The Impact of Exporting Modern Services on Economic Development:

A Potential Growth Strategy for Low Income Countries

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Abstract

Technology has made it possible to export many services in a similar manner to goods. The focus in this thesis is on modern services, therefore traditional service exports like travel and tourist services, are not included. Examples of modern services that can be exported are financial, IT and communication services. The export of these modern services has grown drastically in the past 25 years. Developing countries are also supplying these services internationally, a well-known example being India's IT sector. In this thesis a panel study using data from the World Data Bank on 214 countries is performed. The fixed effects model is used to see if and how the value of modern service exports influences GDP per capita growth, controlling for other determinants of economic growth. The results show that there is a significant positive effect of modern services exports on GDP per capita growth.

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1. Introduction

Since the 1980s, trade of services has grown faster than trade in goods. The trade in services is a relatively new phenomenon, where a service can be supplied to a consumer, without the need for physical proximity to the producer. Globalization of services has also made it possible for developing countries to supply services on an international level, which could potentially work as a source of growth (Ghani, 2009). This thesis focuses on the export of service as an economic growth strategy for developing countries, as alternative to the traditional economic growth strategy of industrialising and exporting manufactured goods. Creating a large exporting service sector could be a viable growth strategy towards employment opportunities and economic prosperity.

In developed countries the large majority of the workforce is employed in the service sector. Services generate over 70 percent of the GDP (gross domestic product) in OECD countries (Hoekman & Mattoo, 2008). This is in contrast to countries in the early stages of economic development, where a great share of the workforce is employed in the agriculture sector. The agriculture sector loses its share when industrial production starts to expand (Henderson, 2002; Soubbotina, 2014). Many developing countries have experienced economic development by exporting manufactured goods and products. Traditionally, when the manufacturing sector is matured, deindustrialisation takes place and a shift towards the service sector is visible (Noland, Park & Estrada, 2012; Park & Chen, 1989). Statistics show that more developed economies have a higher share of services in GDP and that there is a positive correlation between share of the service sector and per capita income (Bear & Samuelson, 1981).

Contrary to the mature manufacturing sector, services are likely to be labour intensive. The growth of the service sector can lead to many jobs and therefore inclusive growth. A productive service sector can have positive effects on manufacturing. An entire economy can benefit from advances in ICT and effective transportation. According to Noland et al. (2012) middle income countries could benefit from business services and a strong modern service sector, moving up the value chain and therefore escaping the much-feared middle income trap (Noland, Park & Estrada, 2012).

As mentioned, there is increasingly cross-border trade in services where there is no longer a need for actual proximity. This is the result of many advances in the information and communication technology. Telecom networks and Satellite make it possible to electronically transport services internationally (Hoekman & Mattoo, 2008; Ghani, Goswami & Kharas, 2011). Services that can be exported are mostly modern services, like financial, legal, communication, computer, technical, advertising and business services. Historically, services were supplied primarily for domestic consumption, however services now contribute to a large share of global trade (Bradford Jensen, Kletzer, Bernstein & Feenstra, 2005). According to Ghani (2009) personal services, which require face to face interaction, have turned into impersonal services that can be delivered electronically over long distances, without or with little degradation in quality. Technology has influenced the proximity, location and time requirements, making them redundant. More and more types of businesses are being digitized and globalized. However, Storper & Venables (2003) mention quite the opposite, stating that face-to-face contact is still very important, even though transport costs have drastically declined. Technology might make long distance communication possible, but often face to face interaction is still needed for the successful transmission of a message.

Figure 1 shows the increasing value of service exports in the world and of lower and middle income countries.
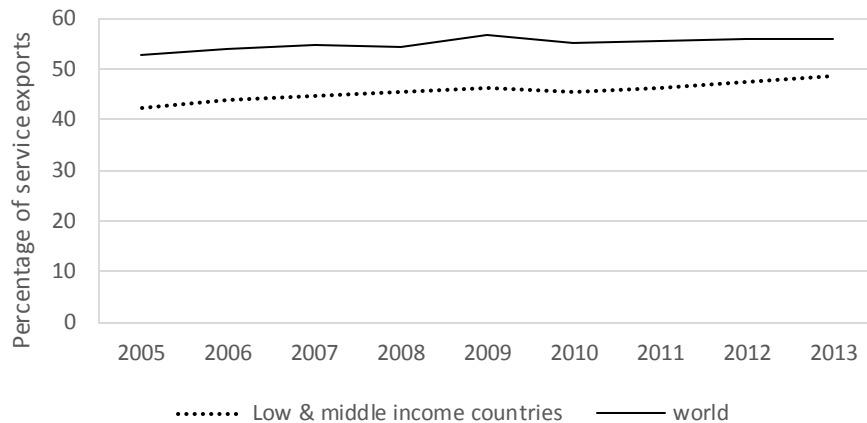
Figure 1. Service exports
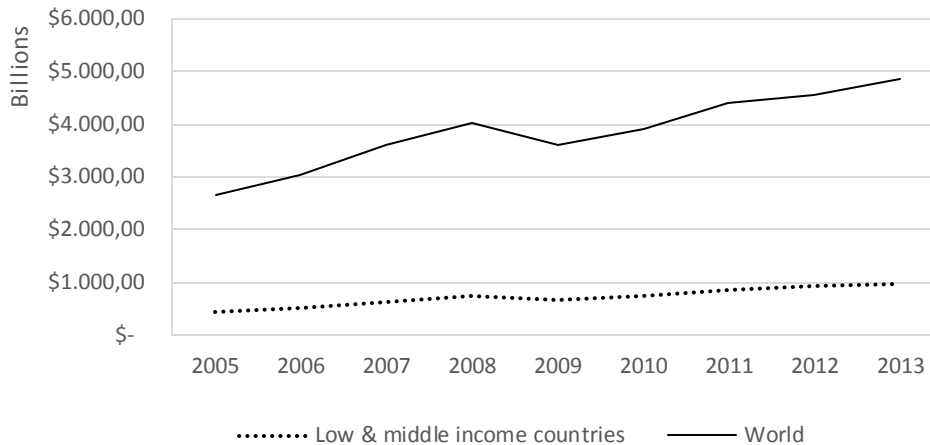
The value of the world's service exports has grown enormously between 2005 and 2013. There is a little dip visible around the time of the economic crisis in 2008-2009, but apart from that there has been a steady increase in service exports. Lower and middle income countries also show increasing service exports, more than doubling their value between 2005 and 2013.

Because of the new tradability of services across borders, developing countries can also produce them, even though a strong domestic demand is lacking. Prime examples of developing countries who are exporting services are India, Pakistan, Sri Lanka and Nepal, who provide services in the software industry and via callcenters ("The service elevator," 2011; Noland Park & Estrada, 2012). The success of some countries in trading services seems to be unrelated to their industrial development or to their performance in exporting in goods (Goswami, Mattoo, & Sáez, 2012). In 2010, the size of the international services market has been estimated at 252 Billion US$ (UNCTAD, 2013). Developing countries have high growth rates in business service exports, leading to their share taking up 22 percent of global trade. Moreover, large amount of foreign direct investment have gone to the service sector, shifting away from the manufacturing sector (Hoekman & Mattoo, 2008; Banga, 2005; Mishra, Lundstrom & Anand, 2011). In figure 2 the modern services as percentage of service exports is presented. [1]

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[1] In section 3 the types of service exports included in calculations can be found.

Figure 2. Modern services (% of service exports)

Not only service exports have clearly grown, the percentage of modern services in service exports has also slightly grown in the period 2005-2013. This is also visible for low and middle income countries where the modern services make up almost 50 percent of the total service export in 2013.

