UNIVERSITY OF LUND
School of Economics and Management
Department of Economics

Regional Integration and Production Fragmentation

the Case of the Hungarian Telecom Industry

Julia Borzasi Dull

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Supervisor: Yves Bourdet

Abstract

This paper analyzes production fragmentation in the telecommunications industry, using Hungary as a case study. The driving forces of production fragmentation are partly industry and product characteristics but also conditions in the environment, among which transaction cost are especially important. Because of its characteristics, the telecommunications industry has high fragmentation potential and due to Hungary's locational advantages the country is likely to host firms producing some components in the industry. Since production fragmentation gives rise to changes in specialization, calculations of revealed comparative advantage can indicate fragmentation. It is shown that Hungary specializes in many of the goods in the telecommunications industry, as defined in the Standard International Trade Classification. It is therefore concluded that Hungary is taking part in an international production sharing network in the telecommunications industry.

Keywords: Production fragmentation, telecommunications industry, regional integration, Hungary.

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List of Abbreviations

CEEC	Central and Eastern European Countries
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
IIT	Intra Industry Trade
IPT	Inward Processing Trade
IT	Information Technology
MNE	Multinational Enterprise
OECD	Organization of Economic Cooperation and Development
OPT	Outward Processing Trade
RCA	Revealed Comparative Advantage
SITC	Standard International Trade Classification
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organization

1. Introduction

International trade has increased dramatically in the last few decades. Trade flows have grown faster than world production and the largest share of trade seems to take place in intermediate goods. The integration through trade has given rise to international production sharing, that is more and more goods are the result of production processes spread in different locations and different countries. Albeit this phenomenon goes under several names; production fragmentation, delocalization, outsourcing and vertical specialization to mention a few, they all refer to the idea that different segments of the production process no longer are conducted under the same roof by the same firm. Instead they are carried out in the firm's plants located in different countries or by entirely different firms. The ideas of production fragmentation and outsourcing are not really new; the global dimension of it however is. Driven by the technological revolution, reductions of trade barriers and of transportation costs, globalized fragmented production has developed dramatically (Ruane & Görg 2001, p 146). Due to its impacts on trade and capital flows, patterns of specialization and income distribution, it has attracted the attention of trade economists.

Production fragmentation can be found in many industries of the manufacturing sector but is especially present in the electronics industry because the characteristics of these products match the conditions for fragmentation quite well (Ruane & Görg 2001, p. 144). In a European context, several studies have focused on the splitting of production between the European Union[1] and the CEEC (Central and Eastern European Countries)[2] (see for example Baldone *et al*. 2001 and Kaminski & Ng 2001). These countries' transition to market economy and gradual integration with the EU, paired with lower

[1] With the European Union, EU and EU15 that will be used interchangeably, I refer to the 15 countries making up the European Union prior to the 2004 enlargement.

[2] Czech Republic, Estonia , Hungary, Poland, Slovenia, Bulgaria, Romania, Slovakia, Latvia and Lithuania.

factor costs, a well educated workforce and a favourable geographic location leads one to suspect that they stand a good chance of taking part in and benefiting from the global production fragmentation.

This paper focuses on a particular sector within the electronics industry; that of telecommunications equipment, and a particular country in the CEEC; namely Hungary. Hungary was integrated in international production networks through incoming foreign direct investment (FDI) at an early stage of transition and the main part of FDI went to the manufacturing sector, more specifically to the automotive, electric and electronics industries (UNCTAD 2003). Telecommunications equipment is a part of the latter and has because of its characteristics potential to be produced in a fragmented fashion. It can therefore be suspected that Hungary is part of a production sharing network in this industry. The purpose of the paper is twofold: first, the factors driving international production fragmentation will be identified with reference to existing theory on the subject. Second, the patterns of production fragmentation in the telecommunications industry will be analyzed, with special reference to Hungary.

The paper is organized as follows: chapter two presents some theoretical aspects on production fragmentation and regional integration. In chapter three, the characteristics of the telecom industry in general and the Hungarian telecom industry in particular are considered. The empirical analysis in chapter four measures production fragmentation in the Hungarian telecom industry with Balassa's RCA indexes. Chapter five summarizes and concludes.

2. Theories on Production Fragmentation

Although the concept of production fragmentation is not a new one, the international dimension of it is. Aided by the development of information technology and the reduction of trade barriers, more and more products are the result of international production processes. Since fragmentation involves production of parts that are shipped between production locations, plants located in different countries trigger increased trade flows. In addition, fragmentation can lead to changes in patterns of specialization and trade. This chapter outlines some definitions and driving forces of production fragmentation and its implications for specialization and trade.

2.1 Definitions and Driving Forces

Production fragmentation is defined as the "splitting up of a previously integrated production process into two or more components" (Jones & Kierzkowski 2001, p. 18). Fragmentation can be of the intra-firm or inter-firm type. The former refers to the situation where different segments of the production process are carried out by the same firm, in plants operating in different locations. The latter, also referred to as outsourcing, implies that the different plants do not belong to the same firm but are independent suppliers taking part in a production network (Ruane & Görg 2001, p. 146). Intra-firm fragmentation protects firm-specific advantages such as patents, trademarks and special management skills that otherwise risk being dissipated. However, trying to produce all components of a good within the same firm may lead to higher costs. Inter-firm fragmentation allows the firm to reduce costs by better taking advantage of international specialization, but the negative externalities just mentioned may arise and transaction costs can be high (Ruane & Görg 2001, p. 147). The shift from intra- to inter-firm fragmentation can develop over time. When a firm grows, it may start fragmenting its production internally to be more cost efficient. As the firm becomes larger it is

increasingly difficult to manage the production process and intra-firm fragmentation may no longer be the cost minimizing solution. Instead, the firm can chose to outsource parts of its activity to other firms. This development has been particularly recurrent during the last few years and there are many examples of firms adopting this strategy.

Fragmentation is either domestic or international. As the latter allows firms to take advantage of differences in comparative advantage, it is most likely to occur when production processes require different factor intensities and factor costs differ between countries (Ruane & Görg 2001, p. 147). However, fragmentation across borders normally implies higher transaction costs. These include costs of coordination of the production process, transportation costs, cost for frontier formalities as well as costs related to risks such as strikes, national disasters, involuntary spillovers of technology and know-how, etc. Due to these transaction costs, fragmentation is more likely to occur when geographic distance is less significant, which until recently meant within the same country.

