Effects of IP protection on export of knowledge-intensive business services – US and EU evidence[*]

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Abstract

We investigate the impact of intellectual property protection on exports of services (with a special attention to knowledge-intensive business services) from the US to the EU (27 countries) and rest of the world (36 countries) in 2000-2010.

We separately assessed EU member countries because the EU and the US are currently negotiating the TTIP agreement leading to the creation of the largest free trade area. EU15 and US altogether account for about two thirds of global KIBS exports, which makes them the most important players in international turnover in these services.

We construct a gravity model of bilateral trade flows that includes standard dependent variables, measuring the "economic masses" of countries and economic distance between them. In our model we built a specific variable: the threat of imitation. It is a dummy variable expressing the level of IPR protection (measured by Ginarte and Park Index) and imitation abilities (with human capital index as a proxy) in the importing country. We investigate empirically the occurrence of market size effects (Maskus, Penubarti 1995), as the theory does not provide definite answer whether more stringent IP regulations increase or decrease trade.

Keywords

Knowledge-intensive business services, IP protection, gravity model

JEL classification

F14, F21

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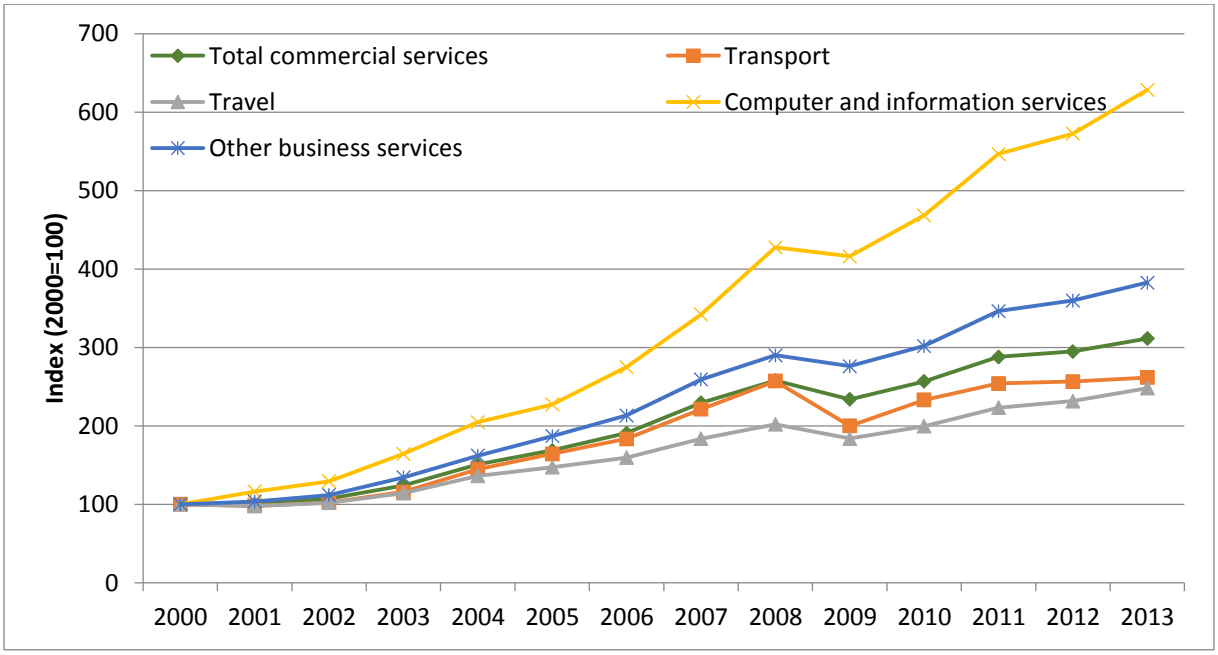
Introduction

The past several decades have brought significant changes in the economies' structures of the developed countries in Europe, North America and Asia. Industry, once regarded as a backbone of these societies, has lost its significance (just as the primary sector did earlier), while services became the main source of economic output and employment. Nowadays services account for about three quarters of GDP in developed countries. In the United States it is even more, as it reaches almost 80%. The share of services in global trade has also been increasing over the last decades. Export of services accounts for some 20% of total world exports. The growth rates are especially high for commercial services other than transportation and travel, among which the fastest growth if exports since 2000 was noted for knowledge-intensive business-to-business activities, such as computer and information and other business services (figure 1).

