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Regulation and Service Exports: Theoretical and Empirical Analyses

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This paper constructs a theoretical framework to analyze the impacts of deregulation on service exports using the monopolistic competition model developed by Krugman (1980). The framework entails two core claims. First, the positive effects of deregulation on service exports are more prominent in the differentiated or knowledge-intensive service sectors such as insurance, business, and cultural and recreation sectors than those in the standardized ones such as travel and communication sectors. Secondly, the trade-stimulating impacts of deregulation in exporting country are of larger magnitude than those of deregulation in importing country. We then empirically test and prove these arguments using the Hausman-Taylor estimation method and the World Bank's STRI dataset. From these results, some policy implications are drawn for service industry development.

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I. Introduction

World trade in services has increased substantially for the last two decades. Entering the 2000s, world service trade has expanded with an annual average growth rate of 10.7% against 6.6% for the period from 1990 to 1999. There is little doubt that the recent increase in service trade is helped by transportation, logistics, and ICT developments that allow persons and services to efficiently move long

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distance across borders (Menor, 2000; Marel and Shepherd, 2013). Services matter not only for trade but also for national economy, particularly for economic growth. In developing countries, the average share of services in GDP increased from around 40% in 1965 to around 50% in 1999, while the average share increased over the same period from 54 % to over 60 % in the OECD countries (Mattoo *et al.*, 2008).

Against this backdrop, many developing countries or emerging economies which face limits to the growth of the manufacturing sector are paying keen attention to the service sector as a new growth engine that promotes job creation and new investment. The Korean government is also pushing forward with the development of service industries, specifically high value-added services. Of particular interest in this development context is how to promote the competitiveness of local service firms and foster them as economically viable exporters, given the limited size of the domestic market. Such an export-oriented policy is associated with the idea that the globalization of services and rapid technological progress are increasing pressure for service firms to compete on new service offerings (Menor, 2000), which is regarded as the primary driver for competitiveness in many service industries (Fitzsimmons and Fitzsimmons, 2000; Johnson *et al.*, 2000).[1]

In this respect, it is of great significance to analyze what determines service exports. The major determinants identified by the general gravity model for merchandise exports - economic scale, physical distance, cultural homogeneity, tariff and non-tariff barriers (e.g., regulatory barriers) - are largely true for services exports as well (Marel and Shepherd, 2013). From the perspective of the export-oriented growth strategy, the understanding of how regulatory reforms affect domestic service providers' export performance is to be one of the main questions. Nevertheless, clear theoretical rationale and empirical analysis on the relationship between domestic regulation and local service providers' export performance are rare, still remaining as a '*black box*'.

In this paper, we try to reveal the content of the '*black box*' by employing the concept of '*innovation*'. In the service sector, new and improved service products are regarded as the fruits of innovation.[2] Regulation, however, will deter '*innovation*' by inhibiting the development and manifestation of creativity. Based on this approach, we develop a theoretical model for trade in differentiated service products to examine how and to what extent regulation affects service exports through '*innovation*'. We then empirically test and prove the theoretical arguments using the

[1] The benefits that accrue from providing new services include: (1) enhancing the profitability of existing offerings, (2) attracting new customers to the firm, (3) improving the loyalty of existing customers, and (4) opening markets of opportunity (Storey and Easingwood, 1999).

[2] Service innovation can be defined in a number of ways including the creation of new products, processes, or organizations (Miles, 1993). However, it is natural to see that the effects of such innovative activities are finally reflected on service products delivered to customers.

Hausman-Taylor estimation method to take the possible endogeneity of explanatory variables into consideration, using the World Bank's STRI dataset. In addition, we check the robustness of the results using the various service regulation indexes constructed by the World Bank and the OECD.

This paper is organized as follows. The next section examines the existing studies on the relationship between regulation and service exports, and then lays out a theoretical model for trade in differentiated service products. Section 3 describes the estimation model and the data for empirical analysis. Sections 4 and 5 present the regression results. The final section concludes the paper, with the discussion of the policy implications in the analysis.

II. The Relationship between Service Exports and Regulation

2.1. Literature Survey

Literature on service exports is relatively small compared to merchandise exports. Nevertheless, a number of citable studies on the determinants of service exports have been carried out. Such pieces mainly aim to empirically identify the influence of various geographical and economic factors - distance, language, market size, institution, human resources and technology, etc. - on service export volume. For example, there are studies of Amin and Mattoo (2008), Jensen (2008) and Shingal (2010) on the positive roles of human resources in service exports. Freund and Weinhold (2002) discovered that communication infrastructure facilitates service exports.

The following studies examine this paper's main concern, the effects of regulation and institutions on service exports. Lennon (2009) analyzed service exports using indexes on corruption, complexity of export procedures, and rigidity in employment law as proxies for institutions. Grünfeld and Moxnes (2003) used the corruption perception index, while Kimura and Lee (2006) utilized the economic freedom index. Lejour and de Palva Verheijden (2004) employed a market regulation index - OECD PMR (Product Market Regulation) index - as an explanatory variable, comparing the trade deal between the EU and Canada. Schwellnus (2007) also used the OECD's PMR index as an economy-wide indicator of trade barriers. Marel and Shepherd (2013) tried to address the question of to what extent regulation would drive bilateral trade in services, focusing on detailed importers' regulations at sectoral levels.

Among others, Kox and Lejour (2005) and Kox and Nordås (2007) are closely in line with our exercises. Kox and Lejour (2005) verified a negative relationship

between the level of OECD PMR index (and its heterogeneity) and the volume of service exports. Kox and Nordås (2007) also obtained the same results for aggregate service exports but mixed ones for the business service exports. Regulatory indices both in exporting and importing countries are significantly correlated with trade, but the relation is stronger in exporting countries. Thus, strict regulation at home appears to impose a burden on local service providing firms' ability to engage in exports. However, regulatory heterogeneity is not significantly correlated with market entry.

In terms of empirical methodology, most existing studies employed the traditional fixed or random effects model. Kimura and Lee (2006) made a methodological progress by applying the Hausman-Taylor estimation method which is based on the instrumental variables (IV) method, thereby considering the endogeneity of some explanatory variables. We also rely on the Hausman-Taylor method to test our theoretical arguments in the paper.