2.1.1 When does fragmentation arise?

In order for fragmentation to occur, some conditions need to be met. First, the production technology has to be such that splitting it in different stages effectively is possible and that the stages can be carried out in different locations. Second, in order to exploit the advantages of different locations, the production process should be characterized by different technologies, e.g. different factor intensities. Third, the costs of coordination and transportation have to be low (Baldone *et al*. 2001, p. 82). Firms will engage in production fragmentation when it is profitable for them to do so. Very low factor costs in a certain location can make it worthwhile to locate a segment of the production process there, but high transaction costs because of geographical distance or trade barriers can severely reduce this gain. When locating in foreign countries or making use of independent firms as suppliers, stability and reliability is very important, as is coordination of the production process, because fragmentation increases the risk of supply disruptions (Yeats 2001, p. 128). The characteristics of the product matters as well. If factor requirements are such that the product can be manufactured nearly

anywhere and the value of the product is high compared to its volume (leading to relatively low transportation costs), international fragmentation is more likely to occur (Ruane & Görg 2001, p. 160).

In the past, the conditions for production fragmentation were met more easily domestically. However, the development during the last couple of decades has facilitated international production sharing, due to three main reasons. First, in the context of the WTO negotiations, trade barriers in general, and for manufactures in particular, have been significantly reduced. Second, there has been a reduction of transportation costs. Finally, and perhaps most importantly, electronic communications have developed dramatically (Curzon Price 2001, p. 99). Telephone communications have become cheaper and more reliable and the Internet has lead to a virtual revolution in the transmission of information. Geographical distance is thus less important and coordination of the production process has been facilitated. This development has resulted in a considerable reduction of transaction costs. As has been mentioned, transaction costs are crucial for fragmentation to occur, since a high level can cancel any gains that may arise. Transaction costs are the measure against which the gains of production fragmentation are weighed. Most of the driving forces mentioned above can in one way or another be translated into transaction costs; therefore it can be argued that transaction costs are one of the main determinants of production fragmentation.

2.2 FDI, Regional Integration and Fragmentation

When a firm decides to engage in foreign production it is often conducted through direct investment in the foreign market.[3] By acquiring or establishing production facilities in a certain location, the firm can benefit from the comparative advantages of the location in question, incorporating them in its production and becoming more cost efficient. Therefore there is usually a relationship between fragmentation and foreign direct investment (FDI). Since the investment is made on different levels of the production

[3] In the case of intra-firm fragmentation across borders, the firm is sometimes referred to as a multinational enterprise (Ruane & Görg 2001, p. 147).

process, fragmentation normally gives rise to so called *vertical FDI*. The driving forces of fragmentation in this case are synonymous to those of FDI, i.e. availability of factors, a favourable geographic location, low trade barriers towards the rest of the world, political and economical stability in the targeted country, government policy measures etc. If a country turns out to have a good investment climate, it is also likely to attract firms engaging in production fragmentation and can thus take part in an international production network.

As mentioned above, trade barriers are a part of the transaction costs, the level of which is crucial for fragmentation to occur. Regional integration plays a fundamental role for the reduction of trade barriers and thus for international fragmentation. Primarily, simple regional integration implies trade liberalization between the member countries by reducing or removing trade barriers. However, integration agreements often also contain other measures such as investment provisions, harmonization of laws and regulatory systems, freedom of establishment, free movement of labour and capital etc. Deeper integration of this kind leads to significantly reduced transaction costs, thus production fragmentation can be substantially facilitated among countries that integrate economically. In other words, deepened regional integration is another important driving force behind production fragmentation.

2.3 Agglomeration and Fragmentation

Agglomeration refers to the phenomenon of firms clustering together. The presence of one or a few major firms in a certain location tends to attract more firms to that location, because there are some advantages of locating close to other firms. Knowledge spillovers, access to a pool of skilled labour and demand and supply linkages (i.e. that firms use each other's output in their production) are commonly cited reasons for the emergence of industrial clusters (Shatz & Venables 2000, p. 10). The advantages of agglomeration are best exploited when firms are on different levels of the value chain. If identical firms, all using the same input and generating the same output with the same technology, cluster together, the result is more competition for customers, inputs and labour, which affects

prices and creates congestion effects. If, on the other hand, firms specialize in different sections of the production chain, producing components that eventually are assembled into final products, they can benefit from locating close to each other. For example, a firm manufacturing computer chips established in a certain location may attract sub-suppliers as well as firms using computer chips in their production. Following this, other manufacturers of computer chips may choose to locate in the same area. All firms thus gain better access to inputs and markets. In other words, agglomeration and production fragmentation go together so that industrial clusters often develop when production is fragmented.

2.4 The Role of Services

The different production blocks that arise from production fragmentation are bound together by various service links. These include transportation, insurance, telecommunications services, quality control, accounting, legal and management services etc. Services are necessary for the coordination of the production process, in integrated as well as fragmented processes. However, when production blocks are separated, the need for coordination increases and so does the importance of service links (Jones & Kierzkowski 2001, p. 24). Much of the development that has shaped the trade in goods in recent years has affected services as well. Like goods, trade in services has been subject to liberalization. Convergence of legal and regulatory systems, increased freedom of establishment and the technological revolution have all facilitated international coordination and reduced costs and some of the risks of production fragmentation across borders (Arndt & Kierzkowski 2001, p. 4), thus contributing to the increasingly global dimension of fragmentation.

2.5 Effects on Specialization and Trade

Economic theory suggests that countries specialize in line with their comparative advantage. According to the Heckscher-Ohlin model, countries will specialize and export the good which uses the country's abundant factor intensively (see for example Markusen *et al.* 1995). The possibility to fragment production allows firms to locate each segment of the production process where it is most cost efficient. It is thus the factor content of each component that determines location instead of the average factor intensity of the good. This will lead to a finer division of labour and affect countries' specialization patterns so that a country that does not have comparative advantage in the production of a final product may well have it in a certain segment of the production process (Baldone *et al*. 2001, p. 82). Two conclusions can be drawn from this: first, the principles of trade theory regarding specialization according to comparative advantage continue to hold also in the case of trade in parts and second, even countries with relatively low development levels can take part in international production networks by specializing in more labour intensive segments of production. If countries' specialization patterns change, so will the patterns of trade. Inputs are shipped several times across borders translating into increased trade flows in intermediate goods (Feenstra 1998, p. 34). As a finer degree of specialization generally is welfare enhancing (Arndt & Kierzkowski 2001, p. 6), production fragmentation opens up new possibilities to achieve gains from trade.