Figure 1 World exports of selected commercial services, 2000-2013



Source: World Trade Organization (WTO) http://stat.wto.org/ (10.06.2015)

This growth resulted mainly from 1) the rapid development of information and communication technologies (ICT) increasing the tradability of services (and favourable conditions for slicing the value chains and offshore outsourcing), 2) deregulation of service industries – previously state-controlled, and 3) processes of multilateral and regional liberalization of services trade (Grünfeld and Moxnes, 2003). However, due to the lack of bilateral services trade data, there are insufficient empirical studies concerning the

determinants of international trade in services. As this problem is gradually being solved, some researches deal with determining the driving forces of that trade through the gravity equation estimations.

The observed evolution towards higher share of services in economies is accompanied by another structural change. Economies become more dependent on knowledge-intensive activities, i.e. those with exceptionally high accumulation of knowledge. It is usually measured by the R&D intensity in the sector (Smith, 1999) or by the share of employees in the sector with higher education (Falvey, Foster, Greenaway, 2009). The first method is used for manufacturing and allows for dividing activities into high-, medium-high-, medium-low-, and low-technology ones (Hatzichronoglou, 1997). Services are left beyond this classification, as they are usually less R&D intensive (in fact they contain less formal R&D and are more related to competencies, skills, creativity – or in other words – tacit knowledge). At the same time they are very often intensive users of high technology and have relatively highly skilled workforce necessary to benefit from rapidly changing innovations. Here comes the second method, which takes into account the accumulation of knowledge in the labour force and allows for identifying knowledge-intensive services (KIS), i.e. service industries with over 33% share of employees with tertiary education[§]. Service industries cannot be regarded as only users (or adapters) of technology though. Many service companies pass the knowledge they possess to other businesses thus they actively participate in the creation (nationally and internationally) and diffusion of innovation. It may embrace new products and technologies (such as customization of software), new processes (e.g. new forms of delivering services), and also new organizational types or marketing procedures (Schricke, Zenker, Stahlecker 2012, p. 7). They also create global sourcing of innovation as a new phenomenon in the world economy (e.g. Don et al., 2010; Massini et al., 2010; Lewin et al., 2009; Manning, Massini, 2008). Services, which provide knowledge-intensive inputs for other business companies, are called knowledge-intensive business services (KIBS) (Miles, 2005).

The magnitude of innovation in services and manufacturing differs because of the human factor that is obviously more important in services (especially in KIBS). Moreover, production of service and its consumption are carried out simultaneously, so we may state that innovation with its intangible nature is closely linked to customers. Additionally, the ways of protection of the results of innovative activities by KIBS and manufacturing is significantly

[§] For example Eurostat classifications based on NACE rev. 1.1: http://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an2.pdf and NACE rev. 2: http://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf (data of access: 1.07.2015)

different. In general, services are harder to protect from imitation: patents (popular in manufacturing) protect intellectual property very rarely. They are more often used with regards to KIBS than with other services.

Very relevant IP protection methods for certain KIBS sub-sectors are copyright and trademarks. For other sub-sectors, trade secrets protect valuable know-how. We can also indicate other methods of IP protection: membership in professional associations as a proof of meeting certain quality standards; striving for reputation in order to establish long lasting and trustful relationships in which knowledge can be transferred (Schricke, Zenker, Stahlecker 2012, p. 8).

Taking into account the relatively high level of innovativeness of KIBS and therefore the importance of protecting the results of intellectual property (IP) we assume that the level of IP protection in destination countries can affect export decisions of such companies. Theoretical models do not predict clearly the effects of stronger protection of intellectual property rights (IPR) on trade. Two opposite effects are probable: increase of exports to a country with stronger IPR due to reduced risk of imitation by domestic firms (market expansion effect) or alternatively – decrease of exports to such a country because of exploitation of temporary monopoly power received over the protected technologies (market power effect) (Maskus and Penubarti, 1995). An extensive literature review on how trade-related are IPRs and discussion on both above mentioned effects in manufacturing sectors can be found in a paper by Folfas and Kuźnar (2014). The literature review we summarize in the next section indicates that empirical research on the influence of IP regimes on exports of services is not extensively researched. This research fills in this gap, concentrating on knowledge intensive business services, because of their higher than average in the sector accumulation of knowledge and expected importance of its protection.

The aim of our study is to find out whether importing country characteristics, especially the threat of imitation (a combination of the strength of patent rights and imitation abilities) affect exports of knowledge intensive business services.

Our contribution to the literature is a complex analysis of the determinants of trade in commercial services, with a particular attention paid to the role of threat of imitation. We construct the variable as a threat of imitation using the methodology developed by Smith (1999), and enriched by Folfas and Kuźnar (2014) who employed the index of human capital to measure the imitation abilities (instead of R&D intensity or education level indicators used in earlier studies). Contrary to the most of previous studies considering aggregated services data, our model is extended to ten disaggregated service sub-sectors (transport, travel,

communications, construction, insurance, financial services, computer and information services, royalties and license fees, other business services, and personal, cultural and recreational services) with a special attention to knowledge intensive business services.