The growth of service exports and modern service exports is an interesting development. Research by Mishra, Lundstrom and Anand (2011) shows that there is a positive relationship between GDP growth per capita and service export sophistication. The relative comparative advantage and share in total service exports are used to compile sophistication. In this thesis the aim is to research whether a simpler model, only looking at the export of modern services, will have a positive influence on the GDP growth per capita as well. The research question will therefore be:

 "What is the impact of exporting modern services on economic growth for developing economies?".

The effect of education, computer access and English proficiency on the exporting of services will also be looked into. The structure of this thesis is as follows: first the current literature concerning the service sector and export will be discussed in section 2, next the data and empirics, showing the data and the fixed panel data model used for this research in section 3 and 4. Then the results will be discussed in section 5, and a conclusion will follow in section 6.

2. Literature review

Even though the service sector makes up the greatest share of the economy there is not a large amount of research done on the service sector. A great number of research about services and development has been done on the South Asia region, especially on India. This is not surprising since India's service sector grew rapidly and India exports a lot of services, most notably in the IT sector. Before reviewing the literature, concepts regarding the service sector will be explained to gain some insight into the sector. The link between GDP and the service sector will be discussed, as well as describing the influence of services on productivity growth. Then the tradability and effects of export will be reviewed. Lastly, the hypothesis will be drawn and several determinants of growth that could be added as control variables will be described.

2.1. Concepts

According to Hoekman and Mattoo (2008) services have unique features that affect their tradability. The typical characteristics include:

(i)   intangibility – this makes it hard to observe and tax international transactions in services;
(ii)   non-storability – services cannot be stored, hence consumption and production often must occur at the same time and place;
(iii)   differentiation – services are often different for every customer; and
(iv)   joint production, which means that clients have to participate in the production process.

Services can be divided into two categories, modern services (or modern impersonal services) and traditional personal services. Traditional personal services often require face to face contact like trade, hotel, restaurant, education, beauty shops, barbers, health services, public administration and defence. They require the physical proximity of the customer. The share of traditional services in GDP tends to fall in more advanced economies. Modern services have benefitted from technological advancement and can now be stored and traded digitally through satellite and telecom networks. Modern services are ICT intensive and are no longer restricted by time and space. Examples are communication, call centres, insurance, banking, business-related services, remote access services, transcribing medical records, and computer services. Their share in GDP has risen with per capita income (Mishra, Lundstrom & Anand, 2011; Ghani, 2009; Ghani, Goswami & Kharas, 2011; Banga, 2005; Eichengreen & Gupta, 2011).

The General Agreement on Trade in Services (GATS) defines four modes of supply for trade in services:

• Mode 1 Cross-border: *trade of services across borders*. Similar to trade in goods, supplied from one country into another country, without physical interaction.
• Mode 2 *Consumption abroad*: a supply of services where the consumer travels to the country of the provider, like tourism.
• Mode 3 *Commercial presence*: a provider supplying services in another country by establishes a facility in that country, like FDI.
• Mode 4 *Presence of natural persons*: the temporary movement of a person into another country to supply the service.

(Noland, Park & Estrada, 2012; McGuire, 2002; Hoekman & Mattoo, 2008; WTO, 1994)

In this thesis the focus will be on the export of modern services, and exports conducted via mode 1.

2.2. Services sector and GDP

In developed economies the share of the service sector is large. Many papers find that the share of the service sector rises as GDP grows. Bear & Samuelson (1981) did a cross-section revealing a positive correlation between per capita income and the service sector share of product. Noland et al. (2012) find the same correlation, as well as a positive correlation for employment in services and per capita income. Using panel data for Asian developing economies they demonstrate that the growth of services is correlated with the rise in income and achieving education over time. Moreover they find that service growth is significantly correlated with poverty reduction. Gordon and Gupta (2004) also find that countries with higher per capita income have a larger share of services in GDP. They show that factors such as increased use of services by other sectors and high income elasticity of demand have played an important role in the growth of the service sector. This means that as income rises the demand for services grows faster than the demand for other goods and commodities. Business processes that were previously done internally by individual firms now are being outsourced. This leads to an increase in the demand for services from the industrial sector. Accounting, legal, and security services are examples of provided services that were previously done by firms themselves. Economic reforms and the growth in foreign demand for services have also played a part in enlarging services growth. Business and telecommunication services are very popular domestic and foreign investment destinations, after being liberalized. In India the modern services attract most of the FDI inflows. Ghani (2009) used a plot to show the relationship between GDP growth and the service and manufacturing sector value-added growth for 134 countries. Both sectors are positively associated with GDP growth. But the relationship between GDP growth and service output growth is steeper in comparison to the relationship between GDP growth and manufacturing output growth. In a cross-country growth regression the paper shows that the service sector has a stronger association with overall growth than the manufacturing sector, controlling for initial real GDP per capita. Both coefficients are statistically significant. This means that both the service sector and the manufacture sector are associated with growth, but the service sector has a higher coefficient. In developing countries services contributed more to growth than in developed countries. For a sample of 50 developing countries the paper finds that growth in the service sector is more correlated with poverty reduction than growth in agriculture and manufacturing. Both manufacturing and the service sector are negatively related to growth in poverty. The slope for the service sector is steeper. With change in poverty as the dependent, growth in the service sector is significant (Ghani, 2009; Ghani Goswami & Kharas, 2012).

Although it is clear there is a strong correlation between economic development and the share of the service sector, there is no strong proof for causality, indicating that enlarging the service sector would lead to GDP growth. Eichengreen and Gupta (2009) shed some light on the nature of the association. They have analysed the share of service in GDP in the course of economic development. In their research they use the percentage of services in GDP as dependent. They found evidence for the two waves of service growth. The first wave appears to be made up primarily of traditional services, and already occurs at relatively low levels of income per capita. Park and Chen (1989) find that the service sector employment even tends to grow faster than the manufacturing sector in the early stages of economics development. Mainly as a result of rapid migration from rural to urban areas. When income starts to grow relatively more industrial goods and services are demanded, as opposed to necessities such as food and shelter (Bear & Samuelson, 1981). The second wave includes the modern services. They find that after 1990 the second wave, of modern services, starts at lower levels of income than

before. This means that the share of service sectors shows a growth in earlier economic development phases. The first wave of service sector growth starts more or less as it did in the pre-1990 period. The second wave is most evident in democracies, in countries that are close to major financial centres, and in economies that are relatively open to trade.

2.3. Productivity growth

Just like in some high-growth industries in the manufacturing sector, there is a strong productivity growth visible in several modern service industries. Information and communication technology, trade, competition, and increasing returns to scale lead to the high productivity growth rates (Baily and Gordon, 1988; Ghani, 2009; Triplett and Bosworth, 2004). Ghani (2009) uses a cross-country regression with the growth of national labour productivity as the dependent variable. As controlling variables he uses initial GDP per capita, average annual growth rate in agriculture, manufacturing, and service output. He finds that the coefficient from agricultural output growth is negative and significant. Service and manufacturing output both have a statistically significant and positive effect on the national labour productivity. Ghani suggests that service is a bigger contributor to labour productivity growth than manufacturing, since the coefficient on service output growth is more than double that of manufacturing. He further implies that the service sector in South Asia has behaved like the manufacturing sector in East Asia. GDP growth in South Asia has benefited from the expanding service sector, caused by the high productivity rates.