2.2. Theoretical Framework

2.2.1. Discussions on the Nexus between Regulation and Service Exports

Two commonly used models for commodity trade can also be applied for trade in services (Copeland and Mattoo, 2008). Trade in services may be explained either by the theory of comparative advantage arising from the endowment difference of the natural and human resources, or by the differentiation and love of variety under monopolistic competition. As for the determinants of service trade, generally accepted ones for commodity trade - economic size, distance, cultural commonality, and the quality of institutions - are also applicable (Marel and Shepherd, 2013).

As an institutional factor, regulation is of special importance in service trade. Goswami *et al.* (2012) argued that good institutions are necessary for the development of service industry because of asymmetric information, location limits, and the lasting relationship between consumers and providers. The high quality of institution can contribute to service exports by enhancing the competitiveness of the exporting firms (Amin and Mattoo, 2006). Similarly, regulation, as a sort of institution, also has a significant effect on the production and consumption of services, thus affecting service exports. A higher level of regulation is often associated with a poor quality of regulation and institution through bureaucracy and corruption. This is in line with Grünfeld and Moxnes (2003) who argued that bureaucracy and corruption hinder the development of service industries and service exports.

It is commonly understood that strict regulation on service provision works as market entry barriers. Regulatory barriers that prohibit foreign providers' market entry are often regarded as a measure to protect domestic service industry. However, regulation can also be a barrier to the market entry of local service enterprises.

Regulation that is related to qualification requirements, licenses, or standards can be burdensome not only to foreign service providers but also to local enterprises. The questions to be addressed in this paper are whether there is a negative effect of the regulatory barriers on local service firms' exports and how the effect, if any, should be explained. One of the explanations to these questions was provided by Kimura and Lee (2006) who claimed that deregulation would promote service exports by enhancing economic freedom and competitiveness. This idea suggests that a liberal environment stimulates creative ideas by adding value to services. Kox and Nordås (2007) argued that well-designed and internationally-harmonized domestic regulation in service sectors can reduce fixed costs (i.e., market entry costs), hence enhancing the competitiveness of local service suppliers in foreign markets. Deregulation in the service industry is known to bring positive effects such as creation of a wide range of services and decline in general price level. According to Pilat (2005), OECD countries have experienced lower service prices, new services and high productivity through deregulation. Pilat (2005) also argued that the deregulation of the retail industry in Europe allowed consumers to enjoy lower overall price level. This is because deregulation provides business firms with an incentive for '*innovation*' through expanded competition. Hence, the lower the barriers, the more likely diverse or affordable services will be provided in the markets.

From an economic perspective, the outcome of 'innovation' will be lower price, higher quality or new kinds of service products. The types of service innovation are divided into "product innovation" to improve the quality of existing services (or offer new service products) and "process innovation" to enhance efficiency through improvements in the production process, according to Community Innovation Surveys (CIS).[3] Literature has classified service innovations on the basis of their characteristics (Hipp *et al.*, 2000, 2003). According to Johnston and Clark's (2005) classification, the dimensions of service innovation are identified on the basis of volume versus variety. Innovation in high-volume, low-variety services such as fast-food restaurants tends to focus on efficiency and standardization. On the other hand, innovation in low-volume, high-variety, capability-based services such as management consultancies tends to revolve around client-based customization and specialization (Trott, 2012). Thus, "process innovation" is mainly identified in the course of mass production with standardized products (Barras, 1986).

In contrast, "product innovation" entails an increase in "variety" through the modification and differentiation of product, thus being deeply related with differentiated goods or services. In a similar vein, "product innovation" is mainly based on the advancement of knowledge including R&D and ICT, associated with a

[3] The Community Innovation Survey (CIS) is a pan-European survey carried out every four years by each EU member state.

relatively high profit margin through quality competition rather than price competition (Abernathy and Utterback, 1978). Therefore, product innovation is expected to be dominant in the knowledge-intensive service sectors. The knowledge-intensive services (KIS) are of particular importance for the high level of R&D intensity, innovation performance, job creation and value added. Even though the coverage of the KIS varies, we classify the following services as the KIS according to OECD: IT services, software system, engineering, database services, management consulting, R&D, advertising, industrial design, health care, broadcast and culture related services (Lee *et al.*, 2003).

Service is generally understood to be differentiable in nature (Drejer, 2004). This point of view considers characteristics that distinguish service operations from their manufacturing counterparts such as customer participation, intangibility and heterogeneity[4] (Fitzsimmons and Fitzsimmons, 2006). Nonetheless, some kinds of services are provided in standardized manners and entail process innovation rather than product innovation. The survey research of Tether et al. (2001) confirmed that tourism, retail, and telecommunication sectors provide standardized services. Table 1 below summarizes competitive environments, innovation types and related service sectors for each service categories.

[Table 1] Classification and Features of the Service Sectors

	Differentiated or knowledge-intensive services	Standardized services
Competitive environments	service differentiation	price competition
Innovation types	create new services	enhance process efficiency
Service sectors	business, legal services, R&D, cultural services, broadcasting and engineering (or construction[1]), telecommunication services[2] etc.	tourism, retail and telecommunication services[2] etc.

Notes: 1. Construction service is viewed as consisting of architectural design, engineering and physical construction. Design and engineering can be regarded as the KIS but physical construction may be viewed differently.
2. Telecommunication belongs to both the KIS and standardized service.

Our research interest lies in the KIS and the relationship between their exports and regulation. Therefore, we construct a theoretical framework under the assumption that deregulation increases incentives for service providers to exert 'product innovation' rather than 'process innovation'. The KIS, such as legal advice and business services, often compete for customer loyalty, brand reputation, and

[4] Rauch (1999) suggested criteria to differentiate standardized goods from differentiated goods: (1) existence of organized market - standardized goods (2) no organized market but existence of reference prices - standardized goods (3) others - differentiated goods.

innovative technologies rather than lower prices. If market regulation is eased, markets will become more competitive, forcing firms to differentiate themselves from competitors through new and innovative services. Such new and innovative services may attract foreign customers who love variety and increase service exports (Storey and Easingwood, 1999). However, this scenario is unlikely to happen in a certain industry where it is difficult to differentiate service products. Under the price-driven competition, domestic deregulation would fail to yield benefits through new and innovative services but leads to the escalation of price competition. In other words, a negative relationship between regulation and local providers' service exports would clearly appear in differentiable services such as legal, consulting and business services.

