This article conceptualizes the dynamics of globalization, the changes in the geographical distribution of added value, and the transfer of knowledge from advanced economies to emerging economies through three distinct cases. For the specific literature related to international trade, global value chains, and knowledge transfer, it creates a modern way to capture the logic behind how multinational enterprises have systematically transferred their value-adding activities and knowledge from advanced economies to emerging economies. Furthermore, the article offers the opportunity to consider the commoditization of technology, task-level globalization, and the organizational level of value creation over multiple years (for reviews, see Gereffi, 1999; Pyndt & Pedersen, 2006; Mudambi, 2008; Linden et al., 2009; Dedrick et al., 2009, 2011).

Emerging economies already execute most of the tasks related to certain technologies, including product design and manufacturing. Advanced economies therefore continue to manage the most valuable intangible assets (for comparisons, see Linden et al., 2009; Dedrick et al., 2009, 2011; Ali-Yrkkö et al., 2011). This paper broadens the existing literature and current academic discussion on the relocation of value chains and industrial networks, the offshoring and outsourcing strategies of firms, and agglomeration in the global economy (for comparisons, see Linden et al., 2009; Dedrick et al., 2009, 2011; Ali-Yrkkö et al., 2011). In this paper, these arguments are taken into account when discussing the outcomes of a transformation within a single multinational enterprise.

#### **Research question 4:**

#### **Who captures value in global supply chains?**

The economic consequences of the increasing disaggregation of multinational enterprise processes, activities and tasks are not clearly visible in trade statistics. The fourth paper investigates how the geography of added value for goods and services plays out for a single product in global supply chains in the era of the second unbundling (for an introduction, see Baldwin, 2006). Furthermore, the paper demonstrates that the capture of value, the ultimate variable for multinational enterprises and nations, is less dispersed among global supply chains than processes, activities, and tasks. Moreover, as Grossman and Rossi-Hansberg (2008) argue, recent developments in transportation and communication technologies have weakened the relationship between labor and geographic location.

This paper conceptualizes the approach and methodology to analyze added value in a complete global supply chain of a multinational enterprise from the perspective of a single product. Furthermore, the paper conceptualizes how to calculate the geographical distribution of added value, not only based on

multinational enterprise headquarters, but allowing for the generation of each component of added value created and captured by multiple locations and functions. Moreover, the paper offers an opportunity to compare macro-level international good and service trade statistics data to micro-level data on the product level and to analyze the differences in measures (for reviews, see Linden et al., 2009; Ali-Yrkkö, 2010).

Available trade statistics reveal little about the economic consequences of the increasing dispersion of added value; i.e., trade of goods and services (for comparison see Baldwin 2006; Ali-Yrkkö, 2010; Baldwin & Venables, 2010; Baldwin & Evenett, 2012). This paper extends the existing literature on international trade theory and trade statistics by explaining the importance of separating reporting on the trade in goods from that on the trade in services to capture the contemporary role of services in each economy (for comparison, see Baldwin & Evenett, 2012). This is only visible in minor details in current trade statistics reporting. In this paper, this separation of trade in goods and trade in services is taken into account when discussing the outcomes for public policy.

#### **Research question 5:**

#### **How have offshoring and outsourcing advanced in global high tech business networks and supply chains from 2000 to 2010?**

The fifth study is motivated by the accelerated pace of the disaggregation of multinational enterprise value and supply chains and how this disaggregation causes different phases of product life cycles to shift from advanced economies to emerging economies. The characteristics linked to changes in the leading multinational enterprises' business environments, offshoring and outsourcing strategies and operational structures, and how these changes are then reflected in the strategies and operational structures of industrial supplier networks, motivate this study. However, each industry, global supply chain, and industry supplier network evolves at its own rate (for introductions on this topic, see Blinder, 2007a, 2007b; Mudambi, 2008; Dunning, 1993, 1998; Pyndt & Pedersen, 2006, Seppälä, 2010, 2013).

This research tracks the industry dynamics and transformations of entire industry networks through multiple cases in which systematic knowledge transfer and catch-up effects to balance the inequalities between advanced economies and emerging economies play an important role. Tracking these strategies in global supply chains is therefore often a complex task. Furthermore, this study facilitates the discussion related to the shift from transferring knowledge related to tangible assets to intangible knowledge. Moreover, the research confirms the

observation of Grossman and Rossi-Hansberg (2008) that a decline in labor costs has effects such as factor-augmenting technological progress (for reviews, see Mudambi, 2008; Ali-Yrkkö & Tahvanainen, 2009; Seppälä, 2010, 2013).

Disaggregation has and continues to play an important role in the strategic decisions of firms. New industrial networks are being transferred from advanced economies and rebuilt in emerging economies because of new market opportunities and lower costs (for comparison, see Mudambi, 2008; Baldwin & Venables, 2010). This paper extends the existing literature and current academic discussion on the relocation of value chains and industrial networks, the offshoring and outsourcing strategies of firms, and agglomeration in the global economy (for comparisons, see Pyndt & Pedersen, 2006, Sturgeon et al., 2008; Seppälä, 2010, 2013). In this paper, these arguments are taken into account when discussing the outcomes of multinational enterprises for multinational enterprise interaction.

### 3 METHODOLOGICAL ASPECTS AND RESEARCH MATERIAL

Qualitative research methods in general and case studies in particular have a long and distinguished history in management research; hence, research case studies have seldom been used in economics (Gummesson, 2000). Case studies have been used to develop theories on diverse topics (Yin, 1989, 1994, 2009; Eisenhardt & Greabner, 2008). However, theory built from case studies can sometimes be incomprehensive. As Eisenhardt and Greabner (2008) explain, building theory from case studies involves a rich empirical narrative of a specific phenomenon. A general limitation of case studies is related to the fact that there are no generally accepted guidelines for case assessments (Yin, 1989, 1994, 2009).

In this PhD dissertation, the discussion focuses on five different case studies in relation to the same contemporary phenomenon of globalization to provide a bridge between rich empirical narratives and mainstream research. Furthermore, all the case studies in the different papers focus on the same phenomenon but from different perspectives. It should be emphasized that the dataset for these case studies is unique. However, the dataset focuses only on two industries: mobile telecommunications and precision machinery. Nevertheless, the total number of 17 local and multinational enterprises are covered in the research program.