Park and Shin (2013) take a different approach than Ghani (2009) using labour productivity growth in the service sector as the dependent variable. They use trade in services as an explanatory variable. In a panel study the coefficient of trade in services as a percentage of GDP is positive and statistically significant. Growth of labour productivity in the service sector benefits from trade in services. Domestic firms are being exposed to foreign competition from imported services. This forces firms to become more efficient. Likewise, when a firm wants to export services it need to be able to compete in foreign markets (Park & Shin, 2013; Freckleton, 2013).[2] The export in services improves the productivity, which could lead to a higher GDP.

Eichengreen & Gupta (2011) also show that productivity in the service sector has grown. The highest productivity growth has been in the modern services, although there has also been productivity growth in tradition services like wholesale and retail, where internet often can be used (selling via webshops for example). The traditional personal services such as restaurants, hotels, beauty shops, barbers, education and health benefit not as much from technological changes and ICT (Ghani, 2009; Eichengreen & Gupta, 2011). It is explained that the mix of skilled and unskilled workers in services is increasingly similar to that of the manufacturing sector. This means that the modern services are not only a suitable place for highly skilled workers, but also for lower skilled workers. Lower skilled workers are not deemed to work in the manufacturing sector (Eichengreen & Gupta, 2011).

Gordon and Gupta (2004) also find that in the fast growing service sectors in India, like communications, banking services, business services and community services there are significant productivity gains, which leads to lower relative prices.

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[2] For empirics and results see "Developing the Service Sector As an Engine of Growth for Asia" by the Asian Development Bank, p. 70-72.

2.4. Modern services and tradability of services

Hoekman & Matoo (2008) note that in developing countries the share of business and producer services have been growing at the expense of travel and transport services[3]. International trade in services has grown tremendously because of technological changes. Between 1995 and 2005 developing countries have expanded their business services exports nearly four-fold. The most notable service exporting developing country is India, which is not only supplying simply service tasks like data entry, but is also successful in providing more advance services in fields such as product development customer care, and human resource management. Exporting knowledge intensive services (the type of products developed countries export) may sustain higher growth rates than exporting lower-skill goods according to Ghani (2009). A cross-country regressions shows that economic growth is about one percentage point higher in countries that have an open telecommunications and financial sector. (Arnold, Mattoo & Narciso, 2006). Liberalisation can help the service sector. As found by Banga (2005) growth in services in India has improved after gradually opening up. Reducing barriers to trade and allowing foreign direct investment have increased the demand in services. FDI brings capital and technology and can help increase exports and economic growth (Seyoum, 2007). Bosker & Garretsen (2009) find that in South Asia the majority of the tradable services are not produced for the local market. For example the domestic demand for software in South Asia is low, but software exports increased to US$ 23 billion in 2006. The foreign demand can help small developing countries. International exchange of services could be an opportunity for export diversification. By exporting a wide range of services, countries become less vulnerable, and can experience economic growth (Freckleton, 2013). McGuire (2002) shows that economies with more restrictions tend to have a lower GDP per capita. He estimated that the real income gains for developing economies by liberalizing services are US$ 130 billion. Those economies with the greatest restrictions will have the greatest benefits.

In another paper by Eichengreen & Gupta (2011) they estimate growth in value added of different services in India, for the period 1980-2007. [4] Some of the independent variables to explain the growth are the tradability of the service, whether the sector has been liberalized, its skilled-labour intensity, and per capita income. The increase of the value added in services grows with income per capita. Moreover the results show that tradability has a positive effect on growth, growing four percentage point faster than non-tradable services. As described previously by Banga (2005) and Arnold, Mattoo & Narciso (2006) the paper also finds that liberalization has a significant positive effect on the growth of services. Eichengreen & Gupta (2011) state that exporting financial, IT, business and communication services could possibly lead to economic growth.

Saez and Goswami (2010) show that it is not just India that is exporting services. Professional and information technology related services are exported by countries like Uruguay, Costa Rica and Brazil, while Mexico trades in communication and distribution services. The paper finds that export of business services tends to be highest in countries where the population has more schooling. Human capital is very important for service exports.

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[3] This is also visible in figure 2, modern services include business and producer services, for the full list of included services see section 3, data.
[4] The different services include trade, hotels and restaurant, transport and storage, communication, banking and insurance, business services, public administration and defence, and education and health.

According to Ghani, Goswami and Kharas (2011) modern services are emerging rapidly because of growing tradability, reduced transport costs, and more sophisticated technology, which includes off-shoring, scale economies and specialisation. Not only the value of export of services has grown (as can be seen in figure 1) but also its share in total value added. This share is higher for developing economies. Services do not have to deal with logistical barriers like customs, decreasing the transport costs and making it a genuine opportunity for poor countries. Because of technology the location of countries is less important. There is no need for proximity to more developed countries or to be close to the sea. Manufacturing on the other hand depends on hard infrastructure for delivering goods, like ports, roads, ships and airports. Export of services relies on telephone lines and IT (Ghani, 2009). Time-zone differences between developing and develop countries make 24 hours a day business possible (Goswami, Gupta & Mattoo, 2012).

2.5. Export as an engine of growth

In the previous subsection some of the advantages of trade and export already have been mentioned. Many developing countries have had economic development by exporting manufactured goods and products. Numerous studies have found a positive correlation between exports and GNP growth. Export orientated policies have resulted in enhanced productivity and an optimal allocation of resources (Lal & Rajapatirana, 1987).

Almost US$ 2.5 trillion worth of manufactures was exported by developing countries in 2005. East Asia is a prime example of export-led growth by producing manufactures (UNIDO, 2009). Hong Kong, Korea, Taiwan and Singapore are open to trade and are outward-oriented. They all have reached high economic growth rates. The export-led growth hypothesis says export expansion is one of the main determinants of growth. Export expansion can lead to many advantages. For example by exporting the capacity is better utilized, exports make economies of scale possible and can lead to technological progress. Moreover they increase the labour productivity and create employment (Medina-Smith, 2001). Marin (1992) found, using a Granger causality test, that in the United States, United Kingdom, Japan and Germany exports cause productivity, confirming the export-led growth theory.

However Henriques and Sadorsky (1996) find that the opposite is true for Canada, where no evidence is found for the export-led growth theory. In their Granger causal test they find that GDP growth proceeds exports. Moreover research in China indicates that export-led growth theory doesn't apply everywhere. Time series data shows that there is a bidirectional causality between real industrial output and exports. Shan and Sun (2010) mention that output and export have a positive influence on each other, rather than a one-way effect.

As mentioned in subsection 2.3 there is also productivity growth in the service sector which can be linked to trade. It is possible that exporting services could behave in the same way as manufacturing output and potentially lead to productivity, output and GDP growth. The export-led growth theory is somewhat ambiguous, and it is not clear if services behave in the same manner as goods and products.

2.6. Comparative advantages in services

McGuire (2002) states trade between countries and specialization are very important for the modern economy. Gains from trade can be explained by the comparative advantage theory. According to this theory a country should produce and export the services in which it has a relative advantage, and import those in which it has a relative disadvantage. Thus the services are supplied by the relatively

lowest cost producer, and the optimal quantity of services will be consumed. As mentioned in subsection 2.4 opportunities for developing countries arise from liberalization. They can gain market access and export the services in which they have a relative strength or comparative advantage. Hence, they can improve their export earnings and generate employment, as well as increasing their efficiency. As explained by Park & Shin (2013) in section 2.3 being exposed to foreign competition forces domestic firms to be more efficient.