The next section discusses the applicability of gravity model to services trade and the results of previous studies in this area. Section 3 explains data and method we use and section 4 discusses results.

1. Use of gravity models for indicating determinants of bilateral trade in services

In theory, as claimed by Hoekman and Stern (1991) as well as Sapir and Winter (1994), services trade should be a function of the same determinants as goods trade. Empirical evidence confirms that trade theories explain the level of nation's services exports (Sapir and Lutz, 1980, 1981). Nevertheless, this confirmation comes solely from analyze based on aggregate services data. Data on bilateral flows were not available at that time, so investigation of a role of economic distance between countries in trade was impossible. In early 1990s Francois (1993) provided support for the applicability of the gravity model to services trade. He used US 1986 data and found out that there is a positive relation between producer services trade and economic size of countries, exports and geographic proximity as well as imports and common language. The availability of data on services trade have improved since then especially after OECD released their database on bilateral services flows. As a result, studies explaining trade patterns in services are undertaken more frequently. The research of this topic conducted by Grünfeld and Moxnes (2003), Mirza and Nicoletti (2004), Ceglowski (2006), Kimura and Lee (2003) analyze the determinants of bilateral trade in services using a gravity framework basing on OECD aggregate data. Walsh (2006) and Lennon (2009) benefit from the later release of OECD data and disaggregation of the services sector into four sub-sectors. Co (2007) analyzed the determinants if US exports of knowledge-intensive services basing on US data.

Grünfeld and Moxnes (2003) is the first study based on the new OECD data set of bilateral trade in services. They have been investigating the determinants of bilateral trade in services. They point out unique features of trade in services that let employ gravity model for specifying determinants of this trade. The first feature is simultaneous production and consumption that refers to most of services. Some exemptions would include R&D, business consulting, audiovisual services which can be easily stored and provided on demand. The second characteristic is intangibility (lack of physical form). Taking into account these features and common understanding of services as certain actions over existing goods or

customers (Hill, 1977) effective service provision requires a supplier and a consumer to meet in the same place. Another feature is large heterogeneity of services – they are easily differentiated, often due to the location. What stems from the required simultaneity of provision and consumption, and differentiation of the "product" is that it is difficult to assess the quality before purchasing or consuming services. Therefore consumers are faced with the asymmetric information. One possibility of reducing consumers' risk of getting services of low quality is reputation mechanisms generated in cooperation with consumers (e.g. online reviews). In fact, service providers consider this mechanism as one of the most important factor of competition (in service sector).

How do these characteristics refer to gravity modelling? Grünfeld and Moxnes (2003) discuss that the importance of physical proximity between producer and consumer should strongly negatively affect trade in services. Also, as services are often differentiated, there are conditions in favour of developing monopolistic competition approach to this stream of thoughts. In Helpman-Krugman "new trade theory" model these attributes are the driving force behind intra-industry trade, where larger volumes of trade are observed between similar countries (Deardorff, 1984; Helpman and Krugman, 1985). In the gravity model trade is also maximized when partner countries are of the same size (in terms of their GDP). The importance of economies of scale in new trade theory is also a factor. It has been discussed in the literature that other commercial services (mainly business-to-business services other than transport and travel) present increasing returns to scale (e.g. Jones and Kierzkowski, 2005, Markusen, 1989 and Markusen et al., 2000 and 2005). Moreover, Markusen (1989) characterized these services as being: (1) knowledge-intensive, requiring a high initial investment in human capital, (2) intensive in skilled labour and (3), a sub-sector whose final products are highly differentiated (Lennon, 2009). These factors are important in terms of the subject of this study, which concentrates on knowledge-intensive business services. Finally, reputation and signaling (e.g. through marketing) play central role in many service sectors. According to Melchior (2002) firms undertake market investments (such as advertising) in order to increase demand for their products. He assumes that as soon as demand increase is not large enough (i.e. market investments are not efficient) and trade costs are low, firms will be more export-oriented. If opposite effect takes place, i.e. market investments are efficient in a situation of existence of transport costs, firms become more home market oriented and trade will decline. Due to the fact that fixed market investments are generally important for service sub-sectors, the gravity model predicts that with increasing distance (and thus trade costs) the elasticity of exports with respect to distance will be higher in these sectors.