Inductive case studies in this particular PhD dissertation facilitate an understanding of a complex issue, extend experience and strengthen findings from previous research. Inductive case studies primarily generate new empirical findings on current contemporary globalization and help to set respective new theories. In management research, case studies are typically concerned with understanding the current status of a firm and serve as a starting point for improving its performance. The different papers of this dissertation use different types of research designs, data and levels of analysis; Table 1 summarizes these aspects.

**Table 1**

Summary of the research questions, research designs, key results, and contributions of the papers

	Paper 1	Paper 2	Paper 3	Paper 4	Paper 5
<b>Title</b>	Building Complementary Assets in a Unified TCP/IP World	Global Supply Chains and Transfer Pricing: Insights from a Case Study	Changing Geographies of Value Creation in Global Supply Chains: Evidence from Mobile Telecommunications	Who Captures Value in Global Supply Chains? Case of the Nokia N95 Smartphone	Tracking Offshoring and Outsourcing Strategies in Global Supply Chains
<b>Research objective</b>	To shed light on specific components of international trade theory and contemporary industrial dynamics in mobile telecommunications through the analysis of global value chains with a particular emphasis on the significance of these aspects in the context of the second unbundling.				
<b>Research question</b>	What different strategies are employed in the current mobile internet market?	How do multinational enterprises operate in contemporary global production networks?	How are the operational structures of multinational enterprises being transformed?	How do multinational enterprises operate in contemporary global supply chains?	How are the operational structures of global supply chains being transformed?
<b>Specific research question</b>	What are the strategies of the three most powerful entrants in the mobile internet market?	Where do multinational enterprises locate their costs and profits in global production networks?	How have globalization and the disaggregation of value chains occurred in the mobile telecommunications industry between 2000 and 2007?	Who captures value in global supply chains?	How have offshoring and outsourcing advanced in global high-tech business networks and supply chains between 2000 and 2010?
<b>Level of analysis</b>	Industry-level analysis	Multinational enterprise-level analysis	Multinational enterprise-level analysis	Multinational enterprise-level analysis	Industry and industry-network-level analysis
<b>Research design and methodology</b>	Empirical, qualitative	Empirical, quantitative, case analyses	Empirical, quantitative, case analyses	Empirical, quantitative, case analyses	Empirical, qualitative
<b>Data sources</b>	Public data from eight firms; Qualitative interviews;	Case firm; Public data; ORBIS database (from Bureau van Dijk Electronic Publishing)	Public Data; Qualitative interviews; ORBIS database (from Bureau van Dijk Electronic Publishing)	Public data; Qualitative interviews; ORBIS database (from Bureau van Dijk Electronic Publishing)	Public data; Qualitative interviews; ORBIS database (from Bureau van Dijk Electronic Publishing)

<b>Key results and insights</b>	<p>Inclusion of the geographical turnaround of industrial power through radical interventions</p> <p>Inclusion of two different technology platforms inside the mobile internet market</p>	<p>Identification and inclusion of different measures of trade in the era of the second unbundling: trade in added value, trade in cost of input, and trade in profits</p> <p>Identification and inclusion of the role of transfer pricing in dividing added value into cost of inputs and profits, between the different stages of global manufacturing networks, and by economic geography</p>	<p>Inclusion of the changes in the distribution of added value and in economic geography and inclusion of geographical dispersion of the different product life-cycle tasks, both in a longitudinal study</p> <p>Inclusion of the geographical dispersion of the value added by participants and economic areas in a longitudinal study</p> <p>Inclusion of the dynamics of the geographical dispersion of the different product life-cycle tasks between advanced and emerging economies in a longitudinal study</p>	<p>Identification and inclusion of different measures of trade in the era of the second unbundling: trade in goods and trade in services; identification of the new endogenous role of multinational enterprises in international trade.</p> <p>Identification and inclusion of the geographical dispersion of the value added by participants and by economic geography and the role of business services in trade and value creation and capture</p>	<p>Inclusion of the geographical dispersion of a supply chain</p> <p>Inclusion of the dynamics of the geographical dispersion of the supply chain in a longitudinal study</p>
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All of the papers of this PhD dissertation produce results of general interest, but their conclusions can be either general or specific regarding the number of case studies in each paper. The key results and contributions are presented in the next section of the introduction.



## 4 KEY RESULTS AND CONTRIBUTIONS

The overriding result and contribution of this PhD dissertation is to clarify the separation of added value into two distinct processes, the cost of inputs and profits, and how they are linked to international trade theory and trade statistics. Understanding these two processes and their respective economic geographies in light of two aspects of the contemporary phenomenon of globalization, the second unbundling and global value chains, is critical. Other results of this PhD dissertation contribute to contemporary research on industry dynamics and the global disaggregation of clusters.

### 4.1 CREATIVE DESTRUCTION IN THE MOBILE INTERNET MARKET

We are witnessing Schumpeterian creative destruction on an unprecedented scale in the mobile internet market. Only 10 years ago, the mobile telecommunications industry was a controlled telecommunications network consisting of mobile device makers such as Ericsson and Nokia and incumbent carriers such as AT&T and Verizon. In 2012, the power of these players has declined and Silicon Valley is now at the center of competitive events in the mobile internet market. The first paper of this PhD dissertation (Appendix 1) sets the scene for contemporary events in the mobile Internet market in which multinational enterprises from the Internet, computer and mobile telecommunications industries are merging into n-dimensional competition.

The first paper of the PhD dissertation (Appendix 1) contributes to the literature on industry dynamics, complementary assets and technology platforms by addressing research from a contemporary Schumpeterian creative destruction perspective. Complementary assets and technology platforms have so far been absent from the current literature and academic discussion related to the mobile internet market. In existing research and literature on industry dynamics, complementary assets are well established; however, research and literature on technology platforms has focused mostly on a single-firm perspective, not an ecosystem perspective, as discussed in this paper.

To answer the research questions “*what are the strategies of the three most powerful entrants and platform providers in the mobile Internet industry?*” and “*what implications will their platform models have for a key group of partners, the mobile phone operators, which are the firms that actually provide the connectivity in mobile internet?*”, this paper focuses on understanding symbiotic and context-driven relationships between the different multinational enterprises operating

in a single mobile Internet ecosystem. Hence, many multinational enterprises drive their relationships in two mobile Internet ecosystems.

