

Working Paper 18-06

# **Sources of Comparative Advantage in Services: Institution vs. Social Capital**

Nakgyoon Choi and Soonchan Park

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**Sources of Comparative Advantage in Services:  
Institution vs. Social Capital**

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## Executive Summary

Previous studies that have identified the impacts of institutions or cultural traits on comparative advantage focused on goods trade, but not services trade. In contrast to the rapid increase in trade in services, empirical examination on sources of comparative advantage in services trade remains limited. This paper attempts to fill this gap by investigating empirically the impacts of institution as well as social capital on comparative advantage in services trade. Services are exposed to relatively more pre-choice risks than goods, because it is difficult to obtain information on the quality of services before the consumer decides to purchase. In addition, trade in services involved in global value chains possibly takes on the risks of contract breach by other firms along the same value chains. As a result, the transaction risks for trade in services are higher than for trade in goods. Using the World Input Output Database, we estimate the importance of social capital for comparative advantage in services. We find that countries with more social capital tend to specialize in the production of contract-intensive services. We also find that social capital rather than institution matters for comparative advantage in services.

**Keywords:** Services Trade, Comparative Advantage, Institution, Social Capital

**JEL Classification:** F11, F14

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# Sources of Comparative Advantage in Services: Institution vs. Social Capital

Nakgyoon Choi<sup>†</sup> and Soonchan Park<sup>††</sup>

## 1. Introduction

Recently, trade in services has played a bigger role since the substantial change in the production structure of the global economy. The share of service sectors in world trade increased from 9 percent in 1970 to over 20 percent in 2014 (Figure 1). The drivers of economic growth seem to shift from manufacturing to services<sup>1</sup> because a wide range of services can be consumed in many places of the world at the same time due to technological innovation. Specifically, services are becoming a new wave of globalization because the digital innovations based on Internet of Things (IOT), big data, Artificial Intelligence (AI), and cloud computing among others have transformed traditional production and transaction processes. In addition, trade in

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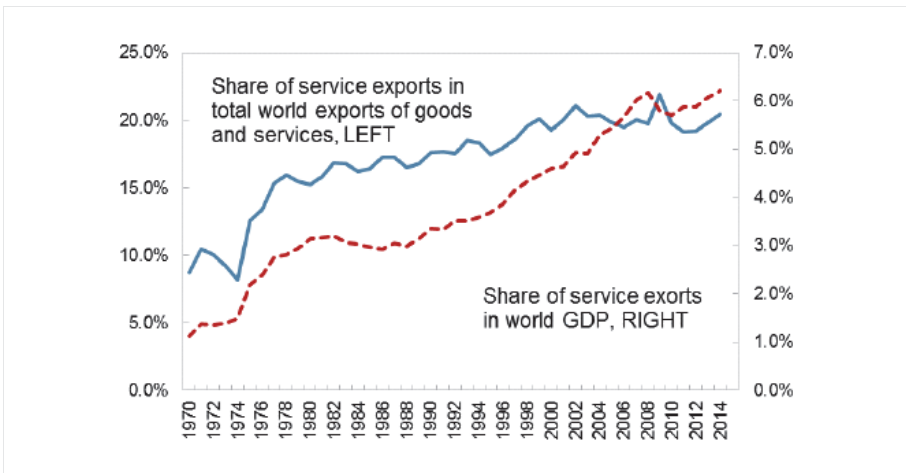
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<sup>1</sup> According to Loungani *et al.* (2017), technological innovations are conducive to the new business opportunities that services are carried out in one location and consumed in many other places. Loungani *et al.* (2017), p. 3.

services has shown resiliency in that it displayed a slighter decline than trade in goods during the global financial crisis and increased at a faster pace than trade in goods after the crisis. Bochert and Mattoo (2009) find that services trade is resilient for the following reasons; services exports and supply have been less dependent on external finance; demand for services has been less cyclical than demand for goods.<sup>2</sup>

**Figure 1. Share of Services Exports in Total World Exports and World GDP**



Source: Loungani (2017), p. 21.

Though services trade is rapidly growing, little attention has been paid to the hold-up problem in services trade. The WTO (2017) reports that world exports of commercial services increased from US\$ 2.9 trillion in 2006 to US\$ 4.8 trillion in 2016. The share of commercial services in world total exports increased from 26.7 percent to 30.4 percent in 2016. Thus, the share of trade in services is expanding more rapidly than that in goods. Moreover, if exports and imports are measured in value added terms instead of traditional trade statistics, services trade is depicted in a very different picture. For example, the World Input Output Database (WIOD) shows that services represented 27.6 percent of total gross trade in 2014, but their share in overall

<sup>2</sup> Bochert and Mattoo (2009) also noted that services are not storable and so are less subject to the big declines in demand in downturns that affect durable goods like shoes and televisions. Bochert and Mattoo (2009), p. 3.



trade amounts to 49 percent when measured in value added terms.

As information and communication technology (ICT) develops, many services that were previously seen as non-tradable have become tradable. The emergence of global value chains (GVCs) also contributes to the increased use of services. As Heuser and Mattoo (2017) noted, the emergence of GVCs has increased the opportunities for international specialization not only in final goods and their parts, but also in services and services tasks. In addition, the ‘servicification’ of manufacturing, a term that describes the intensive use of service content in manufacturing, also added to the increase in services trade. Manufacturing in developed countries uses services more intensively compared to the past. Nordås (2010) presents evidence that the ratio of bought-in services to value added has increased across all manufacturing industries in OECD countries. The OECD Trade in Value Added (TiVA) database shows that typically, a third of the value of global goods exports are composed of services that are either embedded in the product or form part of the sales package of the product. Previous studies investigating sources of comparative advantage not only focus on goods trade, but also fail to consider the servicification of manufacturing by excluding services inputs into manufacturing sectors.

A rapidly growing literature emphasizes the relevance of cultural traits for economic and political outcomes: cultural values and beliefs are important factors for the functioning of institution, institutional structure, and economic development (Guiso, Sapienza, and Zingales, 2004, 2008; Tabellini, 2008; Algan and Cahuc, 2010; Collier, 2017; Nunn *et al.*, 2018). Recent international trade literature addresses the effects of cultural traits on bilateral trade volumes. For example, Tabellini (2008) examines the role of trust in overcoming the hold-up problems in contract-intensive industries and finds that not only institutions but also cultural traits are important sources of comparative advantage. Guiso, Sapienza and Zingales (2009) find that lower bilateral trust leads to less trade between two countries. Felbermayr and Toubal (2010) show that cultural proximity plays an important role in determining trade flows between countries. Lee and Park (2015) find that religious similarity contributes to increased international trade in services.

Although the impacts of institution on comparative advantage have been discussed for decades by economic historians, it is only recently that systematic empirical examinations have been made to assess the importance of the relationship between institution and comparative advantage. Nunn (2007) examined the impacts of

contract institution on comparative advantage and Levchenko (2007) provided evidence for the impacts of institution more broadly defined – contract institution, property right, shareholder protection etc. – on comparative advantage. There are also many other institutions as sources of comparative advantage, including financial development (Beck, 2003; Manova, 2006) and labor-market-related institutions (Cunat and Melitz, 2012; Costinot, 2009; Davidson, Martin and Matusz, 1999; Helpman and Itskhoki, 2010).

While a number of studies have presented some evidence about the impacts of institutions on comparative advantage, the importance of cultural factors in determining comparative advantage has been neglected. An exception is Tabellini (2008), which examines the role of trust in overcoming the hold-up problems in contract-intensive industries. Tabellini (2008) finds that not only institutions but also cultural traits are important sources of comparative advantage.

However, these studies, which have identified the impacts of institutions or cultural traits on comparative advantage, have focused on goods trade, not services trade. In contrast to the rapid increase in trade in services, empirical examination on sources of comparative advantage in services trade remains limited. This paper attempts to fill this gap by investigating empirically the impacts of institution as well as social capital on comparative advantage in services trade.

As addressed by Arrow (1972), “Virtually every commercial transaction has within itself an element of trust.... It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence.” Trust involves an expectation that a person will perform a particular action. Trust reduces the hold-up problem and thus facilitates transaction. We define social capital as the extent to which people believe that others can be trusted and has generalized respect for the rights of others. Using the World Value Survey data, we measure social capital by the first principal component of trust and respect.