In their empirical research Grünfeld and Moxnes (2003) identify determinants of trade and FDI in services. Their study is based on OECD bilateral services trade data in 1999 and 2000. They confirm the roles of size of countries and distance between them in service exports. They indicated a strong home market effect in services trade, and argued that the volume of imports does not increase with the wealth of countries (which is explained by the possible competitive advantage in production and exports of such countries in services trade). They also include trade barriers and corruption variables in the model and report their negative impact on services trade. Additionally, the model shows that regional trade agreements (RTA) do not contribute to services trade.

The research by Mirza and Nicoletti (2004) confirms the role of size and distance, but presents a different conclusion regarding RTAs. The authors proved that membership in a common free trade areas increases bilateral exports. Ceglowski (2006) also indicated a positive impact of participation in RTA on bilateral services trade. She has been analyzing bilateral data for 28 OECD countries and their partners in 1999 and 2000. Even if provisions of RTAs mainly apply to goods, there are many indirect channels that boost services trade as well. It is probable that higher merchandise trade volume induces demand for numbers of services, e.g. transport, insurance, legal advisory, communication and financial services. Furthermore, economic integration intensifies economic contacts and knowledge about partner markets thus facilitating service contracts. Ceglowski (2006) also found a positive impact of common language on service export and confirmed that economic size and geographic distance are significant in services trade.

Walsh (2006) estimated his gravity model considering total services and four service sub-sectors as dependent variables. He used data over 1999-2001 period for 27 OECD countries and their partners. He tested and applied a variety of panel data estimators, including the Hausman-Taylor estimator that has been applied to services for the first time. He pays a special attention to barriers in services trade, and how they determinate the patterns of trade. However, this variable was found weakly significant. The most important determinants are wealth of countries and sharing a common language, and contrary to other studies, distance was found insignificant.

Kimura and Lee (2003), and Lennon (2009) apply a gravitational framework to explain bilateral trade in services, but additionally they investigate differences and complementarities between trade in services and in goods. Kimura and Lee (2003) use aggregated services data, while Lennon (2009) examine the issue based on the disaggregated data in four service sub-sectors and focus on “other commercial services”. She finds out that variables related to a

physical geography are significantly lower when explaining trade in this category of services, whereas cultural proximity (measured by language variable) impacts trade in services more significantly than trade in goods. Kimura and Lee compare the estimates of the standard gravity framework for trade in services and in goods, and conclude that trade in services is better predicted by gravity equations. They also report that distance is more important in case of services trade (which could result from expected higher transport costs for services). Contrary to Grünfeld and Moxnes (2003) the authors found positive impact of RTAs on trade. They found no positive effect of a common language to trade, so Ceglowski's (2006) nor Lennon's (2009) results were confirmed.

Finally, Co (2007) studies the determinants of US exports of knowledge-intensive services to 29 countries between 1989 and 2002. The study focuses on royalties and license fees and other private services. It is based on US trade data which allows for distinguishing between affiliated and non-affiliated exports. Additional factors, such as infrastructure quality, financial depth, government officials' susceptibility to corruption, and political instability are also considered. What is the most important from our perspective is that Co (2007) checks what is the impact of intellectual property rights and specifically the interaction between IPR and imitation ability in importing countries on US knowledge intensive services exports. She proves that when IPR are stronger, the non-affiliated exports decrease. This market power effect is observed for countries with weak imitation abilities. Contrary to expectations, the study shows weak evidence that affiliated transfers of knowledge-intensive services are higher for countries with strong imitation abilities (according to Yang and Maskus [2001] imitation should be a concern only in non-affiliated transfers of knowledge).

2. Data and methods

Numbers of researchers in the area of trade in services frequently raise the problem of low quality and limited accessibility to comprehensive datasets. This issue, to some extent, determines the period (2000-2010) and the scope of our analyze. We used the trade in services database (TSD), which is the consolidated version of multiple sources of bilateral trade data (Francois, Pindyuk 2013) and provides the most comprehensive source of information on bilateral service flows. But these data are only as good as the national sources they come from. We carried on the analysis on relatively aggregated level (10 service activities/sub-sectors). As there is no one commonly accepted definition of KIBS and its contents, we have decided to consider two service sub-sectors as KIBS: computer and information services and other business services (following the Eurostat and OECD works in this area). We were

unable to carry on the analysis on more disaggregated level as there are too many missing values in the TSD database.