The first paper of this dissertation (Appendix 1) collected data from two sources: First, public data, such as press reports, blogs and other similar sources of information were studied; second, F-21 reports, financial reports, and press releases of eight multinational enterprises involved in mobile ecosystems and their direct competitors were assessed. This data set is essential for a dynamic analysis of contemporary events in the mobile internet market. Furthermore, the data allowed for the consideration of the strategies employed by multinational enterprises from the internet, computer, and mobile telecommunication industries.

The first paper makes an empirical contribution to the literature on industry dynamics (Seppälä & Martikainen, 2011; West & Mace, 2010; Kenney & Seppälä, 2012; Funk, 2012; Seppälä & Kenney, 2012), complementary assets (Teece, 1986; Tushman & Anderson, 1996), and technology platforms (Cusumano & Yoffie, 1998; Cusumano & Gawer, 2002; Cusumano, 2010; Kenney & Pon, 2011).

The general results of the analyses of the first paper of the dissertation (Appendix 1) indicate that we are witnessing a geographical shift of industrial power caused by the radical innovations represented by Apple's and Google's business models, especially Google's, in the current mobile Internet market. Empirical evidence indicates that Google's revolutionary business model in particular appears to be the current winning model in the race for competitive and positional advantage in the mobile internet market. However, the future role of the operating system in the mobile internet market remains unclear if the main functions of the operating system and their respective technological architecture are transferred to the cloud with its respective technological architecture. This development then causes the separation into two different technology platforms inside the mobile internet market: device and cloud. This observation is particularly interesting when considering the future dynamics in the mobile internet market in relation to n-dimensional competition.

The key result of the analyses of the first paper of the dissertation (Appendix 1) is related to the complementarity of Google's technologies and service platforms, which take generic, specialized, and non-specialized complementary assets into account. Google provides technologies and service platforms such as Google Play, the Android operating system, cloud services and other technologies and service platforms free of charge to different stakeholders in its mobile internet ecosystem as well as to consumers. This may impede, however, the other ecosystem members from capturing monopolistic rents because they constantly compete with other firms using the platform. Finally, as we have shown, because of Google's weak lock-in, it must protect itself by having positions in the largest number of spots in the value chain/stack.

## 4.2 ECONOMIC GEOGRAPHY OF ADDED VALUE, COST OF INPUTS, AND PROFITS

The so-called “new trade theory” and, more recently, the literature on economic geography and global value chains have enriched the economic understanding of international trade. However, anyone who has sought to understand the shift in international trade between the first and second unbundlings over the past years has faced the problem of low quality trade statistics. The second paper of this PhD dissertation (Appendix 2) contributes to the extant literature by focusing on the specifics of global value chain analytics from the perspective of international trade theory and the economic geography of added value, cost of inputs, and profits; in contrast, earlier literature and empirics have focused on the first type of unbundling in international trade theory and trade statistics.

To answer the research question “*where do multinational firms locate their costs and profits?*”, the paper highlights the fact that multinational enterprises can distribute profits between all their business units or intangible assets or allocate the profits to one single business unit or intangible asset. Hence, trade statistics on added value, cost of inputs and profit levels would reveal the change from the first unbundling to the second unbundling. Furthermore, new trade statistics would expose the contemporary role of multinational enterprises and national economies in modern international trade.

The second paper of this PhD dissertation (Appendix 2) uses data collected from a multinational Finnish precision machinery enterprise. The data focuses on the individual aspects of “simple economics,” i.e., invoice-level data based on the cost accounting and transfer pricing data for a single precision machinery product manufactured by a multinational enterprise with assembly facilities in three macro regions – Northern Europe (Finland), Asia (China), and North America (USA). The product is produced internally in six separate modules and then assembled in one of the three regions for final delivery to the customer.

The paper makes methodological (Linden et al., 2009; Dedrick et al., 2009, 2011; Ali-Yrkkö, 2010; Ali-Yrkkö et al., 2011; Baldwin & Evenett, 2012) and empirical (Baldwin, 2006, 2009, 2011; Baldwin & Venables, 2010; Baldwin & Evenett, 2012) contributions to the discussion of the new international trade theory and the respective academic discussion on the second unbundling and global value chains (for global value chain literature, see Eccles, 1985; Kogut, 1985; Porter, 1986, 1990; Hopkins & Wallerstein, 1986; Gereffi, 1994, 1999; Gereffi et al., 2005; Sturgeon et al., 2008).

The results of the analyses of the second paper of the dissertation (Appendix 2) indicate that we have witnessed a new industrial revolution. However, multinational enterprises appear to be ahead of the game, and international trade statistics

are lagging behind. In this paper, we have identified and illustrated new measures of trade statistics in the industrial era of the second unbundling: trade in added value, trade in cost of inputs, and trade in profits. Furthermore, we have identified and illustrated the role of transfer pricing in dividing added value into cost of inputs and profits between different stages of global manufacturing networks, and by economic geography. Moreover for nation-states, as value and supply chains become more international and complex, critical measures such as gross domestic product, worker productivity etc. are becoming ever more imprecise.

The single most surprising observation to emerge from the case analyses is that MNE's accounting system and the transfer pricing mechanism do not necessarily represent where the most valuable assets of the MNE are geographically located. This could be because the case firm used to manufacture its products mainly in one single economy and has recently distributed its operations and supply chain on a global scale; the accounting system and transfer pricing mechanisms are simply lagging behind.

### 4.3 TRACKING TRANSFORMATIONS IN GLOBAL VALUE CHAINS

The rising share of offshoring in global economies highlights the crucial role of tracking transformations in global value chains in detail. Furthermore, anyone who has attempted to understand these transformations and the respective disaggregation of the supply chain between advanced economies and emerging economies over the last decades has been faced with deficient empirics. The third paper of this PhD dissertation (Appendix 3) contributes to the extant literature and empirics by focusing on the specifics of global value chain analysis from the perspective of the changes in economic geography and knowledge transfer in a longitudinal study; in contrast, earlier literature and empirics have focused on single-point-of-time studies.

To answer the research question *“how have globalization and the disaggregation of the value chain occurred in the mobile telecommunications industry between 2000 and 2007?”*, the paper focuses on understanding how added value is distributed among the different participants of global supply chains, the geographical distribution of added value, in which geographical economy major tasks related to the product are actually performed, and how these developments have changed from the late 1990s until today. Furthermore, the third paper of the PhD dissertation (Appendix 3) sheds light on the progress of the geographical dispersion of supply chains and how this dispersion correlates to the increasing volume of knowledge in emerging economies.