Why does social capital matter to a larger extent in determining comparative advantage in services trade than in goods? As Lee and Park (2015) and many other studies addressed, the characteristics of services differ from those of goods. While goods can be stored, moved and consumed in different locations, services instead cannot be inventoried, divided and are intangible (Hoeckman and Matto 2012). While the characteristics of goods are observed before consumption, the characteristics of services are not. In addition, transactions of services require the proximity

and simultaneity of production and consumption. Therefore, information on the quality of services is limited. The indivisibility of services and asymmetric information between sellers and buyers also makes it difficult for consumers to identify the quality of services. Due to these characteristics, the quality of services cannot be standardized, which means that markets for services are more uncertain than those for goods, and services consumers will confront higher pre-choice risk than goods buyers. Consequently, the hold-up problem in services trade may be more severe than in goods trade. To alleviate these problems, services consumers may rely on non-economic factors, such as the reputation of and trust in sellers or other cultural traits. Thus, the social capital of the exporting country may help overcome the hold-up problem between sellers and buyers.

Our hypothesis that social capital is an important source of comparative advantage in services can be indirectly supported by recent studies on trade in services using firm-level data on exporters of services. Breinlich and Criscuolo (2011), Ariu (2012) and Kelle and Kleinert (2010) provide evidence that a very small number of firms among active service traders accounts for the largest proportion of service trade, and the participation of firms in services trade is rarer than in goods. This suggests that exporting services into foreign countries is more difficult than exporting goods, which is why only a small share of firms is able to serve foreign markets.

Using the World Input Output Database released in 2016, we estimate the importance of social capital for comparative advantage in services. In all estimating equations, we include time-varying country fixed effects, which account for time variant differences in the country characteristics, time-varying industry fixed effects, which account for changes in the industry characteristics over time, as well as country-industry fixed effects, which account for time-invariant differences across countries and industries. We find that countries with more social capital have comparative advantage in contract-intensive services. Furthermore, we show that social capital rather than institution matters for comparative advantage in services.

The rest of this paper is organized as follows. Section II discusses how we calculate value-added exports in services and compares the revealed comparative advantage (RCA) indexes using data on gross exports and value-added exports in services. Section III describes the empirical model and data used in this study. Section IV presents the estimation results and further analysis. Section V provides concluding remarks.

## **2. Value Added Exports (VAX) in Services**

### **2-1. Value Added in Exports of Service Sectors**

In this paper we use the World Input-Output Database (WIOD) released in 2016. It contains data on 28 EU countries and 15 other major countries from 2000 to 2014, covering 56 sectors. For our study, we classify industries into 34 sectors including agriculture, mining, 13 manufacturing sectors, and 19 service sectors (Appendix 1).

We aggregate all industries into three sectors - manufacturing, services, and other sectors (agriculture and mining) - in order to identify how the service sectors play a pivotal role in economic activities (Table 1). When we calculate the shares of world employment as well as world value added taken by the manufacturing, services, and other sectors, we find that the service sectors account for almost half of the total number of persons engaged in 2014. The share of service sectors in total number of persons engaged increased from 49.2 percent in 2000 to 59.0 percent in 2014, while that of manufacturing sectors increased slightly from 14.3 percent to 15.0 percent during the same period.

This means that service sectors play a leading role in creating employment compared to manufacturing sectors. In the case of other sectors including agriculture and mining, employment shares decreased substantially from 2000 to 2014. On the other hand, the shares of gross value added accounted for by each sector differ from the employment shares. The shares of the services and manufacturing sectors decreased slightly from 77.0 percent and 18.6 percent to 76.0 percent and 17.2 percent during the same period, respectively. On the contrary, the share of other sectors increased by 2.4 percentage points from 2000 to 2014.

**Table 1. Shares of Employment and Value Added (%)**

	Number of Persons Engaged			Gross Value Added		
	Manufacturing	Services	Others	Manufacturing	Services	Others
2000	14.3	49.2	36.5	18.6	77.0	4.4
2001	13.9	50.1	36.0	17.6	78.0	4.4
2002	13.6	51.0	35.4	17.2	78.5	4.3
2003	13.5	51.5	35.0	17.2	78.4	4.4
2004	13.6	52.2	34.1	17.3	78.1	4.7
2005	14.0	52.9	33.1	17.1	77.9	5.0
2006	14.2	53.9	31.9	17.2	77.7	5.2
2007	14.5	54.7	30.9	17.2	77.4	5.4
2008	14.7	55.2	30.1	17.0	76.9	6.1
2009	14.6	55.8	29.6	16.4	78.1	5.5
2010	14.5	56.7	28.8	17.0	76.8	6.2
2011	15.4	57.6	27.0	17.3	75.9	6.8
2012	15.8	57.5	26.7	17.3	75.9	6.8
2013	15.4	58.1	26.6	17.2	75.8	7.0
2014	15.0	59.0	26.0	17.2	76.0	6.8

Note: Other sectors include the agriculture and mining sectors.

Source: Author's calculation, using the World Input-Output Database.

The importance of service sectors is more evident in terms of value added in exports than gross exports. When we apply an input-output approach, explained in Appendix 2, the share of service sectors in world value added in exports is 49.0 percent in 2014. This means that about half of the total value added in exports induced directly and indirectly by the final demands of trading partner countries came from service sectors in 2014. This number is much greater than the share of services in world gross exports, which was 27.6 percent in the same year. Services play a crucial role as enablers of trade in goods (OECD, 2013, p. 99). Specifically, they are essentially conducive to assembling parts and materials and completing manufacturing processes efficiently in global value chains.

On the other hand, the share of manufacturing sectors in world value added in exports decreased from 40.7 percent to 35.1 percent during the period from 2000 to 2014. The share of manufacturing sectors in world gross exports amounted to 65.8

percent in 2000, which dropped to 61.4 percent in 2014. There is a big difference between these two shares justified by the manufacturing sectors. In the case of other sectors, including agriculture and mining, their share in value added in exports amounted to 16.0 percent in 2014, which is higher than the 11.3 percent they represent in gross exports.

We find that the shares accounted for by the service sectors, in terms of both gross exports and value added in exports, increased slightly during the period from 2000 to 2014 (Table 2). However, the absolute as well as relative levels of the shares are completely different in terms of magnitude. This reveals that value added in exports should be considered in addition to gross exports. As we are all aware, gross export statistics are vulnerable to the double counting problem, because parts and materials cross borders several times in the course of the assembly of final goods. In addition, they are unable to capture the industrial linkage effects based on the input-output structure.

**Table 2. Composition of Gross Exports and Value Added in Exports (%)**

	Gross Exports (GX)			Value Added in Exports (VAX)		
	Manufacturing	Services	Others	Manufacturing	Services	Others
2000	65.8	25.9	8.3	40.7	48.0	11.3
2001	65.8	26.2	8.0	40.1	49.1	10.8
2002	65.7	26.5	7.8	40.2	49.3	10.6
2003	65.6	26.3	8.2	39.9	49.1	11.0
2004	65.4	26.0	8.6	39.4	48.7	11.8
2005	64.2	25.7	10.1	38.1	48.2	13.7
2006	64.0	25.6	10.4	37.4	48.1	14.4
2007	63.4	26.3	10.3	36.9	48.9	14.2
2008	61.6	26.6	11.8	35.3	48.4	16.3
2009	60.9	28.8	10.3	35.7	50.3	14.0
2010	61.4	27.5	11.1	35.8	48.5	15.7
2011	61.4	26.2	12.3	35.0	47.3	17.7
2012	60.9	26.8	12.4	34.7	47.8	17.6
2013	61.3	27.2	11.6	34.7	48.3	16.9
2014	61.4	27.6	11.0	35.1	49.0	16.0

Note: Other sectors include the agriculture and mining sectors.

Source: Author's calculation, using the World Input-Output Database.

## 2-2. Contribution of Service Sectors to Value Added in Exports of Manufacturing Sectors

It is widely accepted that both ends in a smiling curve tend to take up more and more shares of total value added in sliced-up global value chains.<sup>3</sup> Services are involved in all stages of global value chains and furthermore, their role is becoming increasingly prominent. For example, we can take R&D and design in the early stages as well as transport and distribution, business services, and consumer services at the end of the chains. In addition, finance and telecommunication services play a pivotal role in facilitating the efficient assembly of manufacturing products.