2.6 Synthesis

In this chapter the conditions for fragmentation have been identified. It has been suggested that fragmentation is more advantageous and therefore more likely to occur in some industries than in others. Furthermore it has been established that the level of transaction costs are crucial in the process and that regional integration plays an important part in reducing these transaction costs. By combining these propositions, a matrix can be constructed where industries can be placed, giving an idea whether or not production in the industry has potential to be fragmented.

The label "Fragmentation Advantages" in figure 2.1 mainly refers to industry characteristics, i.e. whether there are gains to be made from fragmentation. It incorporates the first two conditions for fragmentation mentioned in section 2.1.1; that production *can* be fragmented and that it requires different factor intensities so that firms can benefit from the comparative advantages of different locations. If this is true, fragmentation advantages are likely to be strong. The third condition, low transaction costs, is represented by "Regional Integration". Regional integration is here used as a proxy for transaction costs, where a deeper integration implies lower transaction costs due to reduction of trade barriers, liberalization of services and harmonization of rules as well as low transportation costs. Even if it has been argued that the importance of geography has decreased, transportation costs are still lower if production locations are geographically close. As integration normally occurs between neighbouring countries it can be assumed that transaction costs are lower if there is regional integration.

Figure 2.1: Industries' Fragmentation Potential

	Fragmentation Advantages Weak → Strong	
Regional Integration Simple ↓ Deepened	4	3
	2	1

An industry would be placed in area 1 if the fragmentation advantages are strong and a deepened level of integration would lead to low or very low transaction costs. It is for example the case if the final products are made up of many different components that can be used in several products and production requires different technologies, such as in the electronics or textile and apparel industries. Fragmentation is thus likely to occur. In area 2, the gains from fragmentation are smaller, for example because the differences in factor intensities or production costs are not large enough or production is harder to split. However, if regional integration keeps transaction costs down, there still may be some

splitting of production. Single segments can for example be outsourced or firms may use a few foreign suppliers. The gains from fragmentation would be high in industries placed in area 3, but production is less likely to be split because of high transaction costs in the shape of trade barriers, high transportation costs, differences in regulations and difficulties of coordination of the different segments. Examples can be outsourcing to countries that are geographically far or instable economically and politically. The industries placed in area 4 have very low or no potential to be fragmented, either because production processes and technology are such that it is not possible or not advantageous to split and the low level of integration keeps transaction costs too high. One example is the agricultural industry which often is surrounded by rigorous trade barriers and where production is difficult to fragment.

A priori we would expect the Hungarian telecommunications industry to be placed in area 1, due to the characteristics of the industry and the deepened integration with the EU. In the following chapters it will be examined whether Hungary's specialization indicates production fragmentation.

3. The Telecom Industry

3.1 Characteristics of the Telecom Industry

The telecom industry is classified as a "high technology" industry by the OECD (Organization for Economic Co-operation and Development), meaning that the production is technology and skill intensive with products such as televisions, sound recording and broadcasting equipment, telephones and parts and accessories of these (microphones, loudspeakers, transmission equipment etc.). The sector has expanded rapidly in the past decade with growth rates consistently exceeding the growth in real GDP (Ruane & Görg 2001, p. 144). High technology industries play an important part in production of other goods and constitute a considerable share of international trade. They make up one quarter of total OECD trade and had the highest growth rates in manufacturing trade in the OECD area in 1992-2001 (OECD 2003). Characterized by increasing returns to scale at the firm level, the products emerging from the industry are typically made up of many different components where the same components can be used as inputs in several products. The components are often small in volume and weight but have high value, making transportation costs a small share of total costs (Ruane & Görg 2001, p. 144).

Referring back to the conditions for fragmentation in section 2.1.1, it can be seen that the telecommunications industry show characteristics that create incentives for production fragmentation. As the products are made up of different components it is possible to split up the production process and locate them in different places. Furthermore, the production processes require different factor intensities; invention and design of the components is typically skill and capital intensive while assembly operations can be carried out by low skilled labour. The high value-to-volume ratio of the products and components result in low costs for transportation, keeping the level of transaction costs down. In other words, fragmentation in this industry would allow firms to better take

advantage of countries' locational advantages and differences in specialization by locating different segments of the production process in different countries. Each plant or subcontractor would thus become more specialized, which can enhance the gains from scale economies already existing in the industry, resulting in more cost efficient production. It thus seems reasonable to say that the fragmentation advantages in the telecommunications industry are strong.

3.2 FDI in the Hungarian Telecom Industry

Since the beginning of the 1990s, Hungary has been the target of substantial FDI. In 2003, the inflow of FDI amounted to 2470 million USD, making the country the fourth largest recipient in the Central and Eastern European region (UNCTAD 2004). The lion's share of the foreign capital has gone to the automotive, electric and electronics industries with several multinational companies having established facilities in the country (see table 3.1).

Table 3. 1: Foreign MNEs in the electronics industry in Hungary

Philips	TDK	Nokia	Samsung
General Electric	Lear	Hitachi	Clarion
Siemens	Ericsson	Sanyo	Motorola
Flextronics	Bosch	Sony	IBM

Source: ITD Hungary.

Initially, it was mainly the labour intensive assembly operations that were conducted in Hungary but in recent years the focus has been shifted towards production and research activities requiring a more skilled workforce. Fragmentation principally seems to be of the intra-firm type as the telecommunications industry is characterized by foreign firms having established subsidiaries rather than the use of independent Hungarian firms as suppliers. As mentioned earlier, this permits the firms to maintain a higher level of control and facilitates coordination of the production process. However, with increased stabilization of the Hungarian economy, a deepened integration with the EU and the presence of many foreign firms, inter-firm fragmentation is developing as Hungarian

suppliers emerge to serve the foreign firms. Most of the firms in the telecommunications industry are clustered to the Budapest area and there are several examples of demand and supply linkages (e.g. Philips manufactures monitors for Hewlett-Packard while Flextronics supplies the printers) and agglomeration economies, where one firm has attracted others (ITD Hungary).

Given the relationship between FDI and production fragmentation, a good investment climate is important. Hungary is often referred to as economically and politically stable, with good physical as well as IT infrastructure and availability of advanced services (ITD Hungary). In addition to attracting FDI, these circumstances all contribute to lowering transaction costs. Furthermore there is good availability of highly skilled workers, something that is crucial in the skill intensive telecommunications industry. The role of government policy should also be mentioned. FDI has been encouraged by the Hungarian government through various investment promoting measures. There is an explicit ambition to attract high technology industries, such as telecommunications. This positive attitude towards FDI enhances the fragmentation advantages. The integration with the EU is an equally important factor for attracting investment and facilitating production fragmentation. Hungary has been a formal member since 2004 but the integration process has been going on since the beginning of the 1990s. It can therefore be said that the level of integration is rather high and will most likely be deepened with time.