The third paper of this PhD dissertation (Appendix 3) uses data collected from a multinational Finnish telecommunications enterprise. The data focus on the details of three products with similar functionalities but differences in industrial design. This is ideal for a dynamic examination of value creation at the product level. Furthermore, the data allow for the consideration of the commoditization of the technology, globalization at the task level, and geographical and organizational value creation at the product level. The product is produced internally in several different manufacturing locations for final delivery to the customer.

The third paper makes an empirical contribution to the discussion on the new international trade theory and the respective academic discussion on the second unbundling (Baldwin, 2006, 2011; Baldwin & Venables, 2010; Baldwin & Evenett, 2012). Furthermore, the paper makes another empirical contribution to the literature on geographic economy and global value chains (Eccles, 1985; Kogut, 1985; Porter, 1986, 1990; Hopkins & Wallerstein, 1986; Gereffi, 1994, 1999; Gereffi et al., 2005; Sturgeon et al., 2008; Mudambi, 2008).

The results of the analyses of the third paper of the dissertation (Appendix 3) indicate changes in the distribution of added value, economic geography, and the geographical dispersion of the different product life-cycle tasks in a longitudinal study. Three key results of the analyses were found: *First*, the emerging economies execute most tasks related to technology and product development, prototyping, component manufacturing and final assembly. Furthermore, market knowledge is located in emerging economies (in reference, see Mudambi, 2008). *Second*, because the emerging economies execute most of the tasks, the created added value has increased. Third, an increase in more demanding tasks in developing countries has required a competence transfer from developed countries. Rather than occurring suddenly, this process has taken place gradually over several years. Overall, our study provides product-level insight into task-level globalization and how it impacts value creation in different regions. Developing countries such as China are no longer just manufacturing locations; increasingly, they are undertaking tasks with greater added value, including management and R&D tasks.

#### 4.4 ECONOMIC GEOGRAPHY OF ADDED VALUE BY SUPPLY CHAIN PARTICIPANTS

The new models to construct the economic geography based on global value chain analyses are models in which multinational enterprises arise endogenously. Hence, investigating the role of services in international trade and in manufacturing in general during the time of the second unbundling has been limited by scarce trade statistics. The fourth paper of this PhD dissertation (Appendix

4) contributes to the extant literature and empirics by focusing on the specifics of global value chain analytics from the perspective of the international trade theory and the economic geography of added value; in contrast, earlier literature and empirics have focused on the first type of unbundling in international trade theory and on trade statistics.

To answer the research question “*who captures value in global supply chains?*” the paper highlights the fact that current trade statistics can be highly misleading in economic analyses because they continue to measure the gross value of cross-border trade instead of added value. Hence, trade statistics on added value would partly reveal the change from the first to the second unbundling. Furthermore, new added value trade statistics would expose the contemporary roles of multinational enterprises and national economies in current international trade. Moreover, the value added in different manufacturing stages could be properly measured.

The fourth paper of this PhD dissertation (Appendix 4) uses data collected from five different sources in relation to a product that is designed and manufactured by a multinational Finnish telecommunications enterprise. The data focus on individual aspects of public information and on further qualitative and quantitative information collected via interviews with sixteen industry experts who are currently working or have previously worked in various roles in the telecommunications supply chain.

The paper makes methodological (Linden et al., 2009; Dedrick et al., 2009, 2011; Ali-Yrkkö, 2010) and empirical (Baldwin, 2006, 2009, 2011; Baldwin & Venables, 2010) contributions to the discussion on the new international trade theory and the respective academic discussion on the second unbundling and global value chains (for global value chain literature, see Eccles, 1985; Kogut, 1985; Porter, 1986, 1990; Hopkins & Wallerstein, 1986; Gereffi, 1994, 1999; Gereffi et al., 2005; Sturgeon et al., 2008).

The results of the analyses of the fourth paper of the dissertation (Appendix 4) indicate that we have witnessed an appropriately industrial revolution. However, multinational enterprises appear to be ahead of the game, and international trade statistics are lagging behind. In this paper, we have identified and illustrated the importance of differentiating between trade in goods and trade in services in trade statistics in the industrial era of the second unbundling. Furthermore, we have identified and illustrated the geographical dispersion of added value by participants and by economic geography and the role of business services in trade and the creation and capture of value.

The results of our analyses have three broad implications. *First*, our results highlight the irrelevance of the lingering manufacturing vs. services discussion.

*Second*, international commodity trade statistics that continue to record the gross values of cross-border flows of goods can be highly misleading. *Third*, in many countries, national policy makers appear to have an obsession with attaining a certain national final assembly capacity. Hence, the objective of the national economy should be to capture as much added value as possible. For example, while China is determined not to remain a “2%” assembly location and is rapidly extending its higher value adding functions, Europe and the USA retain many advantages in providing globally differentiated inputs.

## 4.5 TRACKING TRANSFORMATIONS IN INDUSTRY NETWORKS

The geographical dispersion of value and supply chains has recently begun to play an increasingly important role in the analyses of offshoring and outsourcing. Anyone who has been interested in offshoring and outsourcing has been faced with an abundance of empirical data on value and supply chains but a lack of data on single multinational enterprises. The fifth paper of this PhD dissertation (Appendix 5) contributes to extant literature and empirics on offshoring and outsourcing by focusing on the specifics of tracking the transformation of a complete supply chain. Furthermore, the paper focuses on describing the transformation in terms of economic geography and the respective knowledge transfer process among the different multinational enterprises participating in the supply chain over a certain period of time.

To answer the research question “*how have offshoring and outsourcing advanced in global high-tech business networks and supply chains between 2000 and 2010?*”, the paper focuses on understanding the changes in the business environment and strategies of leading firms and how these changes affect the different participants in a leading firm’s supply chain. However, industry dynamics appear to differ from those in the mobile devices industry (Seppälä, 2010, 2013). Furthermore, the fifth paper of the PhD dissertation (Appendix 5) sheds light on the progress of the geographical dispersion of supply chains and how this dispersion correlates to the increasing volume of knowledge in emerging economies.

The fifth paper of this dissertation (Appendix 5) used data collected from two sources. First, between August 2010 and May 2011, 14 semi-structured qualitative interviews were conducted. Second, public data, such as F-21 reports, financial reports, and press releases of the involved multinational enterprises and their direct competitors were assessed. This data collection is essential for a dynamic analysis of offshoring and outsourcing in global supply chains. Furthermore, the

data allowed for the consideration of the role of technology commoditization in the offshoring and outsourcing decisions of a multinational enterprise.