In order to identify the contribution of service sectors to value added in exports by characteristics of services, we disaggregate the service sectors into five groups; the first group includes logistics-related services such as retail trade, wholesale trade, and transport services (SEC18-20, SEC22-25)<sup>4</sup>; the second supports producer services including post and telecommunication, financial intermediation, and real estate activities (SEC26-28); the third group can be classified as social services provided directly to consumers including education, health, public administration, and other social services (SEC30-33); the fourth covers infrastructure-related services such as electricity, gas, water supply and construction (SEC16-17)<sup>5</sup>; the fifth and final includes other services such as hotel and restaurants, other business activities, and private households with employed persons (SEC21, SEC29, SEC34).

Table 3 shows that logistics-related services (LOG) including transport and distribution account for the largest share of world value added in exports, followed by other business services (OTH), producer services (PRO), infrastructure-related

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<sup>3</sup> About 50 percent of value-added exports in OECD countries is service value added, and it is to a large extent embodied in gross manufacturing exports. See OECD (2013), p. 99.

<sup>4</sup> Refer to Appendix 1 for detailed descriptions of the sector classifications.

<sup>5</sup> The GATS negotiations have dealt with construction services and energy services in the WTO multilateral negotiations. However, infrastructure-related services usually combine the production of goods and provision of related services. For example, electrical energy is an intangible commodity that must be produced as it is consumed. On the other hand, electrical energy has many functions of the same kind as oil or gas, the goods characteristics (Lakatos, 2004, p. 124). We classify infrastructure-related sectors as service sectors because the services characteristics of these sectors have become more important in recent years.

services (INF), and consumer services (CON). In 2014, the share of logistics-related services amounts to 18.5 percent of total world value added in exports, other business sectors account for 13.7 percent, while producer services, infrastructure-related services, and consumer service sectors account for 9.0 percent, 4.0 percent, and 3.7 percent, respectively.

According to Table 3, the contribution of logistics sectors to world value added in exports was very stable over the period from 2000 to 2014, while the contributions of producer services, infrastructure-related services, and other services increased moderately. On the contrary, the contribution of social services decreased by 0.3 percent during the same period. The share of service sectors in total value added in exports in 2014 was the highest in England, which boasts very competitive financial and logistics service sectors, followed by France, India, the United States and Italy (Table 4). Notably, the share of service sectors in total value added in exports was the lowest in Indonesia, Mexico, Korea, Taiwan, and China, most of which are more competitive in manufacturing compared to services.

**Table 3. Contribution of Service Sectors to Value Added in Exports (%)**

	LOG	PRO	SOC	INF	OTH	Total
2000	18.5	8.5	4.0	3.7	13.3	48.0
2001	18.7	8.9	4.0	3.8	13.8	49.1
2002	18.5	9.0	4.0	3.8	13.9	49.3
2003	18.4	9.0	4.0	3.9	13.8	49.1
2004	18.2	9.0	3.9	4.0	13.5	48.7
2005	18.0	9.1	3.8	4.2	13.2	48.2
2006	17.8	9.1	3.7	4.3	13.3	48.1
2007	17.8	9.4	3.7	4.3	13.6	48.9
2008	18.3	8.9	3.6	4.1	13.5	48.4
2009	18.6	9.6	4.0	4.2	13.9	50.3
2010	18.4	9.0	3.7	4.1	13.2	48.5
2011	18.2	8.6	3.6	4.0	12.9	47.3
2012	18.4	8.7	3.6	4.0	13.1	47.8
2013	18.3	8.8	3.7	4.1	13.4	48.3
2014	18.5	9.0	3.7	4.0	13.7	49.0

Note: Logistics-related sectors (LOG) include retail trade, wholesale trade, and transport; producer service sectors (PRO) cover telecommunications and finance; social service sectors (SOC) include education, health, and public administration sectors; infrastructure-related sectors (INF) include construction, electricity, gas, and water supply; and other sectors (OTH) include other business activities.

Source: Author's calculation, using the World Input-Output Database.



**Table 4. Share of Service Sectors in Total Value Added in Exports in 2014 (%)**

	LOG	PRO	SOC	INF	OTH	Total
AUS	15.3	11.0	5.8	4.6	12.5	49.3
BRA	16.8	7.1	2.8	2.3	13.2	42.2
CAN	15.9	7.9	4.3	3.8	12.8	44.7
CHN	19.6	8.6	1.9	3.0	6.6	39.7
DEU	15.8	8.1	3.8	4.0	17.1	48.8
FRA	21.8	9.9	5.0	3.4	23.2	63.3
GBR	16.2	17.3	6.8	4.0	25.6	69.9
IDN	10.9	3.9	1.8	1.4	3.5	21.6
IND	22.5	7.1	4.6	2.7	22.7	59.6
ITA	16.9	12.2	2.5	4.6	15.4	51.6
JPN	23.3	6.4	2.4	2.5	10.0	44.4
KOR	15.8	6.1	3.0	3.0	10.4	38.3
MEX	17.5	1.7	0.2	1.8	9.3	30.4
RUS	32.0	4.3	2.8	3.5	4.8	47.3
TUR	28.4	6.8	0.8	3.3	6.6	45.9
TWN	23.2	5.4	1.8	2.6	5.3	38.4
USA	18.9	12.6	6.5	2.3	18.7	59.0
WORLD	18.5	9.0	3.7	4.0	13.7	49.0

Note: Logistics-related sectors (LOG) include retail trade, wholesale trade, and transport; producer service sectors (PRO) cover telecommunications and finance; social service sectors (SOC) include education, health, and public administration sectors; infrastructure-related sectors (INF) include construction, electricity, gas, and water supply; and other sectors (OTH) include other business activities.

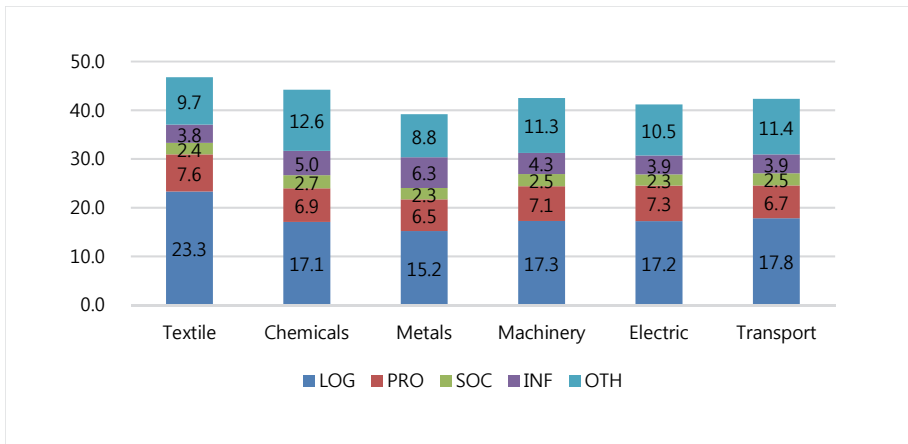
Source: Author's calculation, using the World Input-Output Database.

The contribution of service sectors to value added in exports differs by manufacturing sector (Figure 2). A comparison of various manufacturing sectors shows that the textile sector is the most supported by service sectors. The contribution of service sectors to value added in exports of textile products is 46.8 percent, followed by chemicals (44.2%), machinery (42.5%), transport equipment (42.3%), electric equipment (41.2%), and metal products (39.2%).

A key reason why the contribution of service sectors to value added in exports differs is because the role of logistics-related services depends on the characteristics of manufacturing sectors. Logistics-related services including retail and wholesale trade and transport contributed to value added in exports the most substantially in

the textile sector (23.3%) compared to other manufacturing sectors, followed by transport equipment (17.8%), machinery (17.3%), electric equipment (17.2%), chemicals (17.1%), and metals (15.2%). The contribution of other services, including producer services (6.5% - 7.6%), social services (2.3% - 2.7%), infrastructure-related services (3.8% - 6.3%), and others (8.8% - 12.6%), was relatively stable.