The gravity models are estimated for the following groups of services:

1: Transport

2: Travel

3: Communication services

4: Construction services

5: Insurance services

6: Financial services

7: Computer and information services (KIBS)

8: Royalties and license fees

9: Other business services (KIBS)

10: Personal, cultural and recreational services

We construct a gravity model based on trade in services database (Francois, Pindyuk 2013). Gravity models appear as an adaptation of the law of universal gravitation for socioeconomic phenomena. In 1960s gravity models were applied to analyze international trade flows. Pioneers in these studies were: Linemann (1966), Pöyhönen (1963), Pullainen (1963) and Tinbergen (1962). The last of these authors was announced as a discoverer of gravity equation in international economics. The gravity equation postulates that the amount of trade between two countries increases with their economic sizes and decreases with the cost of transport between them (measured by the distance between them).

Gravity models have become one of the most popular and successful analytical tools in international economics, especially due to the high explanatory power and easily available data in studies concerning international trade of goods. In consequence, there are many versions of gravity equation. The spectrum of independent variables in gravity model of trade seems to be unlimited (Folfas, Kuźnar 2013).

Gravity equations usually include the exporting and importing countries' gross products and per capita gross products, which typically portray market size and its absorptive capacity, such as demand. However, at this stage of research we took into consideration solely the United States as the exporting country, and its partner countries divided into two groups: EU countries (EU-27) and the rest of the world (36 partner countries for which the data were available). We have chosen the US as an exporter because this country was a pioneer in the

shift of the structure of its economy towards the one based on services. It is also one of the largest exporters of knowledge intensive business services – about 10% of world total[**].

As it is proved in the literature, export of services should increase with market size, measured in our model by GDP (*gdp*) (e.g. Grünfeld and Moxnes, 2003; Mirza and Nicoletti, 2004; Ceglowski, 2006; Walsh, 2006). On the other hand, developed and large countries (such as the United States) need services in order to meet their internal demand, which is high, so opposite effect is also possible. Thus we expect rise in US services exports with increasing wealth of importing partners, but increasing GDP of US may result in lower values of its exports.

Another standard variable indicating the market size (and consumers' preferences) contained in our model is GDP per capita (*gdppc*). It enables us to estimate the effect of similar market size and common preferences to export in groups of services that means similar countries (in terms of their economic size) should reveal larger volumes of trade, especially in case of knowledge-intensive business services which are on average more differentiated and characterized by increasing returns to scale.

We also include dummy variable (*rta*) that takes value 1 if both trading countries are members of regional trading arrangement. We expect that membership in RTA will positively affect the volume of exports.

Another variable we include is the exchange rate volatility (*exrate*). We assume that fluctuations in exchange rates diminish the international trade. This variable can only be considered in the EU27 model. It has been dropped out at the model of the rest of the world because of the lack of data.

Finally we take into account variables specific to our research, which are the Ginarte and Park Index (*gpi*), human capital index (*lhci*) and the threat of imitation (*imitat1, imitat2, imitat3*) taking three possible values: 1 when the threat is weak, 2 for moderate threat of imitation and 3 for strong threat of imitation.

The IP protection differs in various sectors and is regulated by different laws (e.g. copyrights and industrial property), resulting in different coverage, length of protection, mechanisms of enforcement, etc. However, data on the level of protection of IPR in separate sectors is not available, so that is why we use the Ginarte and Park index (Park, 2005) that indicates the level of overall IPR protection. The index grades national IPR regimes from zero to five. It is the sum of scores to questions in five categories: types of inventions that can be

[**] KIBS calculated as a sum of computer and information and other business services.

patented, length of protection, membership in international patent agreements, provisions for loss of protection, and existence of adequate mechanisms for enforcement. Smith (1999) claimed that the strength of IPR affects export decisions on its own, but it should be considered in the interaction with imitation abilities of countries. For example, strong patent rights and weak imitation abilities do not create strong threat of imitation, while if combined with strong imitation abilities result in larger threat of imitation. Thus, we constructed a variable (*imit*) describing the threat of imitation in importing country based on the strength of patent rights (Ginarte and Park index) combined with imitation abilities (a human capital index derived from Penn World Table, PWT 8.0) applying the following relations:

- (a) if GPI $\geq$ 2.5, and HCI < 2.88[††], then threat of imitation is equal to 1 (variable: *imit1*);
- (b) if GPI < 2.5, and HCI < 2.88, then threat of imitation is equal to 2 (variable: *imit2*);
- (c) if GPI $\geq$ 2.5, and HCI $\geq$ 2.88, then threat of imitation is equal to 2 (variable: *imit2*);
- (d) if GPI<2.5, and HCI$\geq$2.88, then threat of imitation is equal to 3 (variable: *imit3*).