People temporary working abroad in foreign services markets can develop a new range of skills and knowledge. Upon return they can share this new information and skills in the domestic economy. This way human capital can be improved (McGuire, 2002). In South Asia for example over 22 million people (1.5 percent) live outside their home country (Ghani, 2009). With these acquired skills developing countries can improve the quality of their services. India has a comparative advantage in many services because of their cheap and skilled labour (also, a large share of the population is fluent in English). Many developing countries are characterized by their low cost labour. If they can offer similar quality as developed countries services can substantially lead to new employment. The tradability of services has led to firms looking for countries where these services can be produced at much lower costs. Firms strive to reduce fixed overhead by outsourcing routine functions ((Bosker & Garretsen, 2009; Gordon & Gupta, 2004; McGuire, 2002; Seyoum, 2007).

A number of developing countries have a comparative advantage in modern services. Not only India, but also countries like Israel, Costa Rica and Sri Lanka have a high relative comparative advantage (RCA) index in computer and information services. Indonesia, Venezuela and Colombia have an advantage in communications services, while Mexico, Peru and Bolivia have high RCA in insurance services. Colonial history, common language, and legal systems are important contributors to these advantages, and increase service exports (Goswami, Gupta, Mattoo & Sáez, 2012; UNCTAD, 2013). For example, India's large service sector is partly due to their colonial history. India is a former colony of Great-Britain, explaining their proficiency in English.

2.7. Entry into services

UNCTAD (2013) states four reasons why exporting services is a good possibility for developing countries to implement.

1. Services don't require countries to have natural resources, like petroleum reserves or commodities.
2. The geographic location is not important. The costs of transporting services across borders are very low. Distance does not play a big role in offshore service decisions. However time zones could influence the suitability of the developing country.
3. Governments can create a comparative advantage. In services human capital plays a big role. Education can influence the countries abilities. English and information technology skills can be very important.
4. Services don't depend on economies of scale like goods. Labour productivity, skills and innovation affect the price of services more than quantity. Governments could help to create the conditions that are necessary to enter global trade in services.

There is a positive association between human capital and service exports, as well as between service exports and electronic infrastructure. Governments could create special economic regimes, such as IT

parks of software technology parks. Hence the number of computers per capita doesn't need to be high to be able to compete in transferable services (Goswami, Mattoo, & Sáez, 2012).

2.8. Sophistication of service exports

Mishra, Lundstrom and Anand (2011) performed a panel study indicating a positive association between higher sophistication of service exports and growth in per capita income. Sophistication aims to capture the productivity level associated with a country's production. It measures the increasing improvements in technology and ICT as well as countries exporting the high value services. For this research Mishra et al. (2011) develop a new service exports sophistication index. They use the revealed comparative advantage in specific services, and values of services exported by a country. This is used to predict the dependent variable, GDP growth per capita. In their GDP growth model four other determinants of economic growth are added; initial income level, rates of physical and human capital accumulation, trade openness and institutional quality. The service sophistication coefficient is positive and significant, which implies that higher GDP per capita growth is associated with higher export sophistication.

2.9. Hypothesis

Trading and exporting services can have a positive influence on economic growth. Being open to service trade can help productivity growth and lead to extra foreign demand. Mishra et al. (2011) showed service exports sophistication is positively associated with economic growth. A simpler model, only looking at the value of modern service exports will be conducted. To answer the research question hypotheses 1 is conducted.

Hypotheses 1: *The export of Modern services is positively associated with GDP per capita growth, controlling for other determinants of growth.*

Human capital is not only important for economic growth, but also to be able to produce modern services. Goswami, Mattoo & Saez (2012) found a positive correlation, taking tertiary school enrolment as a variable for human capital. It can be presumed that in order to complete service exporting tasks you'll need at least some basic education Eichengreen & Gupta (2011) on the other hand found that the modern service sector is also a suitable place for low-skilled workers.

Hypotheses 2: *Human capital is essential for modern service to lead to economic growth.*

In order to trade services internationally electronic infrastructure is essential. IT related services are a large share of modern services export. According to UCTAD (2013) information technology skills are crucial. It could be expected that higher usage of the Internet would mean the population is more skilled in IT which is an advantage when producing services. As mentioned in subsection 2.7. Goswami, Mattoo, and Sáez (2012) stated that a high internet rate itself it not necessary as long as there are enough opportunities to access the internet, in science parks for example.

Hypotheses 3: *Internet access is important to successfully export modern services.*

As mentioned by UNCTAD (2013) common language gives service exporting countries an advantage. One of the factors contribution to India's success in the service sector is the ability to speak English. Proficiency in English is necessary for certain service tasks. This leads to the following hypotheses:

Hypotheses 4: *English proficiency is needed to successfully export modern services.*

The main aim is to investigate if exporting modern services can be a growth strategy for developing countries. That why the first hypotheses will also be tested exclusively on lower and middle income countries.

Hypotheses 5: *Using a dataset only including lower and middle income countries does not change the results.*

The location of a country affects its ability to successfully export certain services. Eichengreen and Gupta (2009) find that countries close to major financial centre have a more evident modern service sector. Ghani (2009) and UNCTAD (2013) on the other hand states that in exporting services location is not an important factor. Landlocked countries can also operate efficiently in services. Time-zones play a role in international business. For some types of business it is crucial to be in the same time-zone in order to collaborate, but for others types differences in time-zones are used to achieve 24 hours a day long services. If a country has a favourable location depends on the service. Including the location of a country therefore goes beyond the scope of this thesis.

2.10. Economic growth determinants

In order to test the hypothesis using a GDP growth model some control variables are needed. Several variables can contribute to economic growth. The initial development level contributes to the economic growth rate. The convergence theory describes that poorer countries grow faster than rich countries, closing the gap between the two economies. (Dewan & Hussein, 2001; Durlauf, Kourtellos, & Tan, 2005).

One of growth determinants is the share of investments in GDP (Durlauf, Kourtellos, & Tan, 2005). Investments have a positive effect on efficiency and productivity. Investments provide a constant capital/labour ratio, and cover physical depreciation. The rate of accumulation of physical capital is a major factor in determining GDP per capita (Bassanini & Scarpetta, 2001). Another determinant is human capital. Human capital comprises a highly trained and skilled workforce. A higher skilled workforce enables countries to perform better in research and development and technical improvements (Bassanini & Scarpetta, 2001). Durlauf et al (2005) also find that human capital, defined as secondary school education and life expectance may be robust. Mishra et al (2011) also included human capital as a variable in their research.

Inflation also often added as control variable. Lower and more stable inflation rates can reduce the level of uncertainty (Bassanini & Scarpetta, 2001). If the inflation is uncertain, long-term contracts are discouraged and the relative price variability is increased (Dewan & Hussein, 2001). Prices and inflation can affect the GDP growth strongly, without there being actual economic growth.

3. Data

3.1. Data sources

To research the economic impact from service export for developing countries data from the World Bank used. The World Development Indicators database gives 214 countries. 135 of them are lower and middle income countries, meaning in 2013 their GNI per capita was $12,745 or less. Data indicating if a country has English as an official language is retrieved from a list composed by Wikipedia. The data covers 10 periods, from 2005 to 2014, since before 2005 there is no data available for the service variables at the World Bank Database

3.2. Variables of interest

The variables communications, computer and other services (as percentage of service exports) and insurance and financial services (as percentage of service exports) are included in the database. The communications, computer and other services together with the insurance and financial services will be taken as a variable for modern services. Services in the World Bank database are defined as the economic output of intangible commodities that may be produced, transferred, and consumed at the same time. The communications, computer and other services include: Telecommunications, computer data, news-related service transactions between residents and non-residents, construction services, royalties and license fees, miscellaneous business, professional and technical services, manufacturing services on physical inputs owned by others, personal, cultural and recreational services. The insurance and financial services variable includes insurance, financial intermediary and auxiliary services between residents and non-residents**.** The modern services variable leaves out the transport and travel share of the service exports, which can be viewed as the more traditional kind of services. In the model modern services export is expressed as percentage of GDP. This modern services variable primarily uses mode 1 of the GATS defines models for trade in services.