**Figure 2. Contribution of Service Sectors to Value Added in Exports of Manufacturing Sectors**



Note: Logistics-related sectors (LOG) include retail trade, wholesale trade, and transport; producer service sectors (PRO) cover telecommunications and finance; social service sectors (SOC) include education, health, and public administration sectors; infrastructure-related sectors (INF) include construction, electricity, gas, and water supply; and other sectors (OTH) include other business activities.

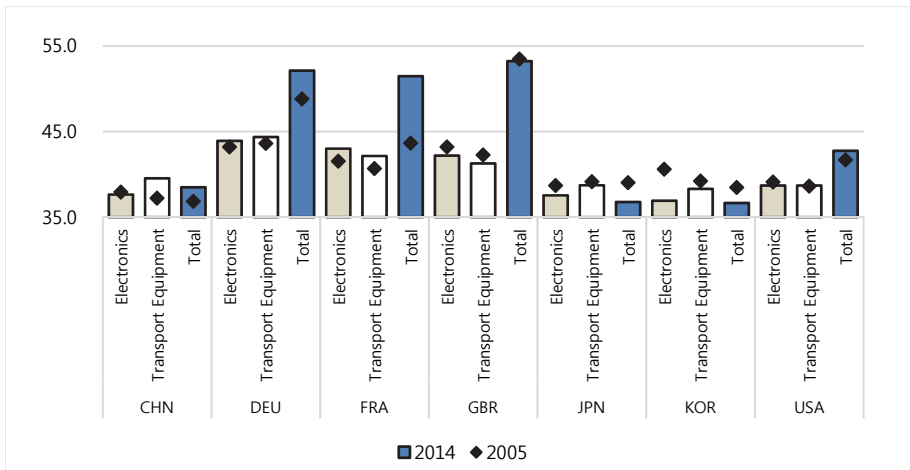
Source: Author's calculation, using the World Input-Output Database

As global value chains become more sliced up, imported services tend to contribute more to production and trade activities (Figure 3). The share of imported services in total value added intermediate imports was relatively high in developed countries such as England (53.2%), followed by Germany (52.1%), France (51.5%), and the US (42.7), compared to East Asian countries such as China (38.5%), Japan (36.8%), and Korea (36.7%) whose industrial structures are more dependent on manufacturing sectors. This means that England, Germany, France, and the US have used more imported services for their value creation in exporting activities than East Asian countries. When we compare the shares of 2004 and 2014, the shares of imported services to value added intermediate imports grew in the cases of the US, France,

Germany, and China, but fell in the cases of England, Japan, and Korea.

As for electronics and transport equipment industries, imported services accounted for smaller shares in value added intermediate imports compared to the overall average. This is partly because the two sectors utilized parts and raw materials other than services to a higher degree than the average of all sectors combined. It is also because the global value chains linked to these two sectors have been more focused on manufacturing and assembly processes. Specifically, the shares were relatively low in Japan and Korea, whose electronics and transport equipment sectors are reputed to be very competitive in the global market. This implies that the two countries, along with China, were less dependent on imported services in terms of R&D and design in the early stages, as well as transport and distribution, business services, and consumer services at the end of the chains.

**Figure 3. Imported Services, % of Value Added Intermediate Imports, 2005 and 2014**



Note: For country classification, refer to Appendix 1.

Source: Author's calculation, using the World Input-Output Database.

### 2-3. Comparative Advantage of Service Sectors

The comparative advantage of service sectors is measured by the following

indexes of revealed comparative advantage (RCA), which was developed by Balassa and Noland.<sup>6</sup>

$$RCA_{ij} = \frac{X_{ij}}{\sum_i X_{ij}} / \frac{\sum_j X_{ij}}{\sum_i \sum_j X_{ij}} \quad (1)$$

The nominator in equation (1) represents the share of exports of country  $i$  in sector  $j$  in world total exports in sector  $j$ , which indicates the market power of country  $i$  in sector  $j$ . The denominator in equation (1) indicates the share of total exports of country  $i$  in world export value, which shows the relative size of country  $i$ . Namely, the RCA index adjusts export specialization by the relative trade value of country  $i$ .

The RCA index ranges from 0 to infinity ( $+\infty$ ) where a value less than 1 represents the relative lack of competitiveness in the world market while a value greater than 1 implies the competitiveness of country  $i$  in sector  $j$ . In addition, the RCA index also indicates how the actual trade volume is realized compared to expectations, as follows.

$$RCA_{ij} = \frac{X_{ij}}{E(X_{ij})}, \text{ where } E(X_{ij}) = \sum_j X_{ij} \left( \frac{\sum_i X_{ij}}{\sum_i \sum_j X_{ij}} \right) \quad (2)$$

As indicated in (1), we assume that the comparative advantage of a specific sector  $j$  is not the same as that of country  $i$ . We obtain country-level RCAs using the weights of disaggregated sectors,  $w_{ij}$ , as follows.

$$RCA_i = \sum_j w_{ij} RCA_{ij}, \text{ where } w_{ij} = \frac{X_{ij}}{\sum_j X_{ij}} \quad (3)$$

Table 5 compares RCAs obtained by using equation (3). It uses the gross exports as well as the value added in exports of five aggregated service sectors, including logistics-related services, producer services, social services, infrastructure-related services, and other services. RCAs based on gross exports turned out to be substantially different from the results based on value added in exports. For example, Australia's logistics, producer services, social services, and other services turn out to be competitive in the global market if we calculate RCAs. However, this is not the case for logistics

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<sup>6</sup> For detailed discussions of the index of RCA, refer to OECD (2009), pp. 22-23 and Choi and Lee (2010), pp. 31-36.

related services, while infrastructure-related service sectors prove to be competitive in the global market. In addition, RCAs based on gross exports may provide misleading information on comparative advantages in the cases of Brazil, Germany, France, Italy, Mexico, Russia, and the US.