2.2.2. Theoretical Model

Based on the discussions above, we lay out a theoretical model to analyze the effects of domestic regulation on the differentiated or knowledge-intensive service exports. Kox and Lejour (2005) attempted to carry out a similar theoretical analysis to investigate the relationship between difference in regulation intensity and export volumes, but their model did not provide a clear explanation on the mechanism of the deregulation effects on differentiated service exports. Thus, we construct a model that fits the distinct characteristics of differentiated or knowledge-intensive services. To this end, we begin by explaining the relationship among services produced (y), price (p), and the number of varieties of service products (N) under monopolistic competition.

The literature on service trade theory has focused on intermediate inputs or producer services that are characterized by increasing returns to scale, differentiation, and knowledge intensity. Knowledge intensity, in turn, implies an initial learning cost (fixed costs) to acquire knowledge and a very low marginal cost (variable costs) at which services can be duplicated and provided (Markusen, 1989). For instance, Ethier (1979), Romer (1987), and Markusen (1988) employed a simple one-sector model with regard to intermediate inputs, while Markusen (1989) developed a two-sector general equilibrium model including producer service sectors. In this paper, we build a model that is in line with Markusen (1989), but elaborates it in a somewhat different way by borrowing the idea and the setting of Krugman (1980) for simplification.[5]

Given the sharing features with knowledge-intensive services, the setting of Krugman (1980) can be directly applied to service trade analysis. Krugman (1980) considers labor as a single primary input, assuming a technology that exhibits "*increasing returns to scale*" and a consumer preference that entails "*love of variety*".

[5] There is no difference in conclusions even though we use the setting of Markusen (1989) which considers two sectors but regards one of them as numeraire.

Given the characteristics of the knowledge-intensive services, human resources are regarded as more important inputs than capital in the service sectors. The start-ups in the service sectors are often required to meet minimum human resources standards (license, academic degree, professional experience, etc.) or to establish substantial customer networks, which comprise fixed costs and give rise to "*economies of scale*". Consumers tend to be interested in services that are "*something new and different*" or provided in "*different ways*." Services, which are, in nature, intangible, customized and non-standardized, can be easily modified to meet various customers' needs.

Now, we begin our model by supposing a CES utility function for a representative consumer as follows:

$$U = \sum_{i=1}^{N} C_i^{(\sigma-1)/\sigma}$$

Here N is the number of varieties, c_i is the consumption of variety i, and σ (> 1 and constant in c) is the elasticity of substitution between varieties. We assume that labor (L_i) is the only input in the following production function: $L_i = \alpha + \beta y_i$, where y_i is the output per variety, α is the fixed labor input needed for production, and β is the marginal labor input. From the hypothesis that the production function is symmetric for each variety, subscript i can be removed. Wage is assumed to be equal to 1 (*numeraire*) for all firms (or economies). For a considerable period, labor supply is assumed to be constant ($L = \bar{L}$).

In order to simplify the analysis, we further assume that deregulation affects the fixed costs (α) but does not reduce the variable costs (β).[6] This assumption has a logical basis as shown in the following literature. Konan and Maskus (2002), Kalirajan (2000), and Francois and Hoekman (2009) divided regulations in two types: rent-creating regulations that restrict the entry of new firms by increasing the company's fixed costs (type I); variable cost-escalating regulations that cause inefficiencies in production by limiting the entry of more efficient providers (type II). Type I regulations are likely to be related to the differentiated or KIS under monopolistically competitive environments, while type II regulations are more associated with the standardized services. Dee (2005) conducted an empirical survey and showed that the regulations in the business and entertainment service sectors have the characteristic of rent-creating (type I), while the regulations in the travel, retails and telecommunication service sectors have cost-escalating characteristic.

Applying the profit-maximizing ($MR = MC$) and zero-profit ($p = AC$)

[6] When we focus on the knowledge-intensive services that can be provided at a very low marginal cost once the initial knowledge is acquired, this assumption is realistic. In a more general term, we can say that the effects of deregulation on the variable costs are small enough to be neglected.

conditions under monopolistic competition, price per variety (p), output (y, or equivalently consumption c), and the number of varieties (N) are determined by solving the following two equations.

$$MR = MC : p\left[1-\frac{1}{\sigma}\right] = \bar{\beta}, \text{ or } \quad p = \bar{\beta}\left[\frac{\sigma}{\sigma-1}\right] \tag{1}$$

$$p = AC : p = \frac{\alpha}{y} + \bar{\beta} \quad \text{or} \quad p = \frac{\alpha}{\bar{L}c} + \bar{\beta} \tag{2}$$

Here σ, the elasticity of substitution between varieties, is also equal to the elasticity of demand from the nature of CES utility function if N is large enough (Feenstra, 2004). From equations (1) and (2),

$$p = \bar{\beta}\left[\frac{\sigma}{\sigma-1}\right] = \frac{\alpha}{y} + \bar{\beta}, \text{ and thus}$$

$$y^* = \frac{\alpha}{\bar{\beta}}(\sigma-1) \tag{3}$$

Now we employ a full-employment condition in the economy to determine the equilibrium number of varieties, which is stated as:

$$\bar{L} = \sum_{i=1}^{N} L_i = \sum_{i=1}^{N} (\alpha + \bar{\beta} y_i) = N(\alpha + \bar{\beta} y) = N(\alpha + \bar{\beta}\bar{L}c),$$

from which it follows that:

$$N = \bar{L}/(\alpha + \bar{\beta} y) \quad \text{or} \quad N = \bar{L}/(\alpha + \alpha^2 \bar{\beta}/p). \tag{4}$$

Substituting y^* for y in equation (4), we obtain the equilibrium N:

$$N^* = \frac{\bar{L}}{\alpha\sigma}. \tag{5}$$

Now we suppose a situation where fixed costs (α) decrease by deregulation. Then, we can see the output per variety (y) decreases from equation (3), and the number of varieties increases from equation (5). Supposing that a variable R denotes regulation or restrictiveness intensity, we consider an arbitrary concave function for fixed costs with respect to R:

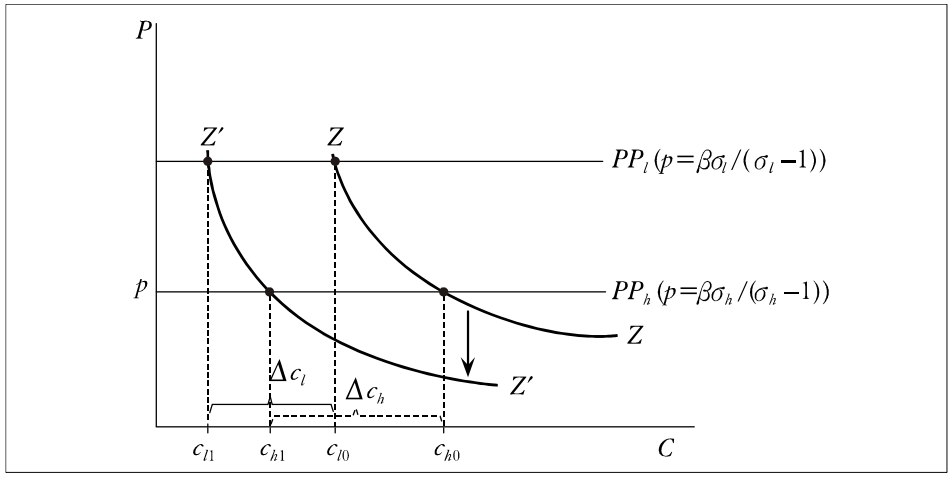
$$\alpha(R) = R^{\mu} (0 < \mu < 1 \quad \text{and} \quad R > 1), \tag{6}$$

where μ denotes the elasticity of fixed costs with respect to change in regulation restriction. Then, the effect of deregulation on the equilibrium y can be expressed as follows:

$$\frac{\partial y}{\partial R} = \frac{(\sigma - 1)}{\bar{\beta}} \alpha(R) = \frac{(\sigma - 1)}{\bar{\beta}} \mu R^{\mu - 1}. \tag{7}$$

Thus, change in y (i.e., intensive margin) depends on the parameters μ and σ. Given the certain value of the elasticity of substitution (σ), the higher μ is, the larger changes in y. However, the magnitude of reduction in y after deregulation is limited when the elasticity of substitution is small. The higher the level of service differentiation, the smaller the elasticity of substitution is. Thus, we infer that the knowledge-intensive services that are highly differentiated with small σ show a relatively small change in per variety production, y (and consumption, c). The smaller change in output (or consumption) per variety, the more likely the market share is maintained under competitive environments.

[Figure 1] Effects of Deregulation



This discussion can be illustrated by Figure 1. Equation (1) is depicted as a schedule PP under the assumption of constant σ, while equation (2) is graphed as the downward sloping line ZZ. We separately graph the PP schedule with a large $\sigma(PP_h)$ and a small $\sigma(PP_l)$. Suppose that an open economy currently faces the equilibrium consumption and price of each variety at the level of $c_{h0}(c_{l0})$ and p, respectively. If a deregulation shock reduces fixed costs from α to α', then the ZZ

curve will move down to $Z'Z'$ as average costs fall. As a result, the equilibrium consumption falls to c_{h1} if σ is large. When σ is small, on the other hand, y (or c) changes from c_{l0} to c_{l1}. The size of the change is smaller than that of the case with a large $\sigma(\Delta c_l < \Delta c_h)$.

Similarly, the effect of deregulation on equilibrium N is obtained from (5) as follows:

$$\frac{\partial N}{\partial R} = -\frac{\bar{L}}{\sigma}\mu R^{-\mu-1} \quad (\sigma > 1, 0 < \mu < 1) \tag{8}$$

The equation (8) shows the elasticity of the number of varieties with respect to change in regulatory restriction has a negative sign and the change in N depends on the parameters μ and σ. The higher μ is, the greater change in the number of varieties after deregulation. This implies that a larger elasticity of fixed costs with respect to regulatory stringency leads to a larger elasticity of the number of varieties with respect to change in regulatory restriction. Returning to equation (7), the higher μ leads to the greater reduction in y for each variety. Thus, we may conclude that μ is a relevant parameter to the diversification of service products (i.e., increasing the number of varieties and reducing the amount produced per variety). Regarding the elasticity of substitution (σ), the smaller σ is, the larger increase in the number of varieties with respect to deregulation. The small σ is a characteristic of the differentiated or knowledge-intensive services. Therefore, we may infer that the differentiated or knowledge-intensive services have a stronger extensive margin (increase in varieties) effect of deregulation than standardized services.

In summary, regulatory reforms reduce fixed costs and, in turn, increase the number of varieties. The size of the effect depends on how fast fixed costs go down (μ) as the level of regulation drops and the characteristics of services exported (σ). It is also noticeable that price doesn't change by deregulation in our framework. Thus, in the differentiated service sectors with a small σ, the deregulation provides an opportunity for incumbent service providers to increase varieties without losing the mark-up pricing power and the market shares.

So far, we have considered the equilibrium for a single economy. Now we analyze the effects of deregulation on service exports. The feature of the monopolistic competition model is that it has more goods than factors allowing for complete specialization in different product varieties across countries. In this case, it turns out that trade patterns can be described by a remarkably simple equation called the "gravity equation", which states that the bilateral trade between two countries is directly proportional to the product of the countries' GDPs (Feenstra, 2004). As the monopolistic competition model well fits the knowledge-intensive services as discussed above, the gravity equation can also be directly applied to trade

in knowledge intensive services. When there are border effects, such as transport costs or tariffs, then prices are no longer equalized across countries, so the pattern of trade becomes more complex.