The fifth paper makes an empirical contribution to the literature on geographic economy and global value chains (Eccles, 1985; Kogut, 1985; Porter, 1986, 1990; Hopkins & Wallerstein, 1986; Gereffi, 1994, 1999; Gereffi et al., 2005; Sturgeon et al., 2008; Mudambi, 2008). The results of the analyses of the fifth paper of the dissertation (Appendix 5) demonstrate the changes in and the dynamics of the geographical dispersion of a supply chain in a longitudinal study.

The results of the analyses of the fifth paper of the dissertation (Appendix 5) indicate that the dynamics of industrial networks that cause the disaggregation of global supply chains continue to be one of the key operational strategies implemented by MNEs. This implies that the knowledge transfer – catch-up effect continues to close the skilled labor gap between advanced and emerging market economies. Furthermore, shortages in the labor supply and technology commoditization seem to be other key drivers for firms to relocate their global supply chains from advanced to emerging market economies.

## 4.6 SYNTHESIS

To illustrate the contributions of the different papers (Appendixes 1, 2, 3, 4, and 5) to the literature on international trade theory, economic geography, global value chains, industry dynamics and the global disaggregation of clusters, Table 2 classifies extant literature and analyses on global value chains and provides the main references. The contributions of the different papers were discussed in greater detail in section 4.1–4.5, above.

The key results and contributions of this PhD dissertation (Appendixes 1, 2, 3, 4 and 5) are aligned with the discussion of the linkages between international trade theory and its respective trade statistics as well as how value chain analytics that employ “simple economics” are used to analyze the behaviors of multinational enterprises in global production networks and supply chains (for a comparison, see Linden et al., 2009; Dedrick et al., 2009, 2011; Ali-Yrkkö, 2010; Baldwin & Venables, 2010; Baldwin & Evenett, 2012). Furthermore, using “simple economics,” i.e., transfer pricing mechanisms and the cost accounting of multinational enterprises, the added value can be divided into two different types of trade, cost of inputs, profits, and the respective economic geography. The implications for research, public policy and practice are presented in the next section of the introduction.



**Table 2**

## The existing body of knowledge on global value chains

Elements of global value chains	Extant research and literature	Contribution of papers and the dissertation
International trade theory and second unbundling	Vernon, 1966; Helpman, 1984; Markusen, 1995; Markusen & Venables, 1998, 2007; Baldwin, 2006, 2009, 2011; Baldwin & Evenett, 2012	<p>Paper 2. Identification and inclusion of different measures of trade in the era of the second unbundling: trade in added value, trade in cost of inputs, and trade in profits</p> <p>Paper 4. Identification and inclusion of different measures of trade in the era of the second unbundling: trade in goods and trade in services; identification of the new endogenous role of multinational enterprises in international trade.</p>
Global value chains and analytics	Eccles, 1985; Kogut, 1985; Porter, 1986, 1990; Hopkins & Wallerstein, 1986; Gereffi, 1994, 1999; Gereffi et. al., 2005; Hanson et. al., 2005; Sturgeon et. al., 2008; Linden et. al., 2009; Dedrick et. al., 2009, 2011; Ali-Yrkkö, 2010; Baldwin & Venables, 2010;	<p>Paper 2. Identification and inclusion of the role of transfer pricing in separating added value into cost of inputs and profits, between the different stages of global manufacturing networks, and by economic geography</p> <p>Paper 3. Inclusion of changes in the distribution of added value and economic geography and the inclusion of the geographical dispersion of different product life-cycle tasks, both in a longitudinal study</p> <p>Paper 4. Identification and inclusion of the geographical dispersion of added value by participants and by economic geography and the role of business services in trade and the creation and capture of value</p>
Off-shoring and geographical dispersion of added value	Vernon, 1966, 1971; Quinn, 1969; Teece, 1977; Döring & Schnellenbach, 2005; Grossman & Helpman, 2005; Pyndt & Pedersen, 2006; Antràs & Rossi-Hansberg, 2009; Grossman & Rossi-Hansberg, 2008; Mudambi, 2008; Seppälä, 2010, 2013	<p>Paper 1. Inclusion of geographical changes in industrial power through radical innovations</p> <p>Paper 3. Inclusion of geographical dispersion of added value by participants and economic areas in a longitudinal study</p> <p>Paper 5. Inclusion of the geographical dispersion of a supply chain</p>
Industry dynamics, complementary assets, and technology platforms	Teece, 1986; Tushman & Anderson, 1996; Cusumano & Yoffie, 1998; Cusumano & Gawer, 2002; Cusumano, 2010; Seppälä & Martikainen, 2011; West & Mace, 2010; Kenney & Pon, 2011; Kenney & Seppälä, 2012; Funk, 2012; Seppälä & Kenney, 2012	<p>Paper 1. Inclusion of the two different technology platforms in the mobile Internet industry</p> <p>Paper 3. Inclusion of the dynamics of geographical dispersion of different product life-cycle tasks between advanced and emerging economies in a longitudinal study</p> <p>Paper 5. Inclusion of the dynamics of geographical dispersion of a supply chain in a longitudinal study</p>

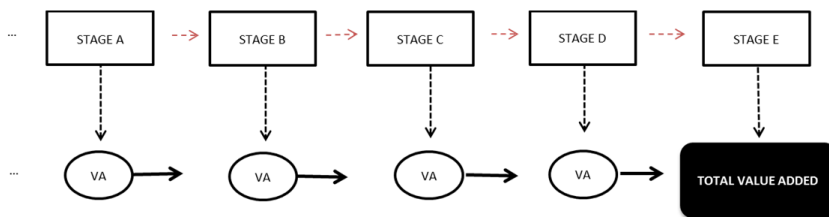
## 5 IMPLICATIONS FOR RESEARCH, PUBLIC POLICY AND PRACTICE

This PhD dissertation investigates the contemporary phenomenon of globalization from the perspective of the second unbundling. Furthermore, this PhD dissertation explores three micro-level determinants of globalization: the dynamics of industries, the economic geography of multinational enterprises (MNEs) and the global configurations of value chains and their respective industrial networks. Each paper of this PhD dissertation identifies areas in the extant literature in which there are empirical gaps and makes related contributions. The contemporary phenomenon of globalization is broad. We would therefore like to emphasize the discussion of the implications of the PhD dissertation papers.