**Table 5. Revealed Comparative Advantage Index of Service Sectors**

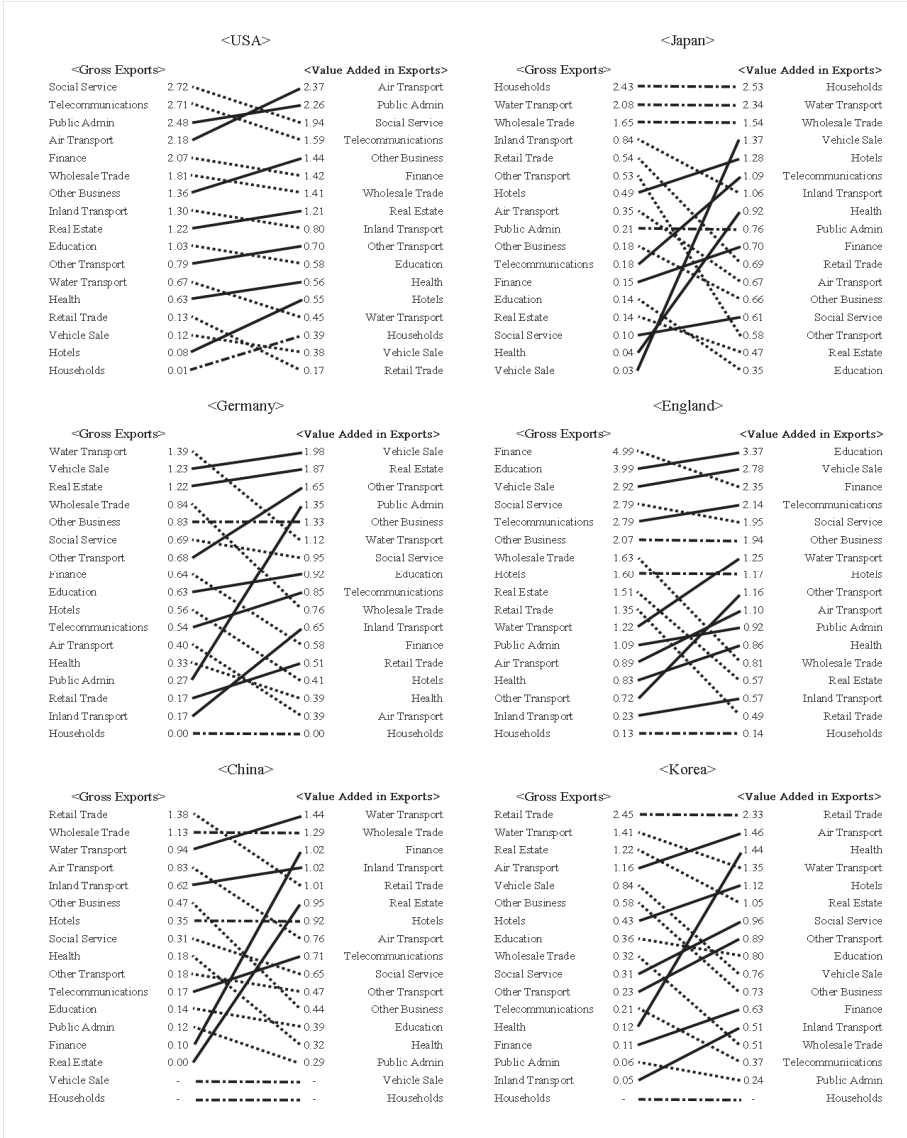
	Gross Exports (GX)					Value Added in Exports (VAX)				
	LOG	PRO	SOC	INF	OTH	LOG	PRO	SOC	INF	OTH
AUS	1.66	1.56	8.72	0.62	1.54	0.93	1.31	3.04	1.59	1.00
BRA	0.66	1.90	1.09	1.13	0.79	1.42	0.84	0.98	0.62	0.97
CAN	1.84	0.67	1.89	0.82	1.21	1.12	0.91	1.53	0.96	1.03
CHN	1.04	0.11	0.28	0.92	0.46	1.17	0.97	0.56	0.78	0.52
DEU	0.90	0.66	0.63	1.58	0.80	1.03	1.21	1.06	1.01	1.31
FRA	1.71	0.87	1.02	1.30	1.53	1.31	1.25	1.44	0.88	1.74
GBR	1.51	4.75	2.82	1.47	2.02	1.13	2.20	2.13	1.15	1.90
IDN	0.36	0.81	0.50	0.24	0.94	0.76	0.54	0.53	0.52	0.48
IND	1.34	0.89	2.07	0.37	2.58	2.24	0.97	1.85	0.74	1.74
ITA	0.83	1.76	0.81	0.75	0.66	1.04	1.51	0.80	1.15	1.14
JPN	1.53	0.16	0.14	0.05	0.36	1.41	0.76	0.66	0.62	0.78
KOR	1.36	0.41	0.30	0.35	0.56	1.30	0.75	0.94	0.86	0.78
MEX	0.89	0.08	0.01	0.05	0.01	1.45	0.24	0.06	0.50	0.71
RUS	4.22	0.31	0.15	0.31	0.02	2.02	0.59	2.11	0.90	0.36
USA	1.67	2.17	2.55	1.24	1.34	1.30	1.41	1.95	0.59	1.41

Source: Logistics-related sectors (LOG) include retail trade, wholesale trade, and transport; producer service sectors (PRO) cover telecommunications and finance; social service sectors (SOC) include education, health, and public administration sectors; infrastructure-related sectors (INF) include construction, electricity, gas, and water supply; and the other sectors (OTH) include other business activities.

Figure 4 shows the ranking of RCAs in the service sectors of the US, China, Germany, England, Japan, and Korea in 2014, using equation (3).<sup>7</sup> The values in the left-hand-side columns represent RCAs calculated using gross exports (GX) data while the ones in the right-hand-side columns represent RCAs calculated using value added in exports (VAX) data. The dotted lines indicate drops in the RCA rankings, while the unbroken lines represent an increase. The comparison of the RCA rankings between gross exports (GX) and value added in exports (VAX) reveals the prevalent changes in the rankings of RCAs in the service sectors of the six countries.

<sup>7</sup> The results for the other countries are available from the authors upon request.

**Figure 4. Ranking of RCA Indexes in Terms of Gross Exports (GX) and Value Added in Exports (VAX)**



Note: Numbers represent the revealed comparative advantage indexes. Detailed descriptions of the service sectors are listed in Appendix 1.

Source: Author's calculation, using the World Input-Output Database.

The results show that an empirical study to investigate comparative advantage based on gross exports (GX) would be misleading in global value chains. Instead, value added in exports (VAX) are required to understand the sources of comparative advantage in services.

## 3. Empirical Model and Data

### 3-1. Comparative Advantage in Services

Before we examine the impacts of institution and social capital on comparative advantage in services, we check whether the importance of Ricardian comparative advantage is valid for services trade. To this end, we extend the empirical specification of Costinot, Donaldson, and Komunjer (2012), which develops a multi-country and multi-industry Ricardian model for empirical assessment. The difference lies in data structure and includes country-industry fixed effects additionally: our dataset is a panel structure, while Costinot *et al.* (2012) is cross-sectional. Thus, our empirical specification is as follows:

$$\ln X_{it}^h = \alpha_0 + \alpha_{it} + \alpha_{ht} + \alpha_{ih} + \gamma \ln(LP_{iht}) + \varepsilon_{iht} \quad (4)$$

where  $X_{iht}$  can be country  $i$ 's gross exports (GX) from industry  $h$  or domestic value added in exports (VAX),  $LP_{iht}$  represents relative labor productivity,  $\alpha_{it}$  is the time-varying country fixed effect,  $\alpha_{ht}$  is the industry-year fixed effect and  $\alpha_{ih}$  is country-industry fixed effects, which we included additionally.

The data set is an unbalanced panel structure with missing values that covers 43 countries and 15 goods and 10 services industries for the period between 2000 and 2014. We acquired data on trade flows from the World Input-Output Table. Following Costinot *et al.* (2012), relative labor productivity is defined as the volume of gross output or the volume of value added divided by a labor input measure (number of workers) relative to those of the US in 2000.

$$LP(Q)_{jht} = \frac{Q_{jt}^h / L_{jt}^h}{Q_{US2000}^h / L_{US2000}^h} \quad (5)$$

$$LP(VA)_{jht} = \frac{VA_{jt}^h / L_{jt}^h}{VA_{US2000}^h / L_{US2000}^h} \quad (6)$$



## 3-2. Institution and Social Capital as Sources of Comparative Advantage

In order to identify sources of comparative advantage, recent studies including Romalis (2004), Nunn (2007), Levchenko (2007), Beck (2003) and Manova (2008), Costinot (2009), Cunat and Melitz (2012) assume that the systematic component of the productivity level of industries is determined by the interaction of country and industry characteristics. In particular, Nunn (2007) and Levchenko (2007) show that countries with better institutions export more in industries for which relationship-specific investments and hold-up problems are important, as measured by contract intensity or input concentration. Extending the empirical specification of Nunn (2007), Levchenko (2007), Tabellini (2008) by including time dimension, we identify sources of comparative advantage in services by applying the following empirical equation:

$$\ln X_{iht} = \alpha_0 + \alpha_{it} + \alpha_{ht} + \alpha_{ih} + \beta_1 k_{iht} + \beta_2 l_{iht} + \gamma z_{ht} IC_{it} + \varepsilon_{iht} \quad (7)$$

where  $X$  is gross exports or value added in exports,  $k$  is capital intensity,  $l$  is labor intensity,  $z$  represents contract intensity and  $IC$  is the measure of legal institution or social capital. To address the concern of omitted variables, we include time-varying exporter fixed effects ( $\alpha_{it}$ ), which account for time variant differences across countries, as well as time-varying industry fixed effects ( $\alpha_{ht}$ ), which account for time-varying industry characteristics. Furthermore, we also include country-industry fixed effects ( $\alpha_{ih}$ ). In addition, following the literature on sources of comparative advantage we control for production factor intensities as Heckscher-Ohlin determinants by including labor intensity and capital intensity.

### Measuring Social Capital

There is no widely held consensus on how to measure social capital. In fact, many studies including Reid and Salmen (2000), Pargal, Huq and Gilligan (1999), and Rose (1999) measure social capital by trust. However, trust is only a component of social capital. As Putnam (1995) argues that social capital can be measured by the amount

of trust and “reciprocity” in a community or between individuals, we consider an aspect of cultural traits: respect and tolerance.