We suppose a gravity equation that is constructed following the example of Redding and Venables (2000), which is stated as:

$$X_{ij} = \frac{Y_i Y_j}{(p_i)^{\sigma} y_i}\left[\frac{T_{ij}}{P_j}\right]^{1-\sigma}, \tag{9}$$

where X_{ij} is the total value of exports from country i to country j, Y_i and Y_j are incomes of country i and j, respectively. p_i and y_i are the price and output of export product from country i, respectively, and T_{ij} is trade costs between country i and j. And when there are exporting countries as many as C,

$$(P_j)^{1-\sigma} = \sum_{i=1}^{C} N_i (T_{ij} p_i)^{1-\sigma} \tag{10}$$

In equation (10), we substitute $\frac{\bar{L}}{R_i^{\mu}\sigma}$ (from equations (5) and (6)) for N_i; then, we take the partial derivative to obtain the following relation:

$$\frac{\partial P_j^{(1-\sigma)}}{\partial R_i} = -\mu \frac{\bar{L}}{\sigma}(T_{ij} p_i)^{(1-\sigma)} R_i^{-(\mu+1)} \quad (<0) \tag{11}$$

Using equation (11), we can suppose an arbitrary formula for P_j in an extremely simple form: $P_j = R_i^{\tau}(\tau > 0)$. It is noticeable that τ has a negative relationship with μ while a postive one with σ. By substituting R_i^{τ} and $\frac{R^{\mu}}{\beta}(\sigma - 1)$ for P_j and y_i, respectively, in equation (9) and log-transforming it yields the following equation of the bilateral trade flows from country i to j:

$$\ln X_{ij} = \ln Y_i Y_j - \sigma \ln T_{ij} - \mu \ln R_i + \tau(\sigma - 1)\ln R_i + C \tag{12}$$

The sign of $-\mu$ is negative and $\tau(\sigma - 1)$ is positive. First, the term, $-\mu$ depicts the effect of increased varieties - we call it IV effect. The IV effect means the service diversification caused by regulatory reform and innovation. The term, $\tau(\sigma - 1)$ presents the effect caused by decrease in the overall price level of country j (i.e., P_j) - we call it DP effect. The net effects of them – the IV and DP effects - would consequently appear in the form of change in export volume. The size of the DP effect depends on the size of parameter τ and, in turn, τ depends on μ and σ: the higher μ and lower σ, the smaller magnitude of the DP effect. Since

P_j means overall price level in importing country j, the decline of P_j can be interpreted as a sort of collective behavior of competitors to cut their service prices. Therefore, the DP effect generated by the falling P_j may be small in the differentiated service sectors (with relatively large μ and small σ compared to standardized services) where demands are not much sensitive to changes in price. For example, for financial, intellectual property, business, and engineering services, which are considered as differentiated services, the quality of service (or new services) is more important than the price to consumers; therefore, the imitation of competitors is not easy, and thus competitors' strategy to respond to innovation by lowering the price is relatively less effective. As a result, in the differentiated sectors, the IV effect is highly likely to dominate the DP effect, and the overall positive effects of regulatory reform (a decrease in regulation intensity index) on service exports will appear in the exporting country.

Now, we consider the effects of deregulation in importing countries. Here we suggest a mechanism to explain how importers' deregulations affect service trade. We also show that the trade-promoting effects of importers' deregulation are relatively weak or unclear than those of exporters' deregulation. To this end, we simply regard market regulation in importing countries as entry barriers to foreign service suppliers. Thus, foreign firms face different trade costs from local firms due to regulation. Then, T_{ij} with deregulation effects in equation (9) (denoted as T_{ij}^*, the trade costs between countries i and j) can be expressed with the regulation of importing country j as follows:

$$T_{ij}^* = h(R_j)T_{ij}, \text{ where } h \le 1 \text{ and } h' > 0. \tag{13}$$

First, we imagine an extreme case where deregulation in country j lowers the trade costs of all foreign firms and, in turn, their prices all go down to be a specific level, P_j^*. The new overall price level of country $j(P_j^*)$ can then be expressed as the following: $(P_j^*)^{1-\sigma} = w(R_j)(P_j)^{1-\sigma}$ ($w \le 1$ and $w' < 0$). As seen in equation (9), the effect casued by a decrease in T_{ij} is exactly offset by decrease in P_j (i.e., $h = w^{1/(1-\sigma)}$), eventually having no effect on trade flows between coutries i and j. Secondly, we imagine another extreme case where the effects of deregulation in country j go only to county i among a large number of exporters (i.e., $h < w^{1/(1-\sigma)}$). Then, P_j is almost unchanged, and T_{ij} falls enough to increase exports from country i to j. Finally, reverse case can be supposed where the effects of deregulation in country j exclusively go to country i's competitors (i.e., $h > w^{1/(1-\sigma)}$). Then, exports from country i to j will decrease.

What makes the outcome of deregulation different is the interaction of service characteristics with exporters' capability to exploit the new and less regulated markets. For example, in the legal service industry, lowering entry barriers does not

necessarily bring more foreign competitors in the market. This is because non-regulatory factors that influence a consumer's choice, such as established networks, cultural familiarity, and institutional similarity (e.g., legal system), would be more important for trade in differentiated services. If that is the case, then the effects of deregulation in the importing country go only to a limited number of countries (or firms) who are able to exploit such advantages.

Next, we consider the following arbitrary formulas for h and w regarding the regulation intensity of country j in the simplest form:

$$h = R_j^{\theta}(\theta > 0) \quad \text{and} \quad w^{1/(1-\sigma)} = R_j^{\omega}(\omega > 0) \tag{14}$$

Based on the above reasoning, we transform P_j to incorporate the importer's deregulation effects as follows:

$$P_j = R_j^{\omega} R_i^{\tau}, \tag{15}$$

where $\omega > 0$ and $\tau > 0$. By substituting $R_j^{\theta} T_{ij}$ and $R_j^{\omega} R_i^{\tau}$ for T_{ij} and P_j, respectively, equation (9) is transformed into the following linear equation:

$$\ln X_{ij} = \ln Y_i Y_j - \sigma \ln T_{ij} - \mu \ln R_i + \tau(\sigma - 1) \ln R_i + (\omega - \theta)(\sigma - 1) \ln R_j + C \tag{16}$$

This equation implies that the effects of deregulation in importing countries are determined by $(\omega - \theta)(\sigma - 1)$ term. For $(\omega - \theta)(\sigma - 1)$ term to be negative (i.e, for deregulation in j to have positive effects on i's exports), θ must be larger than ω. This means that the decrease in trade costs between countries i and j should be larger than the decrease in overall price level of the importing country. According to our model, the export-promoting effects of importer's deregulation are likely to be offset by the negative effects of a fall in overall price level, especially for differentiated or knowledge-intensive services. Comparing the exporter's deregulation effects, $(-\mu + \tau(\sigma - 1))$, with importer's one, $(\omega - \theta)(\sigma - 1)$, it is more likely that the former is larger than the latter, given a small σ (i.e., in differentiated services). Thus, we may conclude that the effects of exporters' deregulation are relatively stronger and clearer than those of importers' deregulation, particularly in differentiated services.

