

Huub Meijers
Bernhard Dachs
Paul J. J. Welfens (Eds.)

Internationalisation of European ICT Activities

Dynamics of Information
and Communications Technology

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and Communications Technology

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CHAPTER I. Introduction and Main Policy Lessons

Huub Meijers, Bernard Dachs and Paul J.J. Welfens

The world economy is currently facing a wave of internationalisation or globalisation which can only be compared to that of the second half of the 19th century after the invention of railroads, steamships and the telegraph. The Information and Communication Technologies (ICT) sector is highly affected by these changes and the internationalisation of ICT activities has become a major topic in policy debates and discussions. Next to increasing volumes in trade in ICT goods and services is the increasing tendency to relocate ICT sector production facilities firms' research and development activities to locations outside of their home countries. However, it should be noted that ICT is not only subject to internationalisation and fragmentation, in fact, it is also a major enabler of the process. ICT allows for an easy exchange of information between various locations, and therefore helps to co-ordinate a geographically dispersed production structure.

Internationalisation of ICT is a strategic long term challenge for European Union (EU) economies and the European Community (EC) and its member countries, which involves a number of crucial issues such as growth, employment, technological progress and economic cohesion. In an increasingly digitally networked European and global economy trade, foreign direct investment and international R&D alliances will be strongly shaped by ICTs. In order to get an understanding of ICT internationalisation dynamics, including the impulses for non-ICT sectors in terms of more trade, foreign direct investment, etcetera, one must describe the core developments and key drivers of this process. Given the heterogeneity of the ICT sector, one should use an analytical concept which allows one to distinguish between different subsectors in terms of internationalisation speed, and economic relevance.

Based on theoretical analysis and existing findings of the literature, the presentation of case study material and of new empirical findings with respect to output, trade and investment dynamics, this book allows for the first comprehensive assessment of the internationalisation of European ICT activities. Beyond broad trends, one can highlight within a carefully designed analytical approach, sectoral differentials and cross-country differences and gain an understanding about the relative positioning of EU15/EU10/EU25 within the global economic dynamics. While our analysis shows fields where Europe has considerable strengths, it also indicates that certain problems which must be addressed within a broader growth- and knowledge- society perspective exist. The ICT based potential for endogenous growth, implicitly emphasized in the Lisbon Agenda, must be considered so that various policy suggestions can be developed at both the EU level and the level of EU member states.

ICT is currently perceived as being a force that enables or even drives the current wave of internationalisation. The computer equipment industries as well as

the computer service industry are generally being seen as leaders in the international division of (often knowledge intensive) labour. The relocation of ICT hardware production and ICT (enabled) services from the US and Europe to Asia and Eastern Europe has recently gained momentum. Foreign direct investment, imports and exports are booming, especially in specific regions and countries in new EU10 member states such as Estonia, Hungary and the Czech Republic. Next to this, ICT as a general purpose technology, also facilitates this dispersion of production in an effort to settle wherever it is thought to be attractive, taking into account both location factors and objectives.

In some respects, the use of ICT enables economic agents to get information quicker and with lower costs, and also helps them to store and analyse it. It comes as no surprise then, that the geographic distribution of economic activity is determined more strongly than before by (dynamically evolving) comparative advantages between countries and firms. The modularity of production systems and the opportunities to tap into information flows allow for the division of productive activities not only at the level of final products, but also at the level of individual components of products. At the same time ICT use of enterprises, including interconnected systems that enable the logistics necessary to support this division of productive activities even at the level of individual production processes, exists.

The focus of this book is on ICT production (manufacturing, software and services), research and development in ICT, and on the consequences of internationalisation for competitiveness and job creation in these fields. The justification can be found in the perceived threats and opportunities for Europe associated with the 'internationalisation of ICT activities'. Both the re-location of jobs to locations abroad and stagnating welfare are a policymaker's 'bad dream' however, the higher productivity, increased employment and improved welfare that result from ICT production and use in the broadest sense, are considered opportunities.

This book is based on the final report of a study carried out for the European Commission, DG JRC, IPTS, on the Internationalisation of European ICT activities. The objective of the study was to develop a theoretical and practical understanding of the dynamics of internationalisation of the ICT industry in the EU, to compile data about internationalisation of ICT activities, and to use case studies to show how this entrepreneurial behaviour is planned and materialised. Finally, based on the findings, the study developed policy aspects and policy alternatives that promote R&D, competitiveness and job creation.

The book departs from both a theoretical and a practical point of view: instead, it reveals the processes that are underlying the trend of internationalisation. A combination of several methodological approaches is used to explore and analyse the current and emerging trends in internationalisation of ICT. While each of these approaches has its own merits and drawbacks, we strongly believe that a comprehensive combination is the best way to gain insight into what is occurring.