Trust is viewed here as an amoral, rational, strategic response to the belief that the party to be trusted is trustworthy (Rose, 2007). Many social capital studies consider trust to be an important component of social capital. Consistent with Woolcock (1998) and Putnam, Leonardi and Nanetti (1993), social capital refers to “networks together with shared norms, values and understandings that facilitate cooperation within or among groups.” Social capital has been used to explain a vast range of phenomena, ranging from political turnovers to economic growth. The concept of social capital stems from the seminal book by Putnam *et al.* (1993), which argues that Northern Italy developed faster than Southern Italy because the former was better endowed in social capital, which can facilitate the solution of collective action problems. A wide range of applications of social capital to economic development are collected in Grootaert and van Bastelaar (2002). The literature has identified a number of channels by which social capital improves efficiency. Most of these channels fall under one or a combination of the following three categories: information sharing, group identity, and explicit coordination. In particular, social capital reduces transactions costs and acts as an informal channel for acquiring insurance against liquidity risk (Fafchamps and Minten, 1999).

In order to measure social capital, we use two variables from the *World Value Surveys*<sup>8</sup>, that are widely used to measure cultural traits (Nunn *et al.*, 2018; Tabellini, 2008; Algan and Cahuc, 2010). The first variable is *Trust* towards others. One of the questions in the World Value Survey is: “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” *Trust* is defined as 1 if the respondent answers that “Most people can be trusted,” and 0 otherwise. At the country level, *Trust* is the fraction of individuals answering that “Most people can be trusted.” This variable has been extensively used in many studies, including Glaeser *et al.* (2000), Alesina and La Ferrara (2002), Tabellini (2008), and Nunn *et al.* (2018).

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<sup>8</sup> The World Values Surveys are opinion surveys designed to enable cross-national comparison of individual values and beliefs over time. Until now six waves have been conducted, in 1981-84, 1990-04, 1995-98, 1999-2004, 2005-2009, and 2010-2014. World Values Survey data is available at <http://www.worldvaluessurvey.org/WVSEventShow.jsp?ID=367> (accessed August 30, 2018).

The second variable is *Respect*. The question in the World Value Survey is: “Here is a list of qualities that the children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Please choose up to five.” The variable *Respect* is coded as 1 if the respondent mentions the quality “tolerance and respect for other people” as being important, and 0 otherwise. Again, at the aggregate level *Respect* is defined as the simple average of individual responses. Since cultural trait moves slowly, we measure social capital as a time-invariant country-specific variable generated by averaging three waves of the World Value Surveys (carried out during the period 1999-2014) that ask the trust and respect question. Their coverage of countries is not always the same, as the number ranges from 41 countries in the fourth wave to 60 in the last one. *Trust* and *Respect* may be correlated, thus we use the first principal component of the two variables trust and respect to convert them into an uncorrelated variable.

### Contract Intensity of Services

To empirically examine whether institution or social capital matters for comparative advantage in services, we need the variable institutional intensity or social capital intensity at the country and industry level. However, this data is not available. Levchenko (2007) and Nunn (2007) measure institutional intensities by interacting industry characteristics – contract intensities - with country characteristics, or qualities of legal institution. Following this approach, we construct measures of social capital intensities at the country and industry level by interacting countries’ level of social capital with industry measures of contract intensities. In particular, we construct for each goods and services two measures of the proportion of its intermediates inputs that are relationship-specific:

$$z_h^1 = \sum_c \theta_{hc} R_c^1 \quad (8)$$

$$z_h^2 = \sum_c \theta_{hc} R_c^2 \quad (9)$$

where  $\theta_{hc} = u_{hc} / u_h$ , where  $u_{hc}$  is the value of input  $c$  used in industry  $h$  and  $u_h$  is the total value of all inputs used in industry  $h$ .  $R_c$  is the proportion of the differentiated

input  $c$ . The production of goods and services requires not only goods inputs but also services inputs.

Rauch (1999) provides data on the differentiated goods input, but not on services. Since most services are tailored to their clients and are indivisible, not observable, not storable and their exchange requires the proximity of the supplier and the customer, Copeland and Mattoo (2008), Drejer (2004), Fitzsimmons and Fitzsimmons (2006) assume that all services are differentiated. However, Tether *et al.* (2001) argue that in practice services are sometimes mass-produced and sometimes customized versions of standard products, but can also be produced on a one-off basis. Using the survey of innovation in German services companies including the question about company's sales earned from 'standard services', 'partially customized services' or 'bespoke services,' Tether *et al.* (2001) provide information on the proportion of partially customized and bespoke services for seven service sectors such as trade, transport and communications, banking and insurance, business services, other financial services, technical services and software.

**Table 6. Contract Intensity of Services**

	Proportion of bespoke services	Proportion of partially customized and bespoke services
Sale, maintenance and repair of motor vehicles and motorcycles	0.27	0.71
Wholesale trade and commission trade, except of motor vehicles and motorcycles	0.27	0.71
Other retail trade	0.27	0.71
Inland transport	0.30	0.74
Water transport	0.30	0.74
Air transport	0.30	0.74
Other supporting and auxiliary transport activities; activities of travel agencies	0.30	0.74
Post and telecommunication	0.30	0.74
Financial intermediation	0.45	0.81
Business services	0.46	0.86

Note: The proportion of financial intermediation is the average of banking and insurance and other financial services, and business services is the average of technical services and other business services. Data are taken from Tether *et al.* (2001).

We use these data as the proportion of differentiated services.  $R^1$  is the proportion of differentiated goods input that is neither sold on an organized exchange nor reference priced, and bespoke services input measured by Tether (2001).  $R^2$  is the proportion of goods input that is not homogenous and partially customized, and bespoke services input. We include only the service sectors shown in Table 6 in the empirical estimations.

Table 7 shows the descriptive statistics.

**Table 7. Summary Statistics**

Variable	Obs.	Mean	Std. Dev.	Min	Max
ln(GX)	18,986	7.63	2.26	-12.35	13.57
ln(VAX)	18,996	7.40	2.00	-15.11	12.54
labor intensity	19,462	0.02	0.04	0.00	0.88
capital intensity	19,461	0.19	0.09	0.00	1.69
$z^1$ *rule of law	13,875	0.28	0.27	-0.60	1.37
$z^1$ *social capital	10,552	0.21	0.38	-0.75	2.10
$z^2$ *rule of law	13,875	0.57	0.52	-0.88	1.72
$z^2$ *social capital	10,552	0.41	0.76	-0.75	2.94

Note: GX and VAX indicate gross exports and value added in exports, respectively.

## 4. Estimation Results

### 4-1. Relative Labor Productivity and Comparative Advantage

We estimate Eq. (4) by OLS and the empirical estimation results are presented in Table 8; the dependent variable is the log value of bilateral gross exports or value added in exports at the country-industry level. All empirical models include country-year and industry-year fixed effects to account for their unobserved time-varying factors. In addition, the country-industry fixed effects also are included to control for their time-invariant characteristics.

The estimates of  $\gamma$  in all empirical specifications are positive and statistically significant, implying that the importance of Ricardian comparative advantage is valid not only for goods exports but also for services exports, regardless of whether export performance is measured by gross exports or value added in exports.

**Table 8. Impacts of Labor Productivity on Gross Exports (GX) and Total Domestic Value Added in Exports (VAX): OLS**

	All				Goods		Services	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Variable	ln(GX)	ln(GX)	ln(VAX)	ln(VAX)	ln(GX)	ln(VAX)	ln(GX)	ln(VAX)
ln(relative labor productivity)	0.934 (0.024) <sup>a</sup>	0.497 (0.025) <sup>a</sup>	0.653 (0.016) <sup>a</sup>	0.181 (0.014) <sup>a</sup>	0.573 (0.017) <sup>a</sup>	0.143 (0.016) <sup>a</sup>	0.358 (0.048) <sup>a</sup>	0.174 (0.025) <sup>a</sup>
country-year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
industry-year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
country-industry fixed effect	NO	Yes	NO	Yes	Yes	Yes	Yes	Yes
No. obs.	23,709	23,709	23,835	23,835	11,436	11,418	12,273	12,417
Adj. $R^2$	0.70	0.97	0.79	0.98	0.98	0.98	0.95	0.98

Note: Heteroskedasticity-robust standard errors are reported in parentheses. 'a' denotes significance at the 1% level.

Source: Author's calculation, using the World Input-Output Table.

## 4-2. Sources of Comparative Advantage

Table 9 reports the estimation results for all industries, goods and services industries. The dependent variable is gross exports (GX) at the industry level. All empirical models include country-year and industry-year and country-industry fixed effects to account for unobserved time-varying factors and time-invariant country and industry characteristics. Column (1) – (3) present the estimation results of the Nunn (2007) hypothesis that countries with better legal institutions have a comparative advantage in industries with higher contract intensity.