In light of the above, there is support for the hypothesis that the telecom industry in Hungary can be placed in area 1 of the matrix in figure 2.1, where the potential of production fragmentation is high. The purpose of the empirical analysis in the following chapter is to investigate whether there is any evidence of production fragmentation in the Hungarian telecommunications industry.

4. Fragmentation in the Hungarian Telecom Industry

4.1 Measuring Production Fragmentation

Data on international production fragmentation is not specifically collected, however a number of secondary sources can be used to give indications of the extent of the phenomenon. As production fragmentation leads to increased trade flows, trade data is one option. It is easy to access, however it usually does not differentiate between trade in final goods and intermediate inputs. Since production fragmentation implies that components are shipped between countries for processing, identification of the latter is crucial. The Gruber-Lloyd index of intra industry trade (IIT) could be an alternative, however not all IIT can be attributed to production fragmentation but to consumers preferring diversified products (Kaminski & Ng 2001, p. 4). Therefore, generally, trade data is not an appropriate source of information. Some authors (Baldone *et al.* (2001), Ruane & Görg (2001)) have measured fragmentation by looking at outward and inward processing trade (OPT/IPT). These refer to goods that are temporarily exported/imported to a country for processing and where the only reason of the transfer is that a specific part of the production process is conducted in another country (Ruane & Görg 2001, p. 153). OPT data is collected by the European Union but is difficult to access and could therefore not be used in this paper. Since production fragmentation can affect a country's specialization, measuring this can also give an indication of whether the country takes part in an international production network or not. As mentioned, specialization tends to occur according to comparative advantage. One measure of this is Balassa's index of revealed comparative advantage, RCA (Balassa 1989). The RCA index is based on trade data and is thus not always appropriate for measuring production fragmentation. However, the United Nations Standard International Trade Classification (SITC), after the 2nd and 3rd revisions, makes it possible to report more disaggregated trade data. The

group concerning machinery and transport equipment (SITC 7) gives a fairly complete coverage as it includes data on parts and components trade down to a five-digit level. Telecommunications equipment, which is at the centre of this paper, is reported in SITC division 76. Calculating revealed comparative advantage for Hungary with Balassa's index for the products in this group should thus give a fairly accurate indication of production fragmentation in the telecom industry.

4.1.1 Balassa's Index of Revealed Comparative Advantage

There are two versions of Balassa's RCA index, RCA_1 and RCA_2, as shown below.

$$RCA_1 = (X_{ij}/X_{wj})/(\Sigma_j X_{ij}/\Sigma_j X_{wj})$$

$$RCA_2 = (X_{ij}-M_{ij})/(X_{ij}+M_{ij})$$

where i = country, j = commodity and w = world

RCA_1 measures relative export performance, i.e. country *i*'s share of exports of good *j* (x_{ij}/x_{wj}) compared to country *i*'s share of total exports ($\Sigma_j x_{ij}/\Sigma_j x_{wj}$). If the country exports relatively more of a good, the RCA_1 index is above 1, indicating comparative advantage, while an index below 1 shows comparative disadvantage. Imports are omitted in this measure as an attempt to give more accurate RCA indexes. This is because government interventions, such as trade barriers and subsidies, distort trade flows so that the underlying patterns of comparative advantage are not accurately reflected. As a result, products may show both comparative advantage and disadvantage (Greenaway & Milner 1993, p. 185). Policy interventions tend to be more restrictive on imports; omitting them can thus eliminate some of the distortions of the RCA index. There are however others. By excluding imports, IIT is not taken into account, which, again, may conceal true specialization. Furthermore there is a country size effect. If a country has a small share of total world exports and the country's exports are concentrated to a few commodities, the index will show high levels of comparative advantage for these goods because of the country's size (Hakkala & Nilsson 1997, p. 45-46). These problems can be avoided with the RCA_2 index, which includes imports as well as exports and measures a country's own trade performance. Here, the index ranges from -1 (revealed disadvantage) to 1 (revealed comparative advantage) with 0 indicating ambiguity (Greenaway & Milner 1993, p. 186).

4.2 RCA in the Hungarian Telecom Industry

Measuring specialization with Balassa's RCA indexes can give indications to whether Hungary is taking part in a production sharing network. Specialization in components used in the telecom industry suggests that there is production fragmentation in that industry and that some segments of the production are located in Hungary. As basis for the calculations trade data from Source OECD has been used, where goods are classified according to SITC revision 3. As mentioned, products of the telecom industry are mainly found in SITC division 76, with subgroups as detailed in appendix A.1. Calculations of RCA_1 and RCA_2 were conducted on three, four and five digit levels to give a result as complete as possible. The level of aggregation is crucial for the outcome; too aggregated or disaggregated data may lead to distorted indexes. By using both measures in the analysis I attempt to achieve a more accurate result; Hungary is likely to specialize in reality in the goods which show comparative advantage both with RCA_1 and RCA_2. Balassa's measures were adapted such that:

X_{ij} = Hungary's exports of the goods in the relevant SITC group
M_{ij} = Hungary's imports of the goods in the relevant SITC group
X_{wj} = EU15 exports of goods in the relevant SITC group

The European Union instead of the world is used as comparison for a number of reasons. As explained, foreign production is often conducted through FDI and the existence of foreign firms in a country, especially if the investment is of the vertical type, indicates that there is some production fragmentation. The EU countries are Hungary's main trading partners and most of the FDI in Hungary originates from the EU15 (Hungarian Central Statistical Office), therefore a comparison with the European Union seems more relevant. Furthermore, Hungary has been integrating with the EU since the beginning of the 1990s and is a formal member since May 2004. This implies significantly liberalized trade, free capital movements, freedom of establishment, harmonization of regulations etc. that has severely reduced transaction costs and facilitated production fragmentation. It is therefore more likely that Hungary takes part in a European production sharing network. Finally there is a methodological consideration. Given that Hungary is a small

country, its share of total world exports ($\Sigma_j X_{ij}/\Sigma_j X_{wj}$) can be expected to be quite small. Comparing with the rest of the world is therefore likely to lead to significantly distorted RCA_1 indexes. Comparing with the EU15 is an attempt to mitigate the county size effect. However, this unit of comparison also restricts the time period for which data is available; I will therefore focus on the years 1995 to 2003, during which the EU had 15 member countries. Averages of the years 1995/1996 will be compared to the 2002/2003 averages in order to eliminate annual fluctuations and to see whether the RCA indexes show any specialization in the telecommunications industry.