Economic growth is defined by GDP growth per capita. This is measured in constant 2005 US$ (The World Bank, n.d.).

3.3. Control variables and interaction variables

Several control variables are added to the model.

Initial development level: To control for differences in development stadia the current GDP per capita is included.

Investment: To include investment as a determinant of growth, the variables foreign direct investment and gross capital formation are added. Foreign direct investments are the direct equity flows coming in to the country. Gross capital formation covers additions to the fixed assets of the economy plus net changes in the level of inventories. This can be viewed as the domestic investments (The World Bank, n.d.). Foreign direct investment and gross capital formation are in percentage of GDP, to be able to compare between the different economy sizes.

Human capital: The enrolment ratios of primary and secondary education are used to include human capital. Secondary enrolment rate is also used as an interaction effect for education. The ratio is conducted using the total enrolment and the population of the age group that would correspond to the level of education (The World Bank, n.d.).

Inflation: Inflation shows the price change in the economy as a whole, which could also influence the GDP growth (The World Bank, n.d.).

The value added of services and agriculture will also be added as control variables to prevent from miscalculating and overestimating service export coefficients.

English as official language, internet access and secondary education are used to include an interaction effect.

English official language: English is considered an official language, if it is used in interactions between citizen and government officials (Wikipedia, 2015).

Internet access: This variable indicates the number of individuals per 100 people who haves used the internet in the last 12 months. (The World Bank, n.d.).

3.4. Descriptive data

The extreme outcomes in the GDP per capita growth are both from Libya, which had a decrease in GDP of 62% in 2011, and an increase of 103% a year later. Luxembourg has the highest modern service export as percentage of GDP, with a value of 131% in 2013, whereas Iraq held the lowest value in 2006, with 0,00798% of the GDP.

Table 1: Descriptive values

Variable	Observations	Mean	Std. Dev.	Min	Max
GDP PC growth	1916	2.416643	5.401384	-62.46503	102.7794
Modern Services (% GDP)	1461	5.123525	10.39123	.0079828	131.4571
FDI (% GDP)	1765	6.304774	17.63698	-57.42675	466.5622
Gross capital formation (% GDP)	1695	24.27608	8.744625	1.525177	81.9403
GDP PC Current	1940	14414.05	22372.97	143.7839	193892.3
Inflation	1916	6.339716	8.707247	-30.61347	103.8228
Service value added (% GDP)	1678	58.15489	14.9919	2.428377	93.75511
Agriculture value added (% GDP)	1678	12.80547	12.52616	0	61.57867
School enrolment rate primary	1387	103.9108	13.1117	29.19822	165.1877
School enrolment rate secondary	1263	80.19832	27.51717	7.35183	165.5813

A correlation matrix can be found in appendix A. The correlation between primary and secondary school enrolment rate is not very high, so both are included in the model. Extreme values in the dataset could possibly distort estimates of coefficients in the regression. Therefore a plot of the leverage is made. It shows that Luxembourg (and Malta) has a leverage that is higher than average. Libya on the right has very large residuals, meaning that the true value is very different than the predicted value. If a case would be in the upper right corner it would be a problematic case. To check if any observation should be left out a Cook's distance test is performed. This measures the aggregate

change when the observation is not used in the model. When Cook's distance is higher than 4/N it may be problematic (Williams, 2015). Libya had a Cook's distance of 0,174. Because it is logical that Libya's extreme values cannot be explained by the variables in the model, but are caused by extern factors like war and civil conflict, Libya is deleted from the dataset.

Figure 3: Leverage and normalized residual squared
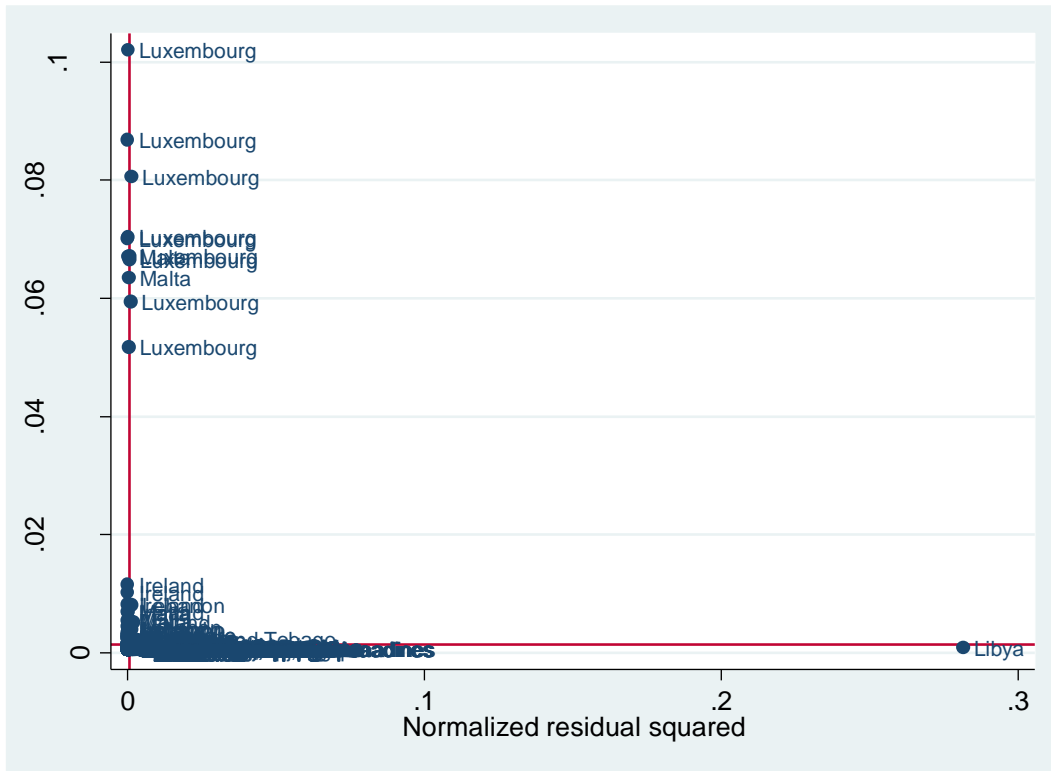
4. Empirics

By using a panel model it can be statistically concluded if modern services have an impact on the GDP per capita growth. In addition to a cross-section study a panel study takes a time series part into account. Using the Hausman's test, it is determined that the fixed effects model is to be used.[5] The Hausman's test checks if there are significant differences between parameter values in the random and the fixed effects model. If there is no correlation between unobserved variables and the explanatory variables the parameters would be consistent in the fixed and in the random effects model. If there is correlation between unobserved variables and the explanatory variables the fixed effects model is to be used. The fixed effects model converges to the true coefficient values in larger samples (Adkins & Carter Hill, 2011). The basic equation for a fixed effects model is:

$$Y_{it} = a_i + \beta_1 X_{it} + \varepsilon_{it}$$

In which Y denotes the dependent variable, in this case GDP growth per capita. a_i is the intercept, which in the fixed effects model is allowed to change across countries. This controls for country specific effects that can influence the GDP growth per capita. β is the coefficient, X the different independent variables, where i denotes the country, and t the year. ε_{it} denotes the error term.