III. Econometric Model and Data

3.1. Econometric Model

Based on equation (16), we construct an augmented gravity equation. As discussed above, generally accepted determinants for commodity trade - economic size, distance, cultural commonality and the quality of institutions - are also applicable for trade in services (Marel and Shepherd, 2013). Control variables include variables that are commonly used such as national income (GDP), geographic distance, and favorable regional trade agreements. We additionally consider FDI as a control variable to incoporate the chrateristics of service exports that require local commercial presence. The equation to be estimated is stated as:

$$\ln X_{ijt} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln FDI_{ijt} + \beta_4 \ln Dist_{ij} + \beta_5 Lang_{ij} + \beta_6 \ln R_i + \beta_7 \ln R_j + \beta_8 \ln RTA_{ijt} + \beta_9 yr_t + \varepsilon_{ijt} \quad (17)$$

X_{ijt} : Export volume from country i to country j at time t
$Y_{it}(Y_{jt})$: GDP of country i (j) at time t
FDI_{ijt} : FDI outflows from country i to country j at time t
$Dist_{ij}$: Geographical distance between country i and country j
$Lang_{ij}$: Dummy for common language between i and j (1 if common language exists, 0 otherwise)
$R_i(R_j)$: Regulation intensity index of country i (j)
RTA_{ijt} : Dummy for regional trade agreement (RTA) at time t (1 if RTA is in effect, 0 otherwise)
yr_t : year dummy to control for deflator, business cycle, etc.
ε_{ijt} : random error term

Bilateral service export flows (X_{ijt}) are measured at aggregate and sectoral levels. Among the service sectors of which trade data are available, we select representative knowledge-intensive services (insurance, business, and cultural and recreation services) as well as some other services (travel, communication and construction services) for the purpose of comparison. The coefficient β_6 for the regulation variable of exporting country (R_i) is expected to show a negative sign, indicating that higher regulatory level is associated with smaller-scale exports. What should be noted is that the coefficient β_6 shows only the sum of the IV and DP effects, but not presenting the two effects separately. Thus, the etimate of β_6 cannot explain how the IV and DP effects interact in detail. Nevertheless, we can infer the different machanism by comparing the etimates of β_6 between the differentiated or

knowledge-intensive services and the standardized services. Given our theoretical framework based on the IV and DP effects, the negative sign of coefficient β_6 is hardly expected to be found from standardized services. The coefficient of the importing country's regulation (β_7) is also expected to show a negative value. The magnitude of β_7 is expected to be smaller than β_6, particulary in the differentiated service sectors. The coefficients of GDP variables (β_1, β_2) are expected to be positive. The coefficient of FDI (β_3) would be positive if the FDI and export are complementary, otherwise negative. We expect a postive sign in the sub-sectors where local commercial presence is required to export services. Since geographical distance increases transaction costs, the sign of the coefficient β_4 is predicted as negative. The coefficient of a common language dummy variable (β_5) is predicted to be a positive sign because export transactions are facilitated when there exists a common language. The coefficient of RTA (β_8) is also expected as a positive value in that trade agreements would reduce transaction costs by lowering trade barriers.

3.2. Data

Countries used in the analysis include OECD 32 exporting[7] and 35 importing countries.[8] All the data are yearly and span from 2005 to 2011. The value of service imports and exports (X_{ij}) is extracted from the bilateral trade flow in the OECD database. Not only aggregate level data, but also selective sectoral level data[9] are used. For economic size, the amount of nominal GDP of World Development Indicators (WDI) by the World Bank is used. Regional trade agreements data are constructed, using De Sousa (2012). Other control variables such as geographic distance and common language are extracted from the CEPII database. FDI data is from the OECD bilateral FDI statistics, and a three-year moving average is used. As for regulation intensity indexes, the World Bank's overall Services Trade Restrictions Index (STRI)[10] is used as a benchmark case. In addtion, as robustness checks, we make use of alternative measures for the sectoral regulation intensity

[7] Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Rep., Luxembourg, Mexico, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Turkey, the U.K., the United States.

[8] Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Indonesia, Ireland, Israel, Italy, Japan, Korea, Rep., Luxembourg, Mexico, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, the U.K., the United States.

[9] Travel, communication, construction, insurance, business, and cultural and recreational service sectors are selected for sectoral analysis.

[10] Extracted from http://iresearch.worldbank.org/servicetrade/ (as of May2015).

variables from either the OECD Services Trade Restrictiveness Index (STRI)[11] or the World Bank's STRI sectoral indexes.

IV. Estimation Results

Table 2 presents the estimation results of equation (17) using the STRI overall index of the World Bank database. We first applied both the fixed and random effect models and conducted the Hausman test. The results indicated that the estimates obtained from the random effect method are likely to be biased.[12] Therefore, we use the Hausman-Taylor method instead to obtain consistent coefficient estimates of the regulation variables which are time-invariant.[13] The signs of the coefficients for control variables are largely consistent with the theoretical expectation explained in the previous section. First, the coefficients of GDP have a positive value for almost all cases in question – aggregate service exports, travel, construction, insurance, finance, business and recreation service exports, showing statistical significance at the 1% level. Only exporter's GDP in the communication sector failed to show a significant coefficient. The coefficients of FDI show a positive sign for construction, insurance, business, and recreation services, implying that these service exports depend on local commercial presence. Only the FDI coefficient of construction services was estimated with a statistical significance and a relatively large magnitude. This result may indicate that the construction service exports more heavily depend on local presence (or production) compared to the other service sectors in question. The coefficients on distance and common language show significant and expected signs. The coefficients of RTA are puzzling: negative values for aggregate and communication services, and no statistically significant estimates for the other service sectors. This may be due to the relative lack of service liberalization of RTAs in force. Even if a RTA is signed between two countries, if services are kept aside in the agreement, the RTA does not

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[11] The index was extracted from http://stats.oecd.org/ (as of May 2015).

[12] From the fixed effect method, we cannot obtain the estimates of regulation variables because they are time-invariant.