4.2.1 RCA on the Three-digit Level

Division 76 of the SITC rev. 3 is divided into groups *761 Television receivers, 762 Radio broadcast receivers, 763 Television image and sound recorders or reproducers* and *764 Telecommunications equipment and parts and accessories of apparatus in division 76*. As shown in table 4.1 below, calculated with RCA_1, Hungary has strong or very strong comparative advantage in all groups except *764 Telecommunications equipment and parts and accessories of apparatus in division 76* in 1995/1996. By 2002/2003 however, also this index is above 1, indicating comparative advantage. The results from RCA_2 calculations present a more mixed picture. With this measure, only *Television receivers* (*761*) show comparative advantage in 1995/1996 while the index is ambiguous or indicates comparative disadvantage for the other goods. However, by the end of the period also the RCA_2 suggests comparative advantage in all groups.

Table 4.1: RCA index for SITC group 761-764

1995/1996		
SITC	**RCA_1**	**RCA_2**
761	***3,14***	***0,32***
762	***4,65***	0,10
763	***2,98***	-0,06
764	0,67	-0,30

2002/2003		
SITC	**RCA_1**	**RCA_2**
761	***12,53***	***0,68***
762	***19,39***	***0,67***
763	***21,10***	***0,64***
764	***1,95***	***0,31***

Source: Calculations based on trade statistics from Source OECD.

The discrepancies between the indexes can likely be attributed to the problems with the measures. As explained in section 4.1.1, both RCA indexes can be distorted; RCA_1

because it excludes imports and ignores intra industry trade and RCA_2 because it is affected by policy interventions.

On more disaggregated levels the number of subgroups rise substantially. There are twelve subgroups on the four-digit level of division 76 and 33 subgroups on the five-digit level. Going through these one by one or presenting them in a table could be confusing without adding much to the analysis. Instead, some of the goods showing comparative advantage will be highlighted and commented (Complete tables with RCA indexes for all subgroups can be found in appendix A.3).

4.2.2 RCA on the Four-digit Level

On the four-digit level, six of the twelve subgroups have positive RCA_1 values in the beginning of the period, but only two of them clearly show the same calculated with RCA_2; *Colour television receivers* (*7611*) and *Radio-broadcast receivers* (*7621*). The RCA_2 values for the other goods are however very close to zero indicating ambiguity. Furthermore, on this level, Hungary also seems to have some comparative advantage in the production of parts and accessories in the electronics industry (subgroup 7649), an advantage that was not visible on the three-digit level.

Table 4.2: RCA-index for selected groups 1995/1996

1995/1996		
SITC	**RCA_1**	**RCA_2**
761.1	***3,28***	***0,32***
762.1	***5,42***	***0,38***
762.2	***1,22***	-0,42
762.8	***5,67***	-0,03
763.8	***3,10***	-0,03
764.9	***1,55***	0,08

Source: Calculations based on trade statistics from Source OECD.

Turning to 2002/2003, some changes can be observed. The number of goods for which Hungary has comparative advantage has increased, as have the RCA-indexes, which can be interpreted as increased specialization in the goods in question.

Table 4.3: RCA-index for selected groups 2002/2003

2002/2003		
SITC	**RCA_1**	**RCA_2**
761.1	***12,67***	***0,68***
762.1	***10,16***	***0,56***
762.8	***51,20***	***0,77***
763.3	***6,38***	***0,53***
763.8	***21,41***	***0,64***
764.2	***2,55***	-0,06
764.3	***6,37***	***0,47***
764.8	0,98	***0,63***
764.9	***2,92***	0,01

Source: Calculations based on trade statistics from Source OECD.

Over the time period examined, Hungary has acquired comparative advantage in the production of *record players* (*7633*), *microphones and loudspeakers* (*7642*), *transmission apparatus for radio telephony* (*7643*) and *other telecommunications equipment* (*7648*), while the comparative advantage for *radio broadcast receivers* (*7622*) has been lost. Furthermore, there is a higher congruence between the two indexes; both indicate comparative advantage in six out of the nine subgroups in table 4.3 above. It can also be noted that the RCA_1 index is substantially higher for the groups where Hungary had comparative advantage already in 1995/1996 compared two the "new" groups. This suggests that there are some endogenous effects where specialization in some goods with time leads to improved production technologies resulting in increased specialization in those goods.

4.2.3 RCA on the Five-digit Level

The results on the five-digit level of division 76 are similar to those obtained on the four-digit level. In 1995/1996, the RCA_1 index indicates specialization for more groups than the RCA_2. Both indexes clearly indicate comparative advantage for three subgroups; *76211 Radio-broadcast receivers incorporating sound recording or reproducing apparatus, 76492 Parts and accessories of the apparatus of subgroup 7642* (microphones and loudspeakers) and *76499 Parts and accessories of the apparatus of subgroup 763* (television image and sound recorders or reproducers). Like on the four-digit level, the number of goods for which Hungary has comparative advantage has risen by 2002/2003, most of the RCA values are higher and so is the congruence between

RCA_1 and RCA_2 (see appendix A.3 for details). The "new" goods for which Hungary has acquired comparative advantage by the end of the period mostly belong to group *764 Telecommunications equipment and parts and accessories of apparatus of division 76*. As the telecom industry is at the core of this paper I will take a closer look at these subgroups.

Table 4.4: Goods belonging to SITC 764, five-digit level (selection)

SITC	Description
764.11	Telephone sets
764.19	Other telephonic or telegraphic apparatus
764.22	Loudspeakers, mounted in their enclosures
764.23	Loudspeakers, not mounted in their enclosures
764.24	Headphones, earphones, combined microphone/speaker sets
764.32	Transmission apparatus with reception apparatus
764.81	Reception apparatus for radio-telephony or telegraphy
764.92	Parts and accessories of the apparatus of subgroup 7642
764.93	Parts and accessories of the apparatus of groups 761, 762 and subgroups 7643, 7648
764.99	Parts and accessories of the apparatus of of group 763

Table 4.4 lists the goods for which Hungary has comparative advantage in 1995/1996 and/or 2002/2003 according to either RCA_1, RCA_2 or both. Apart from goods that are specifically designated to be "parts and accessories", many of the others can be used as components in different products as well. The fact that there is specialization in these goods supports the hypothesis that Hungary is taking part in a production sharing network, manufacturing components of products in the telecommunications industry.