This gives our equation with GDP per capita growth as dependent variable as follows:

Model 1.1 $GDP\ PC\ Growth_{it} = a_i + \beta_1\ Modern\ services/GDP_{it} + \beta_2\ FDI/GDP_{it} + \beta_3\ Gross\ capital\ formation/GDP_{it} + \beta_4\ GDP\ PC\ Current_{it} + \beta_5\ Inflation_{it} + \beta_6\ Service\ value\ added/GDP_{it} + \beta_7\ Agriculture\ value\ added/GDP_{it} + \beta_8\ Life\ expectancy\ at\ birth_{it} + \beta_9\ School\ enrolment\ primary_{it} + \beta_{10}\ school\ enrolment\ rate\ secondary_{it} + \varepsilon_{it}$

Where again the coefficients are denoted by β_1 to β_{10}, and our variable of interest the export of modern services as percentage of the GDP is denoted by Modern services/GDP$_{it}$. Next, the effects of internet access, education and the ability to speak English in combination with the export of modern services are conducted. This is done by adding interaction effects to our first model. This leads to the following formula:

Model 1.2 $GDP\ PC\ Growth_{it} = a_i + \beta_1\ Modern\ services/GDP_{it} + \beta_2\ FDI/GDP_{it} + \beta_3\ Gross\ capital\ formation/GDP_{it} + \beta_4\ GDP\ PC\ Current_{it} + \beta_5\ Inflation_{it} + \beta_6\ Service\ value\ added/GDP_{it} + \beta_7\ Agriculture\ value\ added/GDP_{it} + \beta_8\ Life\ expectancy\ at\ birth_{it} + \beta_9\ School\ enrolment\ primary_{it} + \beta_{10}\ school\ enrolment\ rate\ secondary_{it} + \beta_{11}\ internet\ acces_{it} + \beta_{12}\ Modern\ services/GDP*Internet\ access_{it} + \varepsilon_{it}$

Model 1.3 $GDP\ PC\ Growth_{it} = a_i + \beta_1\ Modern\ services/GDP_{it} + \beta_2\ FDI/GDP_{it} + \beta_3\ Gross\ capital\ formation/GDP_{it} + \beta_4\ GDP\ PC\ Current_{it} + \beta_5\ Inflation_{it} + \beta_6\ Service\ value\ added/GDP_{it} + \beta_7\ Agriculture\ value\ added/GDP_{it} + \beta_8\ Life\ expectancy\ at\ birth_{it} + \beta_9\ School\ enrolment\ primary_{it} + \beta_{10}\ school\ enrolment\ rate\ secondary_{it} + \beta_{11}\ Modern\ services/GDP*education_{it} + \varepsilon_{it}$

Model 1.4 $GDP\ PC\ Growth_{it} = a_i + \beta_1\ Modern\ services/GDP_{it} + \beta_2\ FDI/GDP_{it} + \beta_3\ Gross\ capital\ formation/GDP_{it} + \beta_4\ GDP\ PC\ Current_{it} + \beta_5\ Inflation_{it} + \beta_6\ Service\ value\ added/GDP_{it} + \beta_7\ Agriculture\ value\ added/GDP_{it} + \beta_8\ Life\ expectancy\ at\ birth_{it} +$

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[5] For test output see appendix B.

$$\beta_9 \, School\ enrolment\ primary_{it} + \beta_{10} \, school\ enrolment\ rate\ secondary_{it} +$$
$$\beta_{11} \, English_{it} + \beta_{12} \, Modern\ services/GDP^*English_{it} + \varepsilon_{it}$$

In the models 1.2, 1.3, and 1.4, the interaction effect of internet access, education and the English language are added, respectively. Education is taken as the secondary school enrolment rate, which was already included in the model. English is a dummy variable indicating if English is an official language or not.

As suggested in the research by Mishra, Lundstrom and Anand (2011) a lagged effect is used for the modern services export variable and the current GDP per capita. In this model the one period prior of these variables is used to estimate the dependent.

Model 2. $\quad GDP\ PC\ Growth_{it} = a_i + \beta_1 \, Modern\ services/GDP_{i,t-1} + \beta_2 \, FDI/GDP_{it} + \beta_3 \, Gross$
$capital\ formation/GDP_{it} + \beta_4 \, GDP\ PC\ Current_{i,t-1} + \beta_5 \, Inflation_{it} + \beta_6 \, Service$
$value\ added/GDP_{it} + \beta_7 \, Agriculture\ value\ added/GDP_{it} + \beta_8 \, Life\ expectancy\ at$
$birth_{it} + \beta_9 \, School\ enrolment\ primary_{it} + \beta_{10} \, school\ enrolment\ rate\ secondary_{it}$
$+ \varepsilon_{it}$

Lastly, the logarithmic values of the dependent and independent variables is taken, in accordance with Mishra, Lundstrom and Anand (2011). This leads to the following model:

Model 3. $\quad Log\ GDP\ PC\ Growth_{it} = a_i + \beta_1 \, Log\ Modern\ services/GDP_{i,t-1} + \beta_2 \, Log\ FDI/GDP_{it}$
$+ \beta_3 \, Log\ Gross\ capital\ formation/GDP_{it} + \beta_4 \, Log\ GDP\ PC\ Current_{i,t-1} + \beta_5 \, Log$
$Inflation_{it} + \beta_6 \, Log\ Service\ value\ added/GDP_{it} + \beta_7 \, Log\ Agriculture\ value$
$added/GDP_{it} + \beta_8 \, Log\ Life\ expectancy\ at\ birth_{it} + \beta_9 \, Log\ School\ enrolment$
$primary_{it} + \beta_{10} \, Log\ school\ enrolment\ rate\ secondary_{it} + \varepsilon_{it}$

Models 1.1 till 1.4 are also used with the dataset only including lower and middle income countries, to see if it leads to similar results. To control for heteroscedasticity robust standard errors are used in estimating the models.[6]

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[6] For test output see appendix C.

5. Results

In this section the output of the estimated models, as described in the previous section, is presented. The results found will be discussed.

5.1. Panel model results

Table 2 shows the results of model 1.1 and the models 1.2, 1.3, and 1.4, using an interaction effect. The first column shows the results of the regression of the control variables, before adding the variable of interest, the modern service exports. As expected investments have a positive influence on GDP per capita growth. The variables of Foreign direct investment and gross capital formation both have a significant effect. The current GDP per capita has a significant negative effect on GDP growth per capita, which aligns with the convergence theory mentioned by Dewan and Hussain (2001) and Durlauf, Kourtellos and Tan (2005) as explained in section 2.10. The primary and secondary school enrolment rates have a small negative value. This is surprising, since human capital could be a determinant of economic growth. However the values could be explained by the convergence theory, assuming that wealthy countries have high school enrolment rates.

Model 1.1 shows the results with modern service exports as percentage of GDP added. There are no large differences compared to the first model. The export of modern services has a positive and significant ($p = 0.003$) influence on GDP per capita growth. Adding the modern service variable also leads to an increase in within R^2 from 0.1706 to 0.1863, indicating that the model 1.1 has more explanatory power. The independent variables in model 1.1 explain 18,63% of the variance in GDP per capita growth. When the export of modern services as percentage of GDP grows with one percentage point the GDP per capita growth is expected to be 0.177 higher, other thing equal. Thus hypotheses 1: *The export of modern services is positively associated with GDP per capita growth, controlling for other determinants of growth,* cannot be rejected. The estimator for modern services has significant positive explanatory power.