Chapter II highlights the importance of ICT for economic growth and development. Both the production of ICT and its use are decisive for economic growth and productivity. The notion of ICT as being a general purpose technology is highly relevant for decision makers as such technologies open a new era of innovative activities with, often unforeseen new applications, new dynamics, and

waves of creative destruction. A second highly relevant observation is the expanding fragmentation of production processes due to standardization, reduced transactions and transportation costs, and increased communication possibilities. Finally, this chapter describes the significance of life cycles of products and services, and the relocation of certain types of activity. Main motives for internationalisation include market expansion, cost reduction, and strategic considerations with respect to knowledge. In many cases, which are confirmed in subsequent chapters by data and by case studies, market expansion is a main motive that firms act on to internationalise their activities. However, cost reduction also seems to play an important role. New knowledge intensive and profitable activities in the earlier stages of the product life cycle, are carried out in home countries whereas in the later stages, the products and services become more standardized, less knowledge intensive, and more easily subjected to relocation. Moreover, from an economic point of view, those production processes which are subject to economies of scale are more likely to be relocated since fixed transaction, communication, and related costs are more easily recovered if scale effects are present. In particular, the combination of these characteristics makes the ICT sector and the use of ICT products and services a highly relevant subject for policy makers.

The literature underlines three main channels of internationalisation: trade, FDI and licensing. These elements are discussed in the Chapters III, IV and V. Chapter III focuses on a practical understanding from the trade perspective. Evidence from trade data shows that EU's trade position with regard to *ICT goods* vis-à-vis the rest of the world shows a trade deficit whereas the EU25 shows a trade surplus in the trade of *ICT services*. Another remarkable outcome from the data analysis is that the differences in import and export prices have been increased in the last decade and the trade volumes are more pronounced. For some products, e.g. automatic data processing machines, the EU25 export price has increased as compared to the imported counterparts, whereas the exports volumes have experienced a relative decrease. On the other hand, for some products we see the opposite where EU's relative export prices decline and relative volumes increase. The analysis of quality differences between imports and exports shows that, on average, EU25 exports are more expensive, and imports are less expensive, products and services. This reinforces the initial hypothesis that more mature products and services (and parts thereof) with lower profit margins are more likely to be relocated than new, innovative, and high value added (parts of) products.

Chapter IV presents the analysis of FDI data and shows similar patterns. For the five European countries for which FDI data were available at a sectoral level, we observe that FDI concentrates on those sectors with a relatively low R&D intensity. Moreover, inward and outward FDI seems to be in balance in most sectors except for the so-called 'traditional scale' sectors where outward FDI is about three times higher compared to inward FDI.

Chapter V analyses ICT related R&D patterns with patent data and shows that R&D activities of European ICT companies are still performed in the home countries for the major part. This however, does not mean that there was no internationalisation in R&D activities. European ICT companies expanded their R&D

activities in other European countries. R&D internationalisation in ICT was therefore mainly an intra-EU phenomenon.

A second important de-centralisation trend that results from analysis in Chapter V, is overseas research in the US. We analyzed the geographical patterns of patenting activity of eight companies, four of which were European. All European companies increased the share of ICT patents invented in the US as well as in other European countries. In other words, the degree of concentration in ICT research has decreased in all cases. Moreover, we could also observe a growing level of knowledge exchange between the US and Europe, i.e. US firms also increasingly benefited from innovative activities conducted in Europe.

Despite large out of country investments of European and US companies, only a small fraction of ICT patents have been created at locations outside the Triad such as China or India, and in the EU10 countries so far. Overall, the patent analysis indicates that leading edge R&D in ICT is still largely concentrated in the US and Europe. We argue that overseas R&D in these countries is mainly 'market driven' and concentrated on developments for local markets, instead of 'technology driven'. Strategic R&D is still concentrated in the home countries of the enterprises.

Aside from the analysis of macro, meso and micro data, the study also includes many case studies on the internationalisation of ICT activities. We conducted a number of light and in-depth case studies, the results of which are outlined in Chapter VI. The main objective for the case studies is to illustrate and complement the theoretical and practical understanding that is developed in the first chapters. Important issues include both the motives and the models of internationalisation. As shown in Chapter II, fragmentation of production allows for a more in-depth specialisation and broader international networking. The reason for these developments is that different stages of production correspond to different production functions so that a country may have a comparative advantage in one stage of production and a comparative disadvantage in other stages or functions. The business case-studies focus on the geographical splitting-up of activities within ICT companies and identify geographical specialisation in certain business functions.

The main conclusion arising from the case studies is that European companies are increasingly making use of the internationalisation by focussing on high value-added activities. We have found evidence for a geographical splitting up of functions in ICT industries within international ICT companies. When considering the place of the EU in the international division of activities within ICT companies, our main conclusion is that the activities in the EU15 tend to be relatively knowledge intensive, focussing on customisation and high quality. The functions and activities located in Asia tend to be the more standardised and codifiable activities. New Member States take a middle position within this international division of ICT functions.

Chapter VII finally analyses the policy options and makes some main policy conclusions. Some of the main questions that arise include: How should national as well as EU policy makers react to outsourcing of ICT production and certain types of services? Is there a danger that R&D units of European ICT firms are leaving their home countries for Asia? What is the likely impact of internationali-