[13] Following Walsh (2008), we regard year dummies as the only time variant exogenous variable while distance and common language are considered time invariant exogenous variables. GDP and RTA dummy are chosen as time variant endogenous variables. The endogeneity of GDP and RTA cannot be excluded due to the possibility that increase in service trade would facilitate economic growth and lead to preferential trade agreement for more favorable trade environment. In addition, service exports often require local commercial presence that leads to FDI. Therefore, both of these flows can be endogenous and interdependent. The regulation intensity variables are possibly correlated with the error term if there exists a bidirectional causality. However, an aggregate regulation indicator can be considered endogenous to service exports only to a limited extent. The claim of endogeniety of an aggregate regulation indicator to developments in service trade appears implausible (Schwellnus, 2007). Therefore, we treat regulation intensity variables as exogenous.

necessarily lead to an increase in service trade (Guillin, 2013).

The estimated coefficients of exporter regulation are negative and significant in the construction, insurance, business and recreation services as well as aggregate services. In contrast to the differentiated or knowledge-intensive services, travel and telecommunication services failed to show a positive and significant impact of deregulation on exports. These results are in line with our theoretical model (IV and DP effects model). We claim that deregulation in exporting country promotes its exports by the IV effect: the service diversification caused by innovation and regulatory reform. However, the IV effect is somewhat offset by the DP effect: decrease in the overall price level of importer. The DP effects of differentiated services are smaller than those of standardized services are, according to our model. As a result, export-promoting impacts of exporting country's deregulation are more pronounced in differentiated services than in standardized services.

The coefficients of regulation index for importers are negative as expected for aggregate and all the sub-sectors in question and the estimates are all significant at the 1% level, except for the construction services. It is noteworthy that the estimated coefficients on exporting country's regulation are systemically of larger magnitude than those of importing country's regulation in insurance, business, and recreation services. These results strongly support our argument that the export-stimulating impacts of market deregulation would be greater than import-increasing impacts for the differentiated or knowledge-intensive services. The estimate of coefficient on importer's deregulation in construction services is insignificant and near-zero. This result may be due to the complex characteristics of construction services that entail local production (physical construction).

We can summarize the above results as follows. Variables that are already known to affect commodity trade such as economy size, distance, and cultural homogeneity are confirmed to have a similar role in service exports as well. It is also notable that the effects of changes in exporter regulation (or deregulation) vary over sectors; the differentiated service sectors such as insurance, construction, business, and recreation services show a relatively pronounced effect, while travel and communication services demonstrate relatively unclear or weak effects. These results can be explained by the characteristics of the service sectors.[14]

[14] To test the appropriateness of the Hausman-Taylor method, we conduct the Hausman-Taylor over-identification test for the total service export estimation as a representative case. The test statistic of 8.921 (p-value = 0.178) is less than the critical chi-squared value with six degrees of freedom even at 10 percent significance, so the null hypothesis that the unobserved effects are correlated with other regressors is not rejected. This confirms the validity of the Hausman-Taylor method.

[Table 2] Regression Results: World Bank's STRI Overall Index

VARIABLES	(1) ltotal	(2) ltravel	(3) lcom	(4) lconst	(5) lins	(6) lbusi	(7) lrec
lgdp_exporter	0.788***	0.940***	0.116	1.780***	1.267***	1.355***	1.492***
	(0.060)	(0.065)	(0.173)	(0.263)	(0.132)	(0.112)	(0.225)
lgdp_importer	0.725***	0.531***	0.991***	1.087***	0.416***	0.812***	0.982***
	(0.043)	(0.048)	(0.117)	(0.209)	(0.133)	(0.075)	(0.150)
lfdi	0.002**	-0.002*	-0.004	0.012**	0.003	0.002	0.005
	(0.001)	(0.001)	(0.003)	(0.006)	(0.003)	(0.002)	(0.004)
rta	-0.268**	0.109	-1.330***	-0.007	0.172	-0.080	0.547
	(0.126)	(0.127)	(0.330)	(0.732)	(0.366)	(0.196)	(0.543)
ldist	-0.813***	-0.707***	-1.495***	-1.121***	-0.565***	-0.919***	-0.733***
	(0.054)	(0.065)	(0.145)	(0.235)	(0.142)	(0.086)	(0.198)
comlang_off	0.990***	1.308***	0.806*	0.404	1.809***	0.841***	1.361***
	(0.153)	(0.194)	(0.426)	(0.450)	(0.326)	(0.257)	(0.484)
r _ovr_exporter	-0.017*	-0.014	0.056**	-0.133***	-0.062***	-0.086***	-0.100***
	(0.010)	(0.012)	(0.028)	(0.030)	(0.020)	(0.016)	(0.033)
r _ovr_importer	-0.023***	-0.031***	-0.037***	0.009	-0.031***	-0.023***	-0.038***
	(0.004)	(0.005)	(0.010)	(0.011)	(0.008)	(0.006)	(0.012)
Constant	7.464***	5.386***	13.337***	-12.147***	-0.998	-0.959	-10.271***
	(0.966)	(1.066)	(2.562)	(4.156)	(2.345)	(1.642)	(3.692)
Observations	3,393	3,281	2,492	2,036	2,556	2,796	2,087
Number of pairid	520	518	414	361	445	458	368
Method	HT	HT	HT	HT	HT	HT	HT

Note: Dependent variables are log of the amount of total service exports (ltotal), travel services (ltravel), communication services (lcom), construction services (lconst), insurance services (lins), business services (lbusi) and cultural and recreation services (lrec), respectively. lgdp_exporter, lgdp_importer, lfdi, ldist, comlang_off, and rta denote exporter GDP in log, importer GDP in log, FDI in log, distance in log, sharing common language, and regional trade agreement, respectively. r_ovr_exporter and r_ovr_importer are the World Bank service trade restrictions overall indexes (STRI) of exporter and importer, respectively. HT means the Hausman-Taylor method.

§Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Our theoretical model claims that deregulation by exporter promotes its exports by the IV effect - the service diversification caused by innovation and regulatory reform. But, the IV effect is somewhat offset by the DP effect - decrease in the overall price level of importer. On the contrary, travel and communication services, which are often standardized with referable market prices, allow suppliers to compete on lower prices rather than on service differentiation, yielding a substantial magnitude of the DP effect that cancels out the IV effect. Another distinct feature is that the effects of exporters' regulation are larger than importers' regulation, especially in differentiated service sectors. These results strongly support our

argument that deregulation in exporting countries plays a pivotal role in promoting service exports

V. Robustness Checks Using Alternative Indexes

In this section, we check the robustness of the results obtained in the previous section, using alternative sectoral regulation intensity indexes. Table 3 presents the estimation results obtained by replacing the World Bank STRI overall index with available sector-specific regulation indexes for the selected sectors. As for travel services, OECD STRI courier regulation index is used. We also make use of the World Bank STRI telecommunication, retail, finance, and professional service indexes for the communication, insurance, business, and recreation service sectors, respectively. The estimates are largely similar to those obtained with the overall STRI index. The robust negative relationship between regulation index and exports is confirmed in the differentiated or knowledge-intensive sectors such as construction, insurance, business, and recreation service sectors. In contrast, the exporter's regulation in travel and telecommunication services shows a positive or neutral relation with exports. This would be the case that the IV effect is offset (or overwhelmed) by the strong DP effect. As for the importer's regulation, the coefficients are all significant and negative except for construction services. The coefficient estimates of exporter's regulation for the differentiated services, such as in insurance, business, and recreation services are substantially larger than those of importer's regulation. In general, we can confirm that the estimation results are not sensitive to the choice of proxy for regulation intensity indexes.

[Table 3] Regression Results: Sector-specific Index

VARIABLES	(1) ltravel	(2) lcom	(3) lconst	(4) lins	(5) lbusi	(6) lrec
lgdp_exporter	0.939***	0.124	1.668***	1.204***	0.999***	1.516***
	(0.042)	(0.171)	(0.248)	(0.120)	(0.065)	(0.223)
lgdp_importer	0.676***	1.008***	1.109***	0.399***	0.980***	1.089***
	(0.041)	(0.118)	(0.209)	(0.134)	(0.068)	(0.144)
lfdi	-0.001	-0.004	0.012**	0.003	-0.001	0.006
	(0.001)	(0.003)	(0.006)	(0.003)	(0.002)	(0.004)
rta	-0.051	-1.434***	-0.216	-0.179	-0.115	0.511
	(0.099)	(0.347)	(0.687)	(0.388)	(0.171)	(0.541)
ldist	-0.905***	-1.360***	-1.163***	-0.493***	-1.101***	-0.932***
	(0.060)	(0.147)	(0.247)	(0.131)	(0.072)	(0.195)
comlang_off	1.148***	0.871*	0.302	2.126***	0.852***	1.107**
	(0.180)	(0.445)	(0.475)	(0.325)	(0.231)	(0.464)

r_ltravel_exporter	1.860***					
	(0.445)					
r_ltravel_importer	-1.261***					
	(0.313)					
r_lcom_exporter		-0.000				
		(0.011)				
r_lcom_importer		-0.030***				
		(0.008)				
r_lconst_exporter			-0.027***			
			(0.010)			
r_lconst_importer			0.004			
			(0.006)			
r_lins_exporter				-0.036***		
				(0.013)		
r_lins_importer				-0.029***		
				(0.008)		
r_lbusi_exporter					-3.002***	
					(0.596)	
r_lbusi_importer					-1.033***	
					(0.370)	
r_lrec_exporter						-0.080***
						(0.018)
r_lrec_importer						-0.025**
						(0.010)
Constant	4.204***	12.705***	-12.591***	-1.644	1.922*	-8.400**
	(0.717)	(2.682)	(4.182)	(2.229)	(1.164)	(3.594)
Observations	4,937	2,492	2,036	2,556	4,412	2,087
Number of pairid	806	414	361	445	741	368
Method	HT	HT	HT	HT	HT	HT

Note: r_ltravel_exporter (importer) is OECD STRI courier regulation index. In the same way, the Word Bank STRI telecommunication, retail, finance and professional service indexes are used for r_lcom_exporter (importer), r_lconst_exporter (importer), r_lins_exporter (importer) and r_lbusi_exporter (importer), respectively. r_lrec_exporter (importer) also uses the Word Bank STRI professional service index. HT means the Hausman-Taylor method.

§ Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

VI. Conclusions and Policy Implications

We attempted to build a theoretical framework in the first half of the paper to analyze the impacts of deregulation (or regulatory reforms) on service trade. The framework entails two core claims. First, the export-promoting effects of deregulation in exporting country vary across sub-sectors and they are relatively clear and strong in differentiated or the knowledge-intensive services compared to standardized services. The export-stimulating effects of deregulation in exporting

country are realized by the increase in service varieties produced, which is helped by innovation. Secondly, especially in differentiated services, the import-expansion by deregulation in importing country is of the smaller magnitude than the export-expansion of regulatory reform in exporting country. Due to non-regulatory barriers or price competition, deregulation in importing country does not necessarily lead to an increase in service imports.

These arguments were empirically tested and confirmed in the latter half of the paper: the lower regulatory intensity of exporting country is associated with the greater volume of aggregate service exports. This relationship is also found in differentiated services such as construction, insurance, business, and recreation services. In contrast, such negative relationship was not affirmed for travel and communication services that are less likely to have differentiated product characteristics. It is also empirically affirmed that, in insurance, business, and recreation services, the impacts of deregulation in exporting country are larger than those of importing country. This result implies that imposing more restrictive regulation to foreign services providers would discourage service exports more than service imports.

Our findings offer a theoretical and empirical foundation to policy makers who push forward deregulation policies in order to foster domestic service industry as a global market player. It is well highlighted that regulatory reforms would play a key role in the development process of high value-added services such as finance, business, and cultural and recreation services, which are of special importance for innovation in services and economic transformation not only in developing countries but also in industrialized countries including South Korea. We provided the sophisticated rationale and objective evidence for the positive effects of market deregulation on service exports, which is much needed for governments to successfully implement regulatory reforms, given the vehement resistance of well-entrenched, privileged groups or rent-seekers. On the other hand, our results of the sectoral analysis imply that deregulation is not always good for service industry development as an export industry. The deregulation policy must be carefully designed so as not to cause excessive price-driven competition.

Finally, some limits of the paper should be pointed out for future research. First, we considered only the five sub-sectors, which are grouped into Modes