In model 1.2 an interaction effect with modern services and the use of internet is added to model 1.1. The interaction effect is negative and insignificant ($p = 0.782$). A negative interaction parameter would designate a substitution effect, where higher values of services exports would lead to less GDP per capita growth if the rate of internet users is higher. The modern service exports have a value of 0.209, higher than in model 1.1, indicating that for each percentage point increase GDP per capita increases with 0.209, if rate of internet users is zero. It is logical that without internet access exporting services would not be possible. However a high internet user rate is not necessary. The variable of current GDP per capita becomes insignificant ($p = 0.857$). The internet users variable is very significant. More developed countries have higher internet user rates, so it is not surprising that adding the internet users variable influences the current GDP per capita variable. Model 1.2 has an within R-square of 0.2125, which would signify that it has more explanatory power than model 1.1.

Model 1.3 shows the added interaction effect for education. The modern service exports parameter is no longer significant ($p = 0.356$). If the secondary school enrolment rate would be zero the GDP per capita growth would be 0.17 percentage point higher if modern service export as GDP percentage would be one percentage point higher. The interaction effect is positive, which means that higher modern service export values leads to higher GDP per capita rates, if you also have a higher secondary school enrolment rate. However the variable is not significant ($p = 0.981$).

Table 2: Output GDP growth model

GDP per capita growth		Model 1.0	Model 1.1	Model 1.2	Model 1.3	Model 1.4
Constant		31.864***	33.053***	28.101***	33.070***	33.174***
		(6.651)	(7.342)	(7.252)	(7.425)	(7.376)
Modern services (% of GDP)			0.177***	0.209***	0.173	0.153*
			(0.060)	(0.072)	(0.186)	(0.090)
FDI (% of GDP)		0.016*	0.018**	0.01761***	0.018**	0.018**
		(0.009)	(0.009)	(0.006)	(0.009)	(0.009)
Gross capital formation (% of GDP)		0.223***	0.266***	0.235***	0.267***	0.267***
		(0.052)	(0.063)	(0.060)	(0.064)	(0.063)
GDP PC (Current US$)		-0.0001***	-0.0001***	0.0000	-0.0001***	-0.0001***
		(3E-05)	(3E-05)	(0.0000)	(0.0000)	(0.0000)
Inflation GDP deflator		0.055**	0.040*	0.029	0.040*	0.040*
		(0.022)	(0.024)	(0.023)	(0.024)	(0.024)
Services value added of GDP		-0.400***	-0.435***	-0.369***	-0.435***	-0.436***
		(0.092)	(0.104)	(0.101)	(0.104)	(0.104)
Agriculture value added of GDP		-0.119	-0.159	-0.149	-0.159	-0.159
		(0.085)	(0.098)	(0.102)	(0.098)	(0.099)
School enrolment rate primary		-0.066**	-0.056	-0.056*	-0.056	-0.057
		(0.033)	(0.034)	(0.031)	(0.034)	(0.034)
School enrolment rate secondary		-0.026	-0.041*	0.001	-0.041	-0.041*
		(0.022)	(0.024)	(0.023)	(0.027)	(0.024)
Internet users				-0.086***		
				(0.022)		
English offical language						0.000
						(omitted)
Modern services (% of GDP) * Internet access per 100				-0.0003		
				(0.001)		
Modern services (% of GDP) * secondary education					0.00004	
					(0.002)	
Modern services (% of GDP) * English official language						0.052
						(0.099)
R-squared	whitin	0.1706	0.1863	0.2125	0.1863	0.1864
	between	0.2410	0.2762	0.2355	0.2761	0.2741
	overall	0.1257	0.1187	0.1357	0.1358	0.1350
observations		1047	954	945	954	954

* indicates a 10% significance, ** and *** indicate a 5% and 1% significance, respectively. Robust standard errors are denoted between brackets.

Lastly an interaction effect is added using a dummy variable indicating if English is an official language. The results are shown in model 1.4. Because of collinearity the dummy variable indicating if English is an official language is deleted from the model. The interaction effect is positive, but also not significant. A positive effect means that higher modern service exports would lead to higher GDP growth per capita, if English is an official language.

5.2. Lagged variables

Table 3. Output with lagged variables

GDP per capita growth		Model 2	Model 3 (log)
Constant		30.733***	5.318*
		(7.611)	(2.766)
Modern services lag (% of GDP)		0.300***	0.376***
		(0.082)	(0.127)
FDI (% of GDP)		0.018***	0.173***
		(0.006)	(0.049)
Gross capital formation (% of GDP)		0.285***	1.017***
		(0.058)	(0.276)
GDP PC lag (Current US$)		-0.0003***	-0.916***
		(0.0001)	(0.239)
Inflation GDP deflator		0.019	0.017
		(0.026)	(0.043)
Services value added of GDP		-0.368***	-1.050
		(0.109)	(0.858)
Agriculture value added of GDP		0.057	-0.047
		(0.105)	(0.419)
School enrolment rate primary		-0.086***	-0.301
		(0.032)	(0.903)
School enrolment rate secondary		-0.029	-0.397
		(0.025)	(0.518)
R-squared	whitin	0.2471	0.1979
	between	0.3309	0.0785
	overall	0.1563	0.068
observations		845	612

* indicates a 10% significance, ** and *** indicate a 5% and 1% significance, respectively. Robust standard errors are denoted between brackets.

In model 2 the variables of modern services and the current GDP per capita are lagged one period. This decreases the number of observations. The effects described in section 2.3 and 2.5 could take some time. Trading forces domestic firms to increase their efficiency, leading to productivity growth, which could have positive effects on GDP per capita growth in the next period. In the model the modern service lag is positive and significant at 1% (p = 0.000). If modern service exports would be

one percentage point higher, GDP per capita growth one period later would be 0.30 higher, other thing equal. The within R-square has a value of 0.2471, higher than the R-square in model 1.1, which would denote that model 2 has more explanatory power. The current lagged GDP per capita is also significant (p = 0.000) and has a larger negative value compared to model 1.1.

Model 3 uses the same lagged variables but takes the logarithmic value of all the independent and the dependent variables. The number of observations is reduced cause it is impossible to take the logarithm of negative values. Modern services is still significant at 1% (p = 0.004). If the modern service exports variable would increase by one percent the GDP per capita growth would increase by 0.376 percent in the next period, other thing equal.

5.3. Low and middle income countries

The dataset only including low and middle income countries has 585 observations in model 1.1. Table 3 shows the results for the parameter estimates. Some variables are less significant in comparison to the model including countries of every income level. Foreign Direct Investment and primary school enrolment rate are no longer significant, and current GDP per capita is less significant. However the share of agriculture is significant and negative, signifying that countries that have a higher share of agriculture in GDP have lower GDP per capita growth. In model 1.1 modern service exports are significant at 10% (p = 0.06). The parameter is positive though slightly smaller than the one with the complete dataset. If modern service exports as percentage of GDP increase by one percent point, the expected GDP per capita will be 0.167 percentage point higher, other things equal. The whitin R-square is 0.1317, indicating that model 1.1 explains 13% of the variance in GDP per capita growth.

In model 1.2 and 1.3 the modern services variable is no longer significant. In model 1.4 modern services is more significant than in the complete dataset. The interaction effect for internet access is positive, but not significant (p = 0.532). A positive effect would denote that higher modern service exports would lead to higher GDP growth per capita, if the internet access rate was higher. The interaction effects in model 1.3 and 1.4 are negative, which would imply that higher modern services would lead to less GDP per capita growth, if the school enrolment rate was higher (or if English was an official language in model 1.4).

Using a dataset only including lower and middle income countries does change the results, the variables in model 1.1 are less significant, and the interaction parameters have a reversed effect. The estimates could be less significant because of the smaller dataset, or because there are no strong relations between the explanatory and dependent variables in low and middle income countries.