**Table 9. Impacts of Institution and Social Capital on Gross Exports**

Dep. ln(GX)	All	Goods	Services	All	Goods	Services
	(1)	(2)	(3)	(4)	(5)	(6)
labor intensity	-1.907 (0.127) <sub>a</sub>	-2.107 (0.103) <sub>a</sub>	-1.358 (0.280) <sub>a</sub>	-2.113 (0.223) <sub>a</sub>	-4.697 (0.202) <sub>a</sub>	-0.388 (0.397)
capital intensity	0.174 (0.232)	0.822 (0.205) <sub>a</sub>	-0.413 (0.452)	1.017 (0.409) <sub>b</sub>	1.366 (0.273) <sub>a</sub>	0.446 (1.070)
contract intensity( $z^1$ )* rule of law	0.638 (0.169) <sub>a</sub>	0.485 (0.132) <sub>a</sub>	0.346 (0.424)			
Contract intensity( $z^1$ )* social capital				1.315 (0.253) <sub>a</sub>	0.625 (0.171) <sub>a</sub>	2.843 (0.640) <sub>a</sub>
country-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
country-industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.96	0.98	0.94	0.95	0.98	0.93
No. obs.	13,473	7,443	6,030	10,145	5,601	4,544

Note: Standard errors are reported in the parentheses, and 'a' and 'b' denote significance at the 1% and 5% levels, respectively.

We identify the Nunn (2007) hypothesis for all industries and goods industries, but not service sectors. Columns (4) - (6) replace legal institutions with social capital interacted with contract intensity, as measured by *Trust* and *Respect*. The coefficients of the interaction term of contract intensity and social capital are highly significant and show expected positive signs, meaning that high social capital is a source of comparative advantage. Furthermore, the coefficient of the interaction term of contract intensity and social capital in service sectors is larger than that in goods sectors, implying that social capital is more important for sources of comparative advantage in

services than in goods.

As noted above, gross exports containing this double-counting problem may not be an adequate measure of export performance to investigate sources of comparative advantage in a world with global value chains. We re-estimate the empirical equation (7) by replacing the dependent variable with value added in exports (VAX). The results presented in Table 10 are similar to those in Table 9. For goods sectors, countries with better contract enforcement have a comparative advantage in producing goods that intensively use inputs requiring relationship-specific investments, while the coefficient of the interaction term of contract intensity and rule of law in Column (3) for services is not significant. Columns (4), (5) and (6) show that social capital is a source of comparative advantage for all goods and service sectors. Again, the coefficient of the interaction term of contract intensity and social capital in service sectors is larger than that in goods sectors.

We find that only social capital matters for comparative advantage in services, and not institution. This implies that institution has limitations in resolving the hold-up problems of international service transactions resulting from the characteristics of services, such as the simultaneity of production and consumption, the proximity burden and pre-choice risks. Thus, services consumers may rely on cultural traits, rather than legal institution.

**Table 10. Impacts of Institution and Social Capital on Value Added in Exports**

Dep. ln(VAX)	All	Goods	Services	All	Goods	Services
	(1)	(2)	(3)	(4)	(5)	(6)
labor intensity	-0.474 (0.076) <sub>a</sub>	-0.283 (0.102) <sub>a</sub>	-0.555 (0.120) <sub>a</sub>	-0.768 (0.093) <sub>a</sub>	-0.733 (0.143) <sub>a</sub>	-0.781 (0.129) <sub>a</sub>
capital intensity	-0.521 (0.132) <sub>a</sub>	-0.243 (0.190)	-0.710 (0.187) <sub>a</sub>	0.905 (0.196) <sub>a</sub>	0.688 (0.242) <sub>a</sub>	1.573 (0.348) <sub>a</sub>
contract intensity( $Z^1$ )* rule of law	0.507 (0.090) <sub>a</sub>	0.574 (0.109) <sub>a</sub>	0.129 (0.174)			
contract intensity( $Z^1$ )* social capital				0.860 (0.105) <sub>a</sub>	0.766 (0.124) <sub>a</sub>	1.025 (0.205) <sub>a</sub>
country-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
country-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
country-industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.99	0.99	0.98	0.99	0.99	0.99
No. obs.	13,484	7,426	6,058	10,163	5,588	4,575

Note: Standard errors are reported in the parentheses, and 'a' denotes significance at the 1% level.



### 4-3. Robustness Check

We now test the sensitivity and robustness of our baseline estimates. We consider the robustness of the results to alternative measures of contract intensity  $z^2$ . The dependent variable is value added in exports. We also divide the sample into exports of goods and services.

In Column (1) and (2) the coefficients of the interaction term of contract intensity and legal institution is positive and significant at the 1% level, identifying significant impacts of legal institution on comparative advantage. However, in Column (3) the coefficient of the interaction term of contract intensity and legal institution is insignificant. This result is consistent with that presented in Table 10. Column (4) - (6) report the estimation results for the impacts of social capital on comparative advantage. The positive and significant impacts of social capital on comparative advantage remain unchanged. We again identify that social capital matters for comparative advantage in services, but the impacts of legal institution on comparative advantage in services are insignificant.

**Table 11. Alternative Measure of Contract Intensity and Comparative Advantage**

Dep. ln(VAX)	All	Goods	Services	All	Goods	Services
	(1)	(2)	(3)	(4)	(5)	(6)
labor intensity	-0.475 (0.076) <sub>a</sub>	-0.294 (0.102) <sub>a</sub>	-0.551 (0.120) <sub>a</sub>	-0.756 (0.093) <sub>a</sub>	-0.732 (0.146) <sub>a</sub>	-0.781 (0.129) <sub>a</sub>
capital intensity	0.537 (0.132) <sub>a</sub>	0.259 (0.190)	0.714 (0.187) <sub>a</sub>	0.887 (0.196) <sub>a</sub>	0.715 (0.241) <sub>a</sub>	1.421 (0.348) <sub>a</sub>
contract intensity( $z^2$ )* rule of law	0.291 (0.058) <sub>a</sub>	0.361 (0.076) <sub>a</sub>	0.088 (0.101)			
contract intensity( $z^2$ )* social capital				0.604 (0.066) <sub>a</sub>	0.449 (0.084) <sub>a</sub>	0.726 (0.114) <sub>a</sub>
country-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
country-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
country-industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.99	0.99	0.98	0.99	0.99	0.99
No. obs.	13,484	7,426	6,058	10,163	5,588	4,575

Note: Standard errors are reported in the parentheses, and 'a,' 'b,' and 'c' denote significance at the 1%, 5%, and 10% levels, respectively.

## 5. Summary and Conclusion

The results of this paper reveal that service sectors play a leading role in creating employment and value added compared to manufacturing sectors. In addition, the importance of service sectors is more evident in terms of the value added in exports compared to gross exports. Services are involved in all stages of the global value chains, and furthermore, their role is growing increasingly prominent. As global value chains become more sliced up, imported services tend to contribute more to production and trade activities. When we calculate the revealed comparative advantage (RCA) indexes, RCAs based on gross exports turned out to be substantially different from the results based on value added in exports. In addition, RCAs based on gross exports provided misleading information on comparative advantage.

This paper investigates the relative importance of different sources of comparative advantage in services, with a particular focus on institution and social capital. Services are used for final consumption or as inputs in the production of goods or other services. Thus, they are vital inputs into producing downstream industries. Previous studies on comparative advantage do not include services input, despite the intensifying servicification of manufacturing.

Services have distinguishing characteristics from those of goods: they cannot be inventoried or divided, and are intangible. Moreover, transactions of services require the proximity and simultaneity of production and consumption. Thus, consumers cannot experience the quality of services before they are actually provided and consumed. Due to these characteristics, the quality of services cannot be standardized, making it difficult for consumers to assess the quality of services provided, so that services buyers will confront higher pre-choice risk than goods buyers. Therefore, the hold-up problem in services trade may be more severe than in goods trade.