The spatial disaggregation of global value chains continues (Baldwin & Evenett, 2012). Furthermore, there are numerous stages of added value in global supply chains (see Figure 1 for illustration). In each stage of a global supply chain, value added is created, either positive or negative.

**Figure 1**

Each stage/participant in a global supply chain creates value added

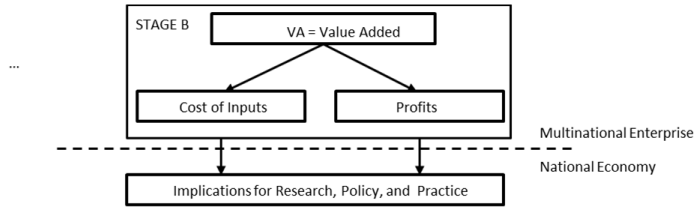


The value added created at each stage of the supply chain can be further divided into inputs of cost of inputs and profits based on “simple economics”: the transfer pricing mechanisms and cost accounting of a multinational enterprise. This approach then allows for the calculations of how the added value, cost of inputs and profits are distributed among different national economies as separate measures of trade in added value (see Figure 2 for illustration).

These contemporary organizational choices of multinational enterprises impact national policy makers and change their respective policies. Figures 1 and 2 illustrate how each stage of the global supply chain has implications for research, policy, and practice. These implications are presented in the next sections.

**Figure 2**

The division of added value into cost of inputs and profits at each stage in a global supply chain and the respective policy implications



## 5.1 IMPLICATIONS FOR RESEARCH

As a contribution to contemporary research, this PhD dissertation and its respective papers demonstrate that the global value chain literature lacks an appropriate methodology to evaluate and understand the contemporary phenomenon of globalization. However, the methodology and literature provide a set of criteria and tools to be developed. As Sturgeon et al. (2008) and Baldwin and Evenett (2012) note, the research is in a nascent stage because we lack empirical evidence. To date, a few empirical analyses have been conducted, but with major limitations due to a lack of understanding of the contemporary behaviors of multinational enterprises in global supply chains. This PhD dissertation shows that there is a great opportunity to confront assertions about globalization with facts from multinational enterprises and a reasonably good methodology.

- **The relevance of contemporary public policies should be evaluated from the perspective of the second unbundling**

This PhD dissertation and its respective papers serve as a useful foundation to empirically challenge the assertions that have been made in relation to global value chains. The first encouraging avenue for future research is to continue extending the current methodology to new areas of analyses, including social and educational policies, and especially job creation policy, and to measure the efficiency of these policies in longitudinal studies. As Tahvanainen (2011) notes in his PhD dissertation, to improve the efficiency of public policies, we need to understand geographical economics and how the geography of multinational enterprises affects the evolution of national economies; we also need to under-

stand the distribution of added value in global supply chains, their respective industry networks and the role of the public sector. Such an understanding would first require several research teams to benchmark the developed methodology and its usage for global value chain analysis. Furthermore, a theory for global value chains could be created.

- **Measures on the trade of cost of inputs and trade of profits should be evaluated and calculated from the perspective of a national economy**

The second encouraging avenue for research is related to international trade theory and new measures of trade because the results from paper two (Appendix 2) show that the geographies of added value, cost of inputs and profits differ significantly from one another. Measuring only trade in added value leads to different conclusions than separately measuring cost of inputs and profits. Such a new study could test the validity and implementation of the new measures of trade. Furthermore, such new measures of trade could lead us to understand the contemporary phenomena of globalization through different means. In particular, understanding the geographies of cost of inputs and profits could lead to small adjustments in the principles of comparative advantages and the respective theories of national economies.

- **Value capture through the different phases of product and innovation life cycles should be analyzed more thoroughly using the basic methodology from paper four of the dissertation**

The third promising pathway for research is in the area of innovation profits (for introduction, see Teece, 1986; Dedrick et al., 2009). Such research would be interesting because Teece (1986) offers a framework in which he identifies the factors that determine who captures profits from innovation. However, specific empirical evidence is missing. Dedrick et al. (2009) take a step in the right direction because their empirics are based on a single point in time. Furthermore, Dedrick et al. (2009) do not consider innovation profits over the product life cycle and do not explain the amount of market access. Identifying the outcomes of innovation profits from a product life cycle is a great opportunity for future studies.

Finally, future studies could investigate the efficiencies of different designs and manufacturing locations for a product or a service of a multinational enterprise by using the same global value chain methodology and analyses. This study would be especially interesting when considering the transfer of knowledge between advanced and emerging economies and its respective advantages

and disadvantages for national economies and multinational enterprises. The implications for public policy and practice are presented next.

## 5.2 IMPLICATIONS FOR PUBLIC POLICY

Offshoring and outsourcing have distributed different tasks and stages of global value and supply chains across the world. Furthermore, technological changes in products and services and changes in organizational structures continue because multinational enterprises continue to search for new markets and new positioning and competitive cost advantages. These changes could lead to increased national employment and investment losses in most advanced economies but also in emerging economies if markets mature, costs rise and investments decline. The contributions of this PhD dissertation and the five papers have the three following potential implications for public policy.

- **Micro-level units of control for national policies should be considered**

Based on economics thinking, the national economy continues to be the unit of control for national policies. The first implication for public policy is two-dimensional: first, the implication relates to micro-level units of control inside and between national economies; second, the implication relates to the larger unit of control for policies that are not decided by a single national economy but a larger consortium of national economies. All five papers indicate that policy makers are still lacking behind in comparison to multinational enterprises (Appendix, 1, 2, 3, 4 and 5). This finding confirms the observation by Baldwin and Evenett (2012) that national policies are still considered through the eyes of the first unbundling.