The traditional gravity model considers also physical distance between trading partners and bi-nominal value of an indicator of a common language. A decreasing value of trade is expected with increasing distance between partners, as it increases costs. It should be especially observed in case of services with a close physical proximity between provider and consumer (majority of services possess this characteristic which make them more costly to trade than goods – see Baier and Bergstrand 2001). It implies that services, which do not require both sides of the contract to be in the same place, should be less affected by increasing geographic distance (e.g. most of business services exports would fall into this category[‡‡]). Costs are also expected to increase due to the lack of cultural proximity (measured by common language[§§]). Our preliminary regression has also included these two variables. However, sequences of the calculations[***] and some publications (Co, 2007) confirmed us in the belief that distance, as well as language, which are constant in time, can be counted in the model with fixed effect approach. The fixed-effects model controls for all country- (α) and

[††] HCI median in 2000-2010

[‡‡] Business services are also provided through establishing foreign presence or direct contacts between employees (GATS mode 3 and 4). These modes are not captured by balance of payments trade statistics under the category trade in services.

[§§] Cultural distance is also often proxied by contiguity (common border).

[***] These dummies have been dropped automatically by Stata because of a lack of within-sample variation for this reduced estimation sample: for the countries for which all data are available, the common language dummy is hardly ever equal to one, which means that it cannot be identified separately from the constant term and must be dropped from the regression.

time-invariant (φ_t) differences between countries (Kohler, et al. 2009).

The following formula of the gravity equation investigates the determinants of US exports of services to country *j* at the time *t*:

$$\ln s\_n_{jt} = \alpha + \beta_1 \ln gdp_{US,t} + \beta_2 \ln gdp_{jt} + \beta_3 \ln gdppc_{US,t} + \beta_4 \ln gdppc_{jt} + \beta_5 \ln exrate_{jt} + \beta_6 \ln gpi_{jt} + \beta_7 hci_{jt} + \beta_8 rta_{jt} + \beta_9 imit1_{jt} + \beta_{10} imit2_{jt} + \beta_{11} imit3_{jt} + \phi_j + \varepsilon$$

For the panel data analysis we used fixed-effects regression model (Hausman tested) as the results of three regression models in the table 3. We estimated the influence of each variable (*rta, imitat1, imitat2, imitat3*) to the predictor variables (*s_n*) in the gravity model. By using the fixed effect, we assumed that membership in RTA or the threat of imitation may impact export of services and we need to control for this. Fixed effect also removes the effect of those time-invariant characteristics so we can assess the net effect of the predictors on the outcome variable.

The dependent variable s_n_{jt} (where *n* is a number of the specific group of services) is exports of services from USA into the country *j* at time *t* over a ten-year period (2000-2010).

3. The results and discussion

The results of the estimations are presented in tables 1 and 2 at the end of this section.

Our first result (both with regard to EU partners and the rest of the world) is that, as to some extent expected, the export of US services is not affected by the size of its economy. The only exception is transport, where the US rise in GDP results in decreasing of services export (but this effect is weak in its significance). In other groups of services (s_2-10) exporter's GDP is not statistically significant. On the other hand, GDP growth in importing country accelerates US services export. The influence of the size of the economy differs in various groups of services: imports of knowledge-intensive business services (computer and information services and other business services), royalties and license fees, and insurance and financial services is less sensitive for importer's GDP change than the remaining groups.

We observe a statistically significant, positive impact of gross product per capita of importing country on US exports of all service sub-sectors to the EU and in some service groups in the model estimating countries of the rest of the world. Its highest positive effect is indicated in exports to EU of financial services and royalties and license fees, followed by knowledge intensive business services (computer and information services, other business services). The results for the rest of the world do not allow for convincing

conclusions as some results are statistically insignificant (transport, financial services, royalties and license fees and other business services), some prove the negative influence of increasing GDP per capita on exports (travel and communication services), and the rest show the positive influence of GDP per capita on exports (construction, insurance, computer and information services, royalties and license fees). Demand and market size illustrated by GDP per capita in exporter country (US) is statistically insignificant.

To sum up, the effect of similar market size and common preferences on export is observed in both estimated models (EU countries and the rest of the world), but essentially larger change took place in the group of EU countries. This result confirms the established hypothesis that similar countries (in terms of their economic size) reveal larger volumes of trade. The stronger effect in terms of knowledge intensive business services was not indicated. The importance of membership to regional trade agreements seems to be much more important in the model of the rest of the world countries.

Our results also show that the strength of patent rights in the importing country is particularly important for the exports of royalties and licensee fees (in both models). Taking into account the specific of these services, this is not surprising that the volume of receipts from sales of royalties and licensees would grow when the regulations in importing country protect intellectual property and provide the security of trade in them. The opposite effect is observed in case of communication services. Probable explanation is that the strong patent rights may limit the spread of information (e.g. of those that need access to Internet network). We also observe positive impact of patent rights on exports of other business services (KIBS sub-sector) to the EU.