Table 4: Fixed effects model, low and middle income countries

GDP per capita growth		Model 1.0	Model 1.1	Model 1.2	Model 1.3	Model 1.4
Constant		28.854***	29.180***	23.714***	28.645***	28.514***
		(7.588)	(8.492)	(8.914)	(8.648)	(8.504)
Modern services (% of GDP)			0.167*	0.117	0.354	0.242**
			(0.088)	(0.078)	(0.347)	(0.095)
FDI (% of GDP)		0.000	0.000	0.000	0.000	0.000
		(0.000)	(1E-11)	(0.000)	(0.000)	(0.000)
Gross capital formation (% of GDP)		0.145***	0.175***	0.167**	0.173**	0.175***
		(0.051)	(0.066)	(0.065)	(0.067)	(0.066)
GDP PC (Current US$)		-0.001	-0.0005	0.0003	-0.0005	-0.0004
		(0.0004)	(0.0004)	(0.0005)	(0.0004)	(0.0004)
Inflation GDP deflator		0.050**	0.033	0.024	0.033	0.033
		(0.023)	(0.024)	(0.022)	(0.024)	(0.024)
Services value added of GDP		-0.365***	-0.387***	-0.340***	-0.386***	-0.388***
		(0.104)	(0.123)	(0.128)	(0.123)	(0.123)
Agriculture value added of GDP		-0.188**	-0.207**	-0.168	-0.205	-0.200*
		(0.086)	(0.104)	(0.109)	(0.104)	(0.103)
School enrolment rate primary		-0.033	-0.015	-0.009	-0.016	-0.009
		(0.033)	(0.033)	(0.037)	(0.032)	(0.034)
School enrolment rate secondary		-0.019	-0.050	-0.028	-0.042	-0.053
		(0.039)	(0.043)	(0.049)	(0.045)	(0.044)
Internet users				-0.112***		
				(0.038)		
English offical language						0.000
						(omitted)
Modern services (% of GDP) * Internet access per 100				0.002		
				(0.003)		
Modern services (% of GDP) * secondary education					-0.003	
					(0.005)	
Modern services (% of GDP) * English official language						-0.263
						(0.216)
R-squared	**whitin**	0.1261	0.1317	0.1501	0.1320	0.1333
	between	0.0690	0.1203	0.1267	0.1125	0.1294
	overall	0.0591	0.0732	0.0894	0.0737	0.0772
observations		612	585	578	585	585

* indicates a 10% significance, ** and *** indicate a 5% and 1% significance, respectively. Robust standard errors are denoted between brackets.

6. Conclusion and discussion

Trade in service plays an increasingly large role in the world economy. Although a large service sector is unmistakably associated with more developed countries, exporting services is not uncommon for low income countries. There is productivity growth in the service sector because of new technologies like IT. The literature also indicates that trading leads to productivity growth in the service sector. By exporting, markets can be increased and foreign demand could lead to substantial gains. Developing countries have a lot of potential to successful supply and export services because of the low cost labor, if they can offer a similar quality. Tradability also leads to extra growth in value added of services (Eichengreen and Gupta 2011). The export-led growth theory explains that export expansion is one of the main determinants of growth. Statistical research on the subject however led to ambiguous results. The theory is based on exporting manufactured goods, but could also apply on services, since they have become tradable in a similar manner to goods. Many developing countries already have a relative comparative advantage is several modern services. Mishra, Lundstrom and Anand (2011) showed that exporting sophisticated services leads to higher economic growth, which applies for developing economies as well.

In the statistical research a positive association between GDP growth and modern service exports is clear. There is a significant positive relationship (p= 0.003) between modern service exports as percentage of GDP and GDP per capita growth, controlling for other determinants of economic growth. GDP per capita growth is 0.177 higher if the export of modern services grows with one percentage point, other thing equal. Interaction effects with secondary school enrolment rate, English language and internet usage and modern services don't lead to significant results, so no effects using these variables can be concluded. A lagged variable for modern services is significant and has a larger effect (β=0.3) than the non-lagged variable. This variable could signify that the positive effects of modern service export take some time. A lagged variable also means the independent variable happens one period prior to the dependent, which could indicate that there is causal relationship between the two variables. Because the focus in this thesis is mainly on developing countries, the same model is used on a data sample only including low and middle income countries. The same positive result is found for the modern services parameter, although it's less significant, having a p-value of 0.06.

The research question in thesis is: "*What is the impact of exporting modern services on economic growth for developing economies?".* It can be concluded that exporting modern services has a positive influence on GDP growth per capita. This is also clear for low and middle income countries, although the parameter is only significant at 10%. Developing countries can have higher economic growth by expanding their modern service exports. As explained in the literature governments could take some actions to implement this, by using education or by establishing software technology parks for example.

The export-led growth theory is somewhat ambiguous. Therefore the causality between modern service exports and GDP per capita growth should be further researched, to make more specific conclusions regarding the association between the variables. In future research different explanatory variables could be used for human capital, since the primary and secondary school enrolment rates did not lead to significant results, although the literature said human capital is a likely determinant of economic growth. Moreover the location of a country should be included in the model. Using a dummy

indicating if English is an official language or not might be problematic in this model because there are a lot of countries where a large share of the population is fluent in English, even though English is not classified as an official language there. Also there could be a lot of service export to neighboring countries that use the same language, other than English, as in South America for example.

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8. Appendices

Appendix A

Table 5: Correlation matrix

	GDP per capita growth	Modern services export	Foreign direct investment	Gross capital formation	Current GDP per capita	Inflation	Services value added	Agriculture value added	school enrol.primary	School enroll. secondary
GDP per capita growth	1									
Modern services export	-0.0756	1								
Foreign direct investment	0.0468	0.3786	1							
Gross capital formation	0.2488	-0.1018	0.045	1						
Current GDP per capita	-0.2566	0.4621	0.1687	-0.1183	1					
Inflation	0.1966	-0.1125	-0.0209	0.0615	-0.2678	1				
Services value added	-0.2879	0.3316	0.1498	-0.0931	0.5046	-0.3451	1			
Agriculture value added	0.1834	-0.195	-0.0698	0.013	-0.5527	0.276	-0.6216	1		
school enrol. primary	-0.1671	0.1635	0.0649	0.0246	0.5562	-0.2407	0.5444	-0.8038	1	
School enrol. secondary	0.012	-0.051	-0.0119	0.1041	-0.1191	0.0179	-0.0373	0.1135	-0.0542	1

Appendix B

To decide if a fixed or a random model is to be used a Hausman's test is performed.

Table 6: Hausman's test

	fixed	random	Difference	S.E.
Foreign direct investment	0.015699	0.020583	-0.00488	0.002155
Gross capital formation	0.223072	0.140313	0.08276	0.020384
Current GDP per capita	-8.5E-05	-3.1E-05	-5.3E-05	3.51E-05
Inflation	0.055461	0.055444	1.71E-05	0.007506
Services value added	-0.40006	-0.06529	-0.33477	0.054529
Agriculture value added	-0.1189	-0.00777	-0.11112	0.074136
school enrolment primary	-0.06618	-0.01593	-0.05025	0.023349
School enrolment secondary	-0.02592	0.001945	-0.02787	0.020534

H_0: There is no systematic difference in coefficients.

Chi square = 84.72
P > Chi square = 0.000

Appendix C

Heteroskedasticity test

Likelihood-ratio test

H_0: The data is homoscedastic

Chi square = 195.38
P > chi square = 0.0017