- **In mature industries, the changes in technological lifecycles, organizational structures and global supply chains continue to be longitudinal**

One of the key implications for public policy relates to the role of longitudinal policies. In terms of the contemporary phenomenon of globalization through the eyes of the second unbundling, longitudinal policies continue to be the backbone for mature industries and industrial networks. As indicated in papers three and five (Appendixes 3 and 5), changes in industry structures require long-term strategic planning and implementation; however, if sudden changes occur in the business environment, there might be a need for supporting short-term policies

- **Employment structures in national economies continue to be multi-level – manufacturing jobs continue to be of importance**

Another key implication for public policy relates to employment structures in national economies. Typically, employment structures include primary (e.g., mining), secondary (e.g., manufacturing), tertiary (e.g., teaching) and quaternary (e.g., research & development) jobs. Regarding second unbundling and the disaggregation of tasks and stages of global value and supply chains, secondary jobs should be treated equal to quaternary jobs. As noted in papers three, four, and five (Appendix 3, 4, and 5), especially in paper three, the connection between manufacturing job losses and business service job losses continues to be high, especially in the area of commoditized technologies. However, the relationship to research & development is indistinguishable. The implications for practice are presented next.

### 5.3 IMPLICATIONS FOR PRACTICE

The change from the first to the second unbundling has been a long-term, multi-year process for multinational enterprises. The spatial reorganization of global value chains during the past fifteen years has been partly caused by the possibility of coordinating the tasks of product life cycles and stages of global supply chains from a distance and partly due to the developments in information and communication technologies, especially in the area of distributed team management tools and enterprise resource management systems. The earlier architecture of such tools and systems were designed and built to manage single tasks and operations such as during the first unbundling. However, the architecture of tools and systems started to change in early 2000, enabling the geographic disaggregation of the tasks and stages of global supply chains in a coordinated manner.

- **The role of management systems and information and communications technology platforms should not be underestimated**

It could be argued that many multinational enterprises do not consider management systems and information and communication technology platforms as enablers for the management of teams and the coordination of the globally dispersed stages of supply chains and industrial networks. Papers three and five (Appendix 3, and 5) explicitly explain the role of disciplined management systems while managing planned knowledge transfers between different geo-

graphical locations but also while managing agreed transformations in global supply chains between multinational enterprises. Furthermore, there is a great opportunity for multinational enterprises to enhance their performance through the effective use of different distributed team management tools and enterprise resource management systems.

- **The optimization of the cost of inputs , profits and taxation performance of multinational enterprises on the task and product levels should be further investigated**

The second unbundling offers a great opportunity for multinational enterprises to plan and implement optimized task- and stage-level input cost, profits and taxation processes. In particular, paper two (Appendix 2) provides temporal and spatial distinctions of these three different processes of the multinational enterprise from the perspective of economic geography. Moreover, this level of planning and implementation represents an opportunity for multinational enterprises to further enhance their financial performance. However, additional resources might be needed for planning and implementation.

## 6 LIMITATIONS

The most noteworthy limitations of this PhD dissertation relate to the broad phenomenon of contemporary globalization under investigation and the case studies and respective data sets used in papers two, three, and four (Appendix 2, 3 and 4). Contemporary globalization includes various components and theories that provide a variety of different empirical perspectives. The discussion in this PhD dissertation is focused on the time of the second unbundling, and the emphasis is more on the methodology used to analyze the geographic distribution of added value, input costs and profits than on actual changes within the economic geography between advanced and emerging economies. This focus then allows for the provision of empirical evidence about the transformation from the first to the second unbundling. It should be noted that the methodology is used only for five product analyses in three papers (Appendix 2, 3, and 4). Nevertheless, a total of 39 product case studies were conducted in research program. For the sake of clarity, all the limitations of the five different papers will be addressed in this introduction chapter.

In addition to one general limitation, this dissertation is subject to several paper-specific limitations. I first explain the limitations of papers two, three and four (Appendix, 2, 3, and 4) because the limitations of paper four build on the limitation of papers two and three.

In the fourth paper of the PhD dissertation, the global value chain analysis methodology is used for the first time. However, a similar methodology has been used by Linden et al. (2009) for analyzing Apple's iPod. Hence, our analyses focus on the added value created by different participants in a global supply chain rather than on gross margins. Furthermore, the theoretical approaches differ because our approach relies on economic rather than management theories. To our knowledge, this paper is the first to use this methodology. The other limitations of the fourth paper of the PhD dissertation are related to the data. Most significantly, we did not have access to either the internal cost accounting or transfer pricing data of multinational enterprises; we only had access to external sources of information and public information.

In the third paper of the PhD dissertation, the global value chain analysis methodology is used for a dynamic approach to analyze transformations of shares of added value between different economies in a longitudinal study. To our knowledge, this paper is the first to empirically demonstrate such systematic added value and knowledge transformations between advanced and emerging economies. Furthermore, the same limitations that apply to paper four also apply to this paper.



Additionally, a second limitation of the second paper of the PhD dissertation is that the global value chain methodology is further developed to analyze not only added value but also two different measures of added value; cost of inputs and profit. Furthermore, the economic geography is calculated separately for the three measures. To our knowledge, this paper is the first to use such an approach to calculate the differences in economic geography. Moreover, the limitations that apply to papers three and four also apply to this paper, with the exception that, in this case, we had access to the cost accounting and invoice-level transfer pricing data of multinational enterprises.

In addition to the limitations in papers two, three and four, papers one and five are subject to specific limitations as well. In the first paper of this PhD dissertation (Appendix 1), the complexity of the researched phenomenon is a limiting factor. Furthermore, in the fifth paper of this PhD dissertation, the complexity of understanding complex transformations in global supply chains is a limitation. However, this is the second such study on the topic of “Transformations of Mobile Telecommunications Supplier Networks” (see Seppälä, 2010, 2013).

## 7 CONCLUSIONS AND FUTURE RESEARCH

The purpose of the introduction of this PhD dissertation is to describe how all five papers of the dissertation are integrated as a whole. Furthermore, the other rationale behind the introduction is to illustrate how the different papers and respective case studies with rich empirical narratives serve as a bridge between the mainstream research on the second unbundling and international trade theory. With these empirically rich case studies, the theory building research should result in new insights on contemporary globalization. Moreover, the replication of similar case studies is important if the ultimate goal is to develop a new theory.

This PhD dissertation has addressed the contemporary phenomenon of globalization by concentrating on providing specific empirical evidence on creative destruction, economic geography, global value chains, and the strategic thinking of MNEs. For these purposes, each of the five papers focuses on a different aspect of a theory and empirics. Furthermore, the PhD dissertation highlights areas where there are gaps in theory, literature, methodology, and empirics and discusses possible contributions to shed light on these areas and their respective approaches.