4.3 Summary of the Empirical Analysis

In this chapter it was investigated whether there is any indication of production fragmentation in the Hungarian telecom industry through calculations of revealed comparative advantage. The analysis shows that Hungary has comparative advantage in many of the goods belonging to SITC division *76, Telecommunications and sound-recording and reproducing apparatus and equipment*, on three-, four- and five-digit levels, which indicates specialization in these goods. However, specialization is not guided by comparative advantage alone; factor endowments play an important role as

well in the process. According to a UN classification of the factor intensities of the goods in the SITC, the goods belonging to division 76 are manufactures with high skill and technology intensity (UNCTAD 2002). The availability of a skilled workforce in Hungary supports the thesis that the country has specialized in the production of these goods.

Specialization is an indirect measure of production fragmentation, yet these goods that Hungary seems to specialize in are primarily parts and accessories of telecommunications equipment or can be used as components in this industry. Hungary thus seems to take part in a production sharing network in the telecommunications industry. Furthermore, specialization has increased over the time period examined, during which the integration with the EU has deepened. With deepened integration, production fragmentation seems to have increased as reflected by the specialization patterns. The result confirms the hypothesis that the Hungarian telecommunications industry can be placed in area 1 of the matrix in figure 2.1.

5. Summary and Conclusions

The purpose of this paper was to analyze production fragmentation in the telecommunications industry, using Hungary as a case study.

Production fragmentation arises when production processes are split and located in different places. The development is partly driven by industry and product characteristics but also by conditions in the environment, such as differences in factor costs, technological development, availability of factors and services, political and economic factors etc. Of special importance are the transaction costs, which represent the additional costs that arise from a fragmented production process and incorporate everything from transportation costs to trade barriers and costs for coordination and risk. A decision to fragment production is always a trade off between the gains from fragmentation and the transaction costs that may arise.

Because transaction costs were high, fragmentation, if it occurred, was mostly domestic. Recently however it has turned into a global phenomenon. Firms are increasingly locating some sections of their production chains in other countries to take advantage of differences in comparative advantage and specialization. Therefore, there is a strong relationship between FDI and international production fragmentation. A good general investment climate reduces transaction costs and makes way for production fragmentation, especially if the investment is of the vertical type. Regional integration plays a fundamental role in the process because it also reduces transaction costs by facilitating the movement of firms, capital, people and most importantly goods across borders, which of course is crucial in fragmented production processes.

As explored in chapter three, the telecommunications industry has because of its characteristics good fragmentation potential. Combined with the environmental factors in

Hungary; significant presence of foreign firms in the electronics and telecommunications industries, the increasing integration with the EU, availability of factors, the government's encouragement of high technology and skill intensive industries etc, supports the hypothesis that there is some production fragmentation in the Hungarian telecom industry.

Additional evidence is given in the empirical analysis of chapter four, in which it is found that Hungary specializes in many of the components in the telecommunications industry. Specialization is an indirect measure of production fragmentation, but because the products measured are parts and components of the telecom industry or can be used as such, it serves as a fairly good indication. It is therefore not inconceivable that production in this industry is indeed fragmented and that Hungary is taking part in an international production sharing network.

Over the seven-year period covered in the paper, the trend has been towards more specialization on all levels examined, translated into increasing RCA-indexes in most cases. On the four- and five-digit levels, Hungary specializes in more goods in 2002/2003 than in 1995/1996 and the increase is mainly seen in the subgroups of SITC *764*, *Telecommunications equipment and parts and accessories of apparatus in division 76*. This indicates that production has become more fragmented over time. As Hungary's integration with the EU has deepened the telecom industry has moved from area 3 to area 1 in figure 2.1.

There is reason to believe that the trend towards increased production fragmentation will continue. The fragmentation advantages in the telecom industry are likely to remain strong and deeper integration with the EU will further reduce transaction costs. The presence of several foreign firms may attract others in the same industry leading to more industrial clusters and agglomeration effects. Although fragmentation until now mainly can be characterized as intra-firm, technology and knowledge will eventually spill over to Hungarian firms, leading to more inter-firm fragmentation. Although there might be a shift in the type of activities that are located in Hungary from less to more skill intensive

segments of the production chain, Hungary will likely continue to take part in international production sharing networks in the future.

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Appendix

A.1: Division 76 of the SITC rev. 3[4]

76 Telecommunications and sound-recording and reproducing apparatus and equipment

761 Television receivers
7611 Television receivers, colour
7612 Television receivers, black and white or other monochrone

762 Radio-broadcast receivers
7621 Radio-broadcast receivers needing external source of power
76211 …incorporating sound recording or reproducing apparatus
76212 … not incorporating sound recording or reproducing apparatus

7622 Radio-broadcast receivers not needing external source of power
76221 …incorporating sound recording or reproducing apparatus
76222 … not incorporating sound recording or reproducing apparatus

7628 Other radio-broadcast receivers
76281 …incorporating sound recording or reproducing apparatus
76282 … not incorporating sound recording or reproducing apparatus but combined with a clock
76829 … not incorporating sound recording or reproducing apparatus nor a clock

763 Television image and sound recorders or reproducers
7633 Turntables and record players without a sound recording device
76331 Record players, coin or disc operated
76333 Other record players
76335 Turntables

7638 Sound- and video-recording or reproducing apparatus
76381 Video-recording or reproducing apparatus
76382 Transcribing machines
76383 Other sound-reproducing apparatus
76384 Sound-recording apparatus, with or without sound-reproducing device

[4] United Nations Statistics Division, shortened version.

764 Telecommunications equipment, parts and accessories of apparatus in division 76

7641 Electrical apparatus for line telephony and line telegraphy
76411 Telephone sets
76413 Teleprinters
76415 Telephonic or telegraphic switching apparatus
76417 Other apparatus for carrier current line systems
76419 Other telephonic or telegraphic apparatus

7642 Microphones and stands, loudspeakers, headphones, earphones etc
76421 Microphones and stands
76422 Loudspeakers, mounted in their enclosures
76423 Loudspeakers, not mounted in their enclosures
76424 Headphones, earphones, combined microphone/speaker sets
76425 Audio frequency electric amplifiers
76426 Electric sound amplifier sets

7643 Transmission apparatus for radio-telephony, -telegraphy, -broadcasting
or television
76431 Transmission apparatus
76432 Transmission apparatus with reception apparatus

7648 Telecommunications equipment, n.e.s.
76481 Reception apparatus for radio-telephony or telegraphy
76482 Television cameras
76483 Radar apparatus, radio navigational apparatus, radio remote control apparatus

7649 Parts and accessories of the apparatus of division 76
76491 …of subgroup 7641
76492 …of subgroup 7642
76493…of groups 761, 762 and subgroups 7643, 7648
76499 …of group 763

A.2 Trade statistics used for RCA calculations[5]