The next variable specific to our model, HCI, reveals strong positive influence on exports to EU of KIBS, as well as in most other sub-sectors (except transport, financial services and personnel and recreational services). At the group of rest of the world countries the significance is indicated in HCI effect in other business services (KIBS) and transport and travel services.

The threat of imitation variable is rarely indicated as statistically significant in the model of EU countries or the rest of the world, however the only significant result found at the EU countries model was that weak (equal to 1) threat of imitation in partner EU countries has a negative impact on the US export of personal, cultural and recreation services. At the model for the rest of the world countries, the US export of insurance

services is positively affected by weak and medium threat of imitation (equal to 1 and 2). There were no indicated effects of strong threat of imitation in other service groups.

Table 1. Results: the US export of services to the EU countries

	(1) *ls_1*	(2) *ls_2*	(3) *ls_3*	(4) *ls_4*	(5) *ls_5*	(6) *ls_6*	(7) *ls_7*	(8) *ls_8*	(9) *ls_9*	(10) *ls_10*
$lgdp_{US,t}$	-14.57*	-9.734	9.570	-21.00	-0.926	-19.17	1.043	-1.386	-4.394	5.704
	(-2.24)	(-1.56)	(1.54)	(-1.40)	(-0.08)	(-1.48)	(0.16)	(-0.15)	(-0.59)	(0.49)
$lgdp_{j,t}$	0.892***	1.116***	0.927***	0.995***	0.775***	0.835***	0.862***	0.858***	0.723***	1.266***
	(19.45)	(25.26)	(19.43)	(8.38)	(9.77)	(8.84)	(17.68)	(12.93)	(13.22)	(15.06)
$lgdppc_{US}$	16.00	9.419	-15.15	18.74	-1.421	20.55	-3.445	-2.345	1.930	-8.678
	(1.94)	(1.19)	(-1.93)	(0.98)	(-0.10)	(1.25)	(-0.42)	(-0.20)	(0.20)	(-0.59)
$lgdppc_{j,t}$	0.805***	0.263**	0.797***	0.438	0.491**	1.790***	0.853***	1.115***	0.970***	0.781***
	(8.63)	(2.95)	(8.29)	(1.73)	(2.85)	(9.62)	(8.28)	(7.72)	(9.09)	(4.57)
$lexrate_{j,t}$	-0.115	-0.224	-0.411**	-0.905**	-0.430	-0.203	0.102	-0.256	-0.194	-0.260
	(-0.86)	(-1.72)	(-3.20)	(-2.92)	(-1.94)	(-0.75)	(0.77)	(-1.39)	(-1.27)	(-1.11)
$lgpi_{j,t}$	-1.759*	-0.362	-2.775***	1.561	1.842	-2.567	0.676	4.061***	2.747**	-5.248***
	(-2.24)	(-0.46)	(-3.77)	(0.81)	(1.38)	(-1.56)	(0.88)	(3.62)	(3.04)	(-3.77)
$lhci_{j,t}$	-0.897	2.154**	3.299***	5.210**	4.112**	3.157	3.195***	4.260***	4.793***	-1.310
	(-1.07)	(2.70)	(4.23)	(2.69)	(3.06)	(1.89)	(3.86)	(3.81)	(4.99)	(-0.90)
$rta_{j,t}$	-0.341	0.597	-1.123**	-4.745***	0.787	0.573	-0.0713	0.227	-1.043*	0.442
	(-0.93)	(1.71)	(-2.72)	(-5.02)	(1.36)	(0.79)	(-0.20)	(0.47)	(-2.49)	(0.71)
$imit1_{j,t}$	-0.0730	-0.107	-0.163	-0.488	-0.152	-0.330	-0.0281	0.157	0.0908	-0.465*
	(-0.63)	(-0.95)	(-1.45)	(-1.73)	(-0.79)	(-1.39)	(-0.24)	(0.99)	(0.67)	(-2.23)
_cons	246.7*	164.9	-155.9	395.3	13.06	323.8	-25.65	27.40	80.06	-108.0
	(2.27)	(1.58)	(-1.50)	(1.58)	(0.07)	(1.49)	(-0.24)	(0.18)	(0.64)	(-0.56)
R-sq	0.826	0.860	0.866	0.636	0.633	0.659	0.874	0.822	0.825	0.709
N	207	200	174	150	187	193	184	186	200	189