The first paper (Appendix 1) of the PhD dissertation explained the Schumpeterian creative destruction that is taking place in the contemporary mobile internet market. The second paper (Appendix 2) discussed the specifics of global value chain analytics from new empirical perspectives of the economic geography of added value, cost of inputs, and profits and the respective contributions to international trade theory and trade statistics. The third paper (Appendix 3) focused on the specifics of global value chain analytics from two new empirical perspectives, economic geography and knowledge transfer, in a longitudinal study. The fourth paper (Appendix 4) concentrated on the specifics of global value chain analytics from two perspectives: the international trade theory perspective and the economic geography perspective of value added. The fifth paper (Appendix 5) explained the essence of tracking transformations in a complete supply chain and especially focused on describing the transformation in economic geography and the respective knowledge transferring process between the different multinational enterprises participating in global supply chains. All papers of this PhD dissertation contribute to the contemporary phenomenon of globalization from the perspective of the second unbundling.

There are several potential directions for future research. The first potential direction for future research is related to the methodology used in papers 2, 3, and 4 (Appendix 2, 3, and 4), extending the methodology to the areas of social,

education and especially job creation policy. The second promising direction of future research relates to the area of international trade theory and new trade measures. In particular, the results related to the geographical distribution of inputs of cost and profits are interesting. The third promising area for future research is the analysis of innovation profits from two specific perspectives: first, the product and innovation life cycle perspective, and second, the transformative economic geography perspective. Finally, future research could investigate the efficiencies of different innovations, designs and manufacturing locations of a product or a service from multi-industry and enterprises viewpoints.

All future research should focus on further understanding the contemporary phenomenon of globalization and developing a methodology for understanding global value chains and the respective changes in economic geography. Furthermore, it enables us to understand the second unbundling and possible future transformations.

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## APPENDIX 6: OTHER ARTICLES, PAPERS AND EDITORIALS THAT UNDERLIE THIS DISSERTATION

- I. Pon, B., Seppälä, T. & Kenney, M. (2014 forthcoming). Firm strategy and platform control in the post-PC world: The demise of operating system-based power? *Telecommunications Policy*
- II. Kalm, M., Seppälä, T. & Ali-Yrkkö, J. (2014). Extracting Value through Technology and Service Platforms: The Case of Licensing, Services and Royalties. ETLA Brief No. 21, Helsinki, Finland.
- III. Seppälä, T. (2013). Global Value Chains: The Role of the Business Services?, in Heikkilä, J., Vuori, M. & Laine J., *Purchasing Business Services* (pages 11 and 13). The Federation of Finnish Technology Industries, Helsinki, Finland
- IV. Seppälä, T. & Karhu, K. (2013). Jollan, Nokian ja Suomen strategiat mobiilitoimialan nykymurroksessa. *Talous ja Yhteiskunta* 4/2013, sivut 20–25.
- V. Seppälä, T. & Kalm, M. (2013). Profiting from Product Innovation: A Product Life Analysis of the Economic Geography of Value Added, *Industry Studies Working Paper:2013-1*, Industry Studies Association, Pittsburg, USA.
- VI. Ali-Yrkkö, J., Kalm, M., Pajarinen, M., Rouvinen, P., Seppälä, T., & Tahvanainen, A-J. (2013). Microsoft Acquires Nokia: Implications for the Two Companies and Finland. ETLA Brief. No. 16, Helsinki, Finland.
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- XI. Seppälä, T. & Kalm, M. (2013). Profiting from Product Innovation: The Product Life-Cycle Analyses of Added Value, *Industry Studies Conference Paper and Presentation*, Kansas City, USA. <http://www.industrystudies.pitt.edu/kansascity13/documents/Papers/4.1%20-%20Seppala%20-%20Profiting%20from%20Product%20Innovation.pdf>.
- XII. Tahvanainen, A-J. & Seppälä, T. (2013). Tarvitseeko Suomi radikaalimpaa innovaatiomallia? ETLA Brief No. 8, Helsinki, Finland.
- XIII. Seppälä, T. & Broens, R. (2013). How New Smartwatches Could Revolutionize the Artefact Surroundings of People, ETLA Brief No. 5, Helsinki, Finland.
- XIV. Seppälä, T. (2013). Transformations of Mobile Telecommunications Supplier Networks; The Offshoring Challenge: Strategic Design and Innovation for Tomorrow's Organization; Pedersen, T., Bals, L., Ørberg Jensen, P. D., Møller Larsen, M. (Eds.). Chapter 19, *Production and Process Engineering Series*, Springer.
- XV. Kenney, M. & Seppälä, T. (2012). Silicon Valley is Doing It Again. *San Francisco Daily Journal*. Vol. 118, No. 209. pp. 1, and 7, San Francisco, USA.
- XVI. Seppälä, T. & Kenney, M. (2012). Nokia ja Microsoft – Avioero ennen kihloja? *Talouselämä* Nro 37. s. 75–76.
- XVII. Seppälä, T. & Kenney, M. (2012). Competitive Dynamics, IP Litigation and Acquisitions: The Struggle for Positional Advantage in the Emerging Mobile Internet ETLA Discussion Papers No. 1288, Helsinki, Finland.

- XVIII. Kalm, M. & Seppälä, T. (2012). Palaako tuotanto Aasiasta Suomeen? Case Polkupyörä. ETLA Keskustelualoitteita No. 1287, Helsinki, Finland.
- XIX. Candelin-Palmqvist, H., Ketolainen, M., Seppälä, T. & Ylä-Anttila, P. (2012). Kiinan patenttistrategia 2011–2020: onko lännessä syytä huoleen?, Kenelle arvoketju hymyilee? Koneteollisuus globalissa kilpailussa. Mika Pajarinen, Petri Rouvinen ja Pekka Ylä-Anttila (Eds.), Sitra 297, s. 25, Taloustieto Oy, Helsinki, Suomi.
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- XXI. Nikulainen, T., Ali-Yrkkö, J. & Seppälä, T. (2011). Softaa koneisiin! Ohjelmisto-osaaminen suomalaisen teollisuuden uudistajana. Helsinki: Taloustieto Oy (Teknologioteollisuus ry).
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- XXV. Seppälä, T. (2010). Transformations of Nokia's Finnish Supplier Network from 2000 to 2008. in Jyrki Ali-Yrkkö (Ed.): Nokia and Finland in a Sea of Change. ETLA B:244, pp. 37–67, Taloustieto Oy, Helsinki, Finland.