Export of goods, Hungary to World, 1000 USD

SITC	1995	1996	Average		2002	2003	Average
761	84453	31076	57764,5		533907	817582	675744,5
761.1	84383	31057	57720		533891	817557	675724
761.2	70	19	44,5		16	25	20,5
762	20326	30201	25263,5		300315	358234	329274,5
762.1	896	25393	13144,5		97695	130069	113882
762.11	880	25391	13135,5		97690	129916	113803
762.12	16	2	9		5	153	79
762.2	2586	109	1347,5		83	49	66
762.21	2525	81	1303		60	43	51,5
762.22	61	28	44,5		23	6	14,5
762.8	16842	4695	10768,5		202532	228118	215325
762.81	16811	4688	10749,5		202523	228092	215307,5
762.82	1	3	2		5	18	11,5
762.89	30	4	17		4	8	6
763	49888	6204	28046		622764	775323	699043,5
763.3	16	6	11		8647	69	4358
763.31	-[a]	-	-		47	39	43
763.33	12	2	7		11	23	17
763.35	4	2	3		8587	5	4296
763.8	49872	6198	28035		614117	775254	694685,5
763.81	44217	440	22328,5		528987	690177	609582
763.82	-	-	-		-	-	-
763.83	4882	2518	3700		67803	71503	69653
763.84	773	3240	2006,5		16671	117	8394
764	281496	242346	261921		3894942	5417787	4656364,5
764.1	3424	5248	4336		143709	280027	211868
764.11	1069	1803	1436		28327	67266	47796,5
764.13	97	33	65		-	-	-
764.15	1437	1090	1263,5		-	70	-
764.17	780	-	-		32761	153583	93172
764.19	43	444	243,5		82439	59108	70773,5
764.2	5479	8950	7214,5		90664	80435	85549,5
764.21	50	66	58		629	451	540
764.22	4122	5131	4626,5		52283	63526	57904,5
764.23	886	1526	1206		13176	9285	11230,5
764.24	34	53	43,5		23138	6213	14675,5
764.25	231	2072	1151,5		1014	686	850
764.26	157	100	128,5		417	269	343
764.3	7885	6098	6991,5		2691551	3682350	3186951

[5] Source OECD
[a] Indicates missing values

764.31	1782	464	1123		351	808	579,5
764.32	6102	5636	5869		2691197	3681543	3186370
764.8	444	914	679		14515	71907	43211
764.81	71	44	57,5		8450	63751	36100,5
764.82	131	22	76,5		22	44	33
764.83	242	848	545		6043	8112	7077,5
764.9	264264	221136	242700		954503	1303068	1128786
764.91	100114	6418	53266		60788	57928	59358
764.92	2329	3145	2737		8624	7470	8047
764.93	86490	82444	84467		706876	911110	808993
764.99	165431	129129	147280		178215	326560	252387,5
Total	12867038	13144614	13005826		34336543	43007722	38672133

Import of goods, Hungary from World, 1000 USD

SITC	1995	1996	Average		2002	2003	Average
761	28082	31983	30032,5		122934	137867	130400,5
761.1	27542	31452	29497		122097	137081	129589
761.2	540	531	535,5		837	786	811,5
762	20132	21314	20723		73074	54892	63983
762.1	6816	5070	5943		41952	21507	31729,5
762.11	6006	4743	5374,5		41691	21073	31382
762.12	810	327	568,5		261	434	347,5
762.2	3352	3191	3271,5		4765	4806	4785,5
762.21	2513	2511	2512		3973	3715	3844
762.22	839	680	759,5		792	1091	941,5
762.8	9964	13053	11508,5		26354	28574	27464
762.81	8801	10950	9875,5		21760	23274	22517
762.82	443	657	550		750	1119	934,5
762.89	720	1446	1083		3844	4181	4012,5
763	30878	32721	31799,5		121514	181434	151474
763.3	2564	1311	1937,5		1257	1421	1339
763.31	239	23	131		33	-	-
763.33	693	331	512		841	1175	1008
763.35	1628	954	1291		381	244	312,5
763.8	28314	31410	29862		120257	180013	150135
763.81	19488	23302	21395		69780	51124	60452
763.82	40	18	29		5	-	-
763.83	3452	3749	3600,5		9235	13176	11205,5
763.84	5334	4341	4837,5		2211	2734	2472,5
764	391516	572819	482167,5		2026092	2928962	2477527
764.1	74161	109323	91742		92869	147901	120385
764.11	14214	13094	13654		15810	18893	17351,5
764.13	932	16	474		-	34	-
764.15	13427	14897	14162		10514	12481	11497,5
764.17	38046	-	-		51751	105384	78567,5

764.19	7533	20820	14176,5		8855	11116	9985,5
764.2	11023	17075	14049		76973	115553	96263
764.21	644	956	800		2541	14469	8505
764.22	1429	2850	2139,5		16538	28282	22410
764.23	4951	5129	5040		32884	35778	34331
764.24	2212	3520	2866		15212	30420	22816
764.25	769	2306	1537,5		4873	3616	4244,5
764.26	1014	2310	1662		4924	2975	3949,5
764.3	81539	178794	130166,5		797027	1488658	1142843
764.31	10378	7019	8698,5		9730	4851	7290,5
764.32	71161	171773	121467		787294	1483804	1135549
764.8	16536	13808	15172		7925	11892	9908,5
764.81	5377	5292	5334,5		2843	3124	2983,5
764.82	7339	1585	4462		2040	2517	2278,5
764.83	3820	6931	5375,5		3042	6251	4646,5
764.9	208257	208819	208538		1051298	1164958	1108128
764.91	78281	57820	68050,5		105995	99603	102799
764.92	799	2146	1472,5		23506	32487	27996,5
764.93	74928	65670	70299		554847	655566	605206,5
764.99	54249	83183	68716		366950	377302	372126
Total	15466235	16208850	15837543		37611835	47674974	42643405