We posit the hypothesis that services buyers rely on socio-cultural factors such as trust in and respect of the exporting country to overcome the hold-up problem. Using panel data covering 43 countries and 15 goods and 10 services sectors over the period of 2000 to 2014, we examine whether social capital is a source of comparative advantage in services and whether it is more important for comparative advantage in services than goods. We find that countries with more social capital tend to specialize in the production of contract-intensive services. We also find that social capital, rather than institution, matters for comparative advantage in services.

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## Appendix 1. Country and Industry Classification

Abbr.	Description	Industry	Description
AUS	Australia	SEC01	Agriculture, hunting, forestry and fishing
AUT	Austria	SEC02	Mining and quarrying
BEL	Belgium	SEC03	Food, beverages and tobacco
BRA	Brazil	SEC04	Textiles, Leather, and footwear
BGR	Bulgaria	SEC05	Wood and products of wood and cork
CAN	Canada	SEC06	Pulp, paper, printing and publishing
CHE	Switzerland	SEC07	Coke, refined petroleum and nuclear fuel
CHN	China	SEC08	Chemicals and chemical products
CYP	Cyprus	SEC09	Rubber and plastics
CZE	Czech Republic	SEC10	Other non-metallic mineral
DNK	Denmark	SEC11	Basic metals and fabricated metal
EST	Estonia	SEC12	Machinery, not elsewhere classified
FIN	Finland	SEC13	Electrical and optical equipment
FRA	France	SEC14	Transport equipment
DEU	Germany	SEC15	Manufacturing, not elsewhere classified; recycling
GRC	Greece	SEC16	Electricity, gas and water supply
HRV	Croatia	SEC17	Construction
HUN	Hungary	SEC18	Sale and repair of motor vehicles and motorcycles; retail sale of
IND	India	SEC19	Wholesale trade, except of motor vehicles and motorcycles
IDN	Indonesia	SEC20	Retail trade and repair, except of motor vehicles and motorcycles;
IRL	Ireland	SEC21	Hotels and restaurants
ITA	Italy	SEC22	Inland transport
JPN	Japan	SEC23	Water transport
KOR	South Korea	SEC24	Air transport
LVA	Latvia	SEC25	Other supporting transport activities
LTU	Lithuania	SEC26	Post and telecommunications
LUX	Luxembourg	SEC27	Financial intermediation
MLT	Malta 2000	SEC28	Real estate activities
MEX	Mexico	SEC29	Renting of machinery & equipment and other business activities
NLD	Netherlands	SEC30	Public administration and defense; compulsory social security
NOR	Norway	SEC31	Education
POL	Poland	SEC32	Health and social work
PRT	Portugal	SEC33	Other community, social and personal services
ROM	Romania	SEC34	Private households with employed persons
RUS	Russia		
SVK	Slovak Republic		
SVN	Slovenia		
ESP	Spain		
SWE	Sweden		
TWN	Taiwan		
TUR	Turkey		
GBR	UK		
USA	USA		

Source: Timmer *et al.* (2015), pp. 598-599.

## Appendix 2. Derivation of Value Added in Exports (VAX)

We will derive value added in exports using the following input-output approach proposed by Stehrer (2012), Stehrer *et al.* (2012), and Choi (2013).

$$X = AX + y = Ly$$

Where  $X$  denotes a vector of gross output,  $A$  is a matrix of input-output coefficients,  $y$  is a vector of final demand, and  $L$  represents a Leontief inverse matrix. In the three-country case, value added in exports of country  $r$ ,  $VAX^r$  is expressed by the value added coefficient ( $v$ ), the Leontief matrix ( $L$ ), and the final demand matrix ( $y$ ).<sup>9</sup>

$$\begin{aligned} VAX^r &= [v^r \quad 0 \quad 0] \cdot \begin{bmatrix} L^{rr} & L^{rs} & L^{rt} \\ L^{sr} & L^{ss} & L^{st} \\ L^{tr} & L^{ts} & L^{tt} \end{bmatrix} \cdot \begin{bmatrix} y^{rs} + y^{rt} \\ y^{ss} + y^{st} \\ y^{ts} + y^{tt} \end{bmatrix} \\ &= VAX^{rs} + VAX^{rt} \\ &= (v^r L^{rr} y^{rs} + v^r L^{rs} y^{ss} + v^r L^{rt} y^{ts}) + (v^r L^{rr} y^{rt} + v^r L^{rs} y^{st} + v^r L^{rt} y^{tt}) \quad (A1) \end{aligned}$$

Where  $(v^r L^{rr} y^{rs} + v^r L^{rs} y^{ss} + v^r L^{rt} y^{ts})$  represent the value added in exports of country  $r$  to country  $s$ , namely  $VAX^{rs}$ ,  $(v^r L^{rr} y^{rt} + v^r L^{rs} y^{st} + v^r L^{rt} y^{tt})$  represent the value added in exports of country  $r$  to country  $t$ , namely  $VAX^{rt}$ . As shown in equation (A1), the value added in exports of country  $r$  is directly and indirectly induced by the final demands of country  $s$  and country  $t$ .  $v^r L^{rr} (y^{rs} + y^{rt})$  denotes the components of value added in exports directly induced by the final demand of country  $s$  and country  $t$  for the goods produced by country  $r$ .  $v^r L^{rs} (y^{ss} + y^{st})$  and  $v^r L^{rt} (y^{ts} + y^{tt})$  represent the components of value added in exports indirectly induced by the final demands of country  $s$  and country  $t$  for the goods produced by the countries other than  $r$ , respectively. Similarly, we get the following value added in exports of country  $s$  and  $t$ .

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<sup>9</sup> The three-country case in this paper is based on Stehrer (2012).



$$\begin{aligned}
VAX^s &= VAX^{sr} + VAX^{st} \\
&= (v^s L^{sr} y^{rr} + v^s L^{ss} y^{sr} + v^s L^{st} y^{tr}) + (v^s L^{sr} y^{rt} + v^s L^{ss} y^{st} + v^s L^{st} y^{tt}) \\
VAX^t &= VAX^{tr} + VAX^{ts} \\
&= (v^t L^{tr} y^{rr} + v^t L^{ts} y^{sr} + v^t L^{tt} y^{tr}) + (v^t L^{tr} y^{rs} + v^t L^{ts} y^{ss} + v^t L^{tt} y^{ts}) \quad (A2)
\end{aligned}$$

On the other hand, final demand is composed of consumption (C) and investment (I).<sup>10</sup> We can replace a vector of the sum of final demands of country  $s$  and country  $t$  by a vector of final demand of country  $r$  in equation (A1), thereby deriving the value added induced by consumption and investment. The value added induced by consumption in country  $r$  is  $(v^r L^{rr} C^{rr} + v^r L^{rs} C^{sr} + v^r L^{rt} C^{tr})$  while the value added induced by investment in country  $r$  is  $(v^r L^{rr} C^{rr} + v^r L^{rs} C^{sr} + v^r L^{rt} C^{tr})$ . The difference in the value added induced by consumption and investment from value added in exports is that the former is to satisfy domestic final demand, while the latter is to satisfy the final demands of foreign countries.

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<sup>10</sup> Consumption in this paper includes final consumption by households, non-profit organizations serving households, and government, while investment covers gross fixed capital formation and changes in inventories and valuables. Refer to Timmer *et al.* (2015), p. 600.

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## 국문요약

본 연구는 제도와 문화적 특성이 서비스무역의 비교우위에 미치는 영향을 실증분석하였다. 서비스의 소비자가 구매를 결정하기 전에 품질에 대한 정보를 얻기가 어렵기 때문에 서비스가 재화보다는 사전 선택의 위험에 노출되어 있다. 더욱이 글로벌 가치사슬에 참여하는 서비스무역은 동일한 가치사슬에 있는 다른 기업의 계약 위반의 위험을 맞이할 수도 있다. 그 결과 거래위험은 재화의 교역보다 서비스무역에 있어 더 크다. 본 연구는 세계투입산출 데이터베이스를 이용하여 비교우위의 결정에 있어 사회적 자본의 중요성을 추정한다. 분석결과에 따르면 더 많은 사회적 자본을 가진 나라는 계약집약적인 서비스의 생산에 특화하는 경향이 있는 것으로 나타났다. 또한 제도보다는 사회적 자본이 서비스무역의 비교우위에 더 중요한 것으로 나타났다.

**핵심용어:** 서비스무역, 비교우위, 제도, 사회적 자본

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