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2. Results: the US export of services to the rest of the world

	(1) *ls_1*	(2) *ls_2*	(3) *ls_3*	(4) *ls_4*	(5) *ls_5*	(6) *ls_6*	(7) *ls_7*	(8) *ls_8*	(9) *ls_9*	(10) *ls_10*
$lgdp_{US,t}$	-13.68*	0.829	-1.259	-12.22	6.502	-10.87	-1.512	-3.248	-13.58	0.215
	(-2.33)	(0.13)	(-0.14)	(-0.50)	(0.72)	(-1.15)	(-0.20)	(-0.35)	(-0.57)	(0.02)
$lgdp_{j,t}$	0.773***	0.826***	0.965***	1.536***	0.800***	0.796***	0.874***	0.872***	0.560**	0.924***
	(21.64)	(21.80)	(7.43)	(7.48)	(14.57)	(12.74)	(14.61)	(15.60)	(3.29)	(10.79)
$lgdppc_{US}$	15.62*	-2.399	3.455	4.749	-7.820	15.03	0.921	2.715	16.18	-1.435
	(2.13)	(-0.31)	(0.31)	(0.15)	(-0.69)	(1.27)	(0.10)	(0.23)	(0.53)	(-0.10)
$lgdppc_{j,t}$	0.0168	0.209***	0.810***	1.027**	0.219**	0.114	0.402***	0.314***	-0.0315	-0.189
	(0.35)	(-4.16)	(-5.08)	(2.99)	(2.97)	(1.28)	(4.49)	(4.19)	(-0.11)	(-1.51)
$lgpi_{j,t}$	0.531	0.128	-6.981*	0.261	1.155**	0.968	-0.626	1.305**	-2.583	1.503
	(1.87)	(0.44)	(-2.52)	(0.11)	(2.64)	(1.51)	(-0.86)	(2.93)	(-1.21)	(1.62)
$lhci_{j,t}$	1.159**	1.346**	-0.0948	1.302	1.106	-0.531	0.252	-1.049	4.799*	0.426
	(2.78)	(3.21)	(-0.08)	(0.57)	(1.70)	(-0.68)	(0.34)	(-1.59)	(2.20)	(0.41)
$rta_{j,t}$	0.688***	0.867***	2.703***	0.176	1.166***	0.931***	0.549***	0.402*	0.0723	1.009***
	(6.70)	(7.93)	(9.41)	(0.34)	(7.34)	(5.41)	(3.45)	(2.49)	(0.14)	(3.80)
$imit1_{j,t}$	0.574*	0.383	0.0109	-0.437	1.875***	-0.0626	0.246	0.312	0.140	-0.288
	(2.01)	(1.27)	(0.07)	(-0.96)	(4.25)	(-0.43)	(1.72)	(0.69)	(0.31)	(-1.37)
$imit2_{j,t}$	0.537	0.520	0	0	1.838***	0	0	0.156	0	0
	(1.97)	(1.80)	(.)	(.)	(4.36)	(.)	(.)	(0.36)	(.)	(.)
$imit3_{j,t}$	0	0	0	0	0	0	0	0	0.287	3.663**
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(0.11)	(2.82)
_cons	229.5*	-14.55	-1.975	266.3	-137.0	149.9	13.83	48.16	227.3	-12.08
	(2.32)	(-0.14)	(-0.01)	(0.65)	(-0.90)	(0.94)	(0.11)	(0.31)	(0.57)	(-0.06)
R-sq	0.759	0.719	0.920	0.648	0.734	0.621	0.773	0.645	0.160	0.560
N	232	240	54	81	232	165	114	232	117	141

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3. Fixed-effect regressions comparison

Variable	fixd	ols	areg
$lgdp_{us}$	-10.119993***	-13.701541*	-13.701541*
$lgdp_{j}$	-.80389438	.9045893***	.9045893***
$lgdppc_{us}$	14.399712***	15.400967*	15.400967*
$lgdppc_{j}$	1.0101988	.36428125***	.36428125***
$lexrate_{j}$	.02805197	-.17545599*	-.17545599*
$lgpi_{j}$	-.43133194	-.87524864*	-.87524864*
$lhci_{j}$	-.25219596	-1.186658*	-1.186658*
rta_{j}	-.11149129	.88902823***	.88902823***
imitations			
1	(base)	-.12474003	
2	.0094228	(omitted)	
3		(empty)	
_cons	169.99845***	229.93058*	229.85416*
N	333	333	333
r2	.35508271	.77979705	.77979705
r2_a	.24872793	.77366137	.77366137

legend: * p<0.05; ** p<0.01; *** p<0.001

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