Export of goods, EU15 to World, 1000 USD

SITC	1995	1996	Average		2002	2003	Average
761	996719	1177159	1086939		1322118	1536206	1429162
761.1	934319	1149055	1041687		1305924	1520328	1413126
761.2	32400	28104	30252		16195	15878	16036,5
762	319494	323586	321540		438992	461065	450028
762.1	134539	152581	143560		279866	314485	297175,5
762.11	106757	138451	122604		267605	294395	281000
762.12	27782	14131	20956,5		12262	20088	16175
762.2	70984	60041	65512,5		41601	40384	40992,5
762.21	52212	38173	45192,5		25081	26791	25936
762.22	18773	21868	20320,5		16520	13593	15056,5
762.8	113881	110965	112423		117525	106198	111861,5
762.81	84939	82867	83903		73364	65919	69641,5
762.82	6638	5333	5985,5		5362	5517	5439,5
762.89	22305	22765	22535		38799	34762	36780,5
763	501617	613262	557440		709304	1047195	878249
763.3	19695	23314	21504,5		18283	17922	18102,5
763.31	9123	9466	9294,5		2640	4261	3450,5
763.33	4726	6853	5789,5		3968	3467	3717,5
763.35	5847	6995	6421		11675	10195	10935
763.8	481922	589950	535936		691021	1029273	860147
763.81	266794	384929	325861,5		191599	202205	196902

763.82	-	-	-		-	-	-
763.83	98273	90583	94428		138657	158942	148799,5
763.84	116437	114204	115320,5		80756	107398	94077
764	19462298	23257529	21359914		29738230	33643653	63381884
764.1	4974173	5820015	5397094		6353474	5909726	6131600
764.11	503620	604724	554172		592719	620777	606748
764.13	8631	4311	6471		266	789	527,5
764.15	2146807	2597156	2371981,5		2211658	2132776	2172217
764.17	1266725	-	-		2863373	2509889	2686631
764.19	1048390	819979	934184,5		685458	645496	665477
764.2	583568	639664	611616		869263	908848	889055,5
764.21	53360	56531	54945,5		124409	85368	104888,5
764.22	277901	303529	290715		317863	342025	329944
764.23	72043	81476	76759,5		132815	147980	140397,5
764.24	47546	45033	46289,5		90624	95964	93294
764.25	76905	87310	82107,5		132064	157842	144953
764.26	55813	65787	60800		71487	79669	75578
764.3	4285615	6177539	5231577		12010720	14507011	13258865,5
764.31	241723	261160	251441,5		263993	306501	285247
764.32	4043892	5916379	4980135,5		11746727	14200510	12973618,5
764.8	779100	891019	835059,5		948498	1386666	1167582
764.81	144881	157374	151127,5		157458	81767	119612,5
764.82	205407	132900	169153,5		174231	233890	204060,5
764.83	428812	600745	514778,5		616809	1071008	843908,5
764.9	8839844	9729292	9284568		9556277	10931403	10243840
764.91	4355229	4360820	4358024,5		3629456	3616251	3622853,5
764.92	86650	109029	97839,5		118262	137506	127884
764.93	3942854	4758907	4350880,5		5420872	6818099	6119485,5
764.99	455111	500536	477823,5		387686	359546	373616
Total	749251848	791019752	770135800		942866268	1107115080	1024990674

A.3 RCA indexes for goods in SITC division 76[6]

Three-digit Level

1995/1996				2002/2003		
SITC	**RCA1**	**RCA2**		**SITC**	**RCA1**	**RCA2**
761	***3,14***	0,32		761	***12,53***	***0,68***
762	***4,65***	0,10		762	***19,39***	***0,67***
763	***2,98***	-0,06		763	***21,1***	***0,64***
764	0,67	-0,30		764	***1,95***	0,31

Four-digit Level

1995/1996				2002/2003		
SITC	**RCA1**	**RCA2**		**SITC**	**RCA1**	**RCA2**
761.1	***3,28***	***0,32***		761.1	***12,67***	***0,68***
761.2	0,09	-0,85		761.2	0,03	-0,95
762.1	***5,42***	***0,38***		762.1	***10,16***	***0,56***
762.2	***1,22***	-0,42		762.2	0,04	-0,97
762.8	***5,67***	-0,03		762.8	***51,2***	***0,77***
763.3	0,03	-0,99		763.3	***6,38***	***0,53***
763.8	***3,1***	-0,03		763.8	***21,41***	***0,64***
764.1	0,05	-0,91		764.1	0,92	0,28
764.2	0,7	-0,32		764.2	***2,55***	-0,06
764.3	0,08	-0,9		764.3	***6,37***	***0,47***
764.8	0,05	-0,91		764.8	0,98	***0,63***
764.9	***1,55***	0,08		764.9	***2,92***	0,01

Five-digit Level

1995/1996				2002/2003		
SITC	**RCA1**	**RCA2**		**SITC**	**RCA1**	**RCA2**
762.11	***6,34***	***0,42***		762.11	***10,73***	***0,57***
762.12	0,03	-0,97		762.12	0,13	-0,63
762.21	***1,71***	-0,32		762.21	0,05	-0,97
762.22	0,13	-0,89		762.22	0,03	-0,97
762.81	***7,59***	0,04		762.81	***81,94***	***0,81***
762.82	0,02	-0,99		762.82	0,06	-0,98
762.89	0,05	-0,97		762.89	0,00	-1,00
763.31	-	-		763.31	0,33	-
763.33	0,07	-0,97		763.33	0,12	-0,97
763.35	0,03	-1,00		763.35	***10,41***	***0,86***
763.81	***4,06***	0,02		763.81	***82,05***	***0,82***

[6] Based on trade statistics in appendix A.2.

763.82	-	-		763.82	-	-
763.83	***2,32***	0,01		763.83	***12,41***	***0,72***
763.84	***1,03***	-0,41		763.84	***2,36***	***0,54***
764.11	0,15	-0,81		764.11	***2,09***	***0,47***
764.13	0,6	-0,76		764.13	-	-
764.15	0,03	-0,84		764.15	-	-
764.17	-	-		764.17	0,92	0,09
764.19	0,02	-0,97		764.19	***2,82***	***0,75***
764.21	0,06	-0,86		764.21	0,14	-0,88
764.22	0,94	***0,37***		764.22	***4,65***	***0,44***
764.23	0,93	-0,61		764.23	***2,12***	-0,51
764.24	0,06	-0,97		764.24	***4,17***	-0,22
764.25	0,83	-0,14		764.25	0,16	-0,67
764.26	0,13	-0,86		764.26	0,12	-0,84
764.31	0,26	-0,77		764.31	0,05	-0,85
764.32	0,07	-0,91		764.32	***6,51***	***0,47***
764.81	0,02	-0,98		764.81	***8,00***	***0,85***
764.82	0,03	-0,97		764.82	0,00	-0,97
764.83	0,06	-0,82		764.83	0,22	0,21
764.91	0,72	-0,12		764.91	0,43	-0,27
764.92	***1,66***	***0,30***		764.92	***1,67***	-0,55
764.93	***1,15***	0,09		764.93	***3,50***	0,14
764.99	***18,25***	***0,36***		764.99	***17,90***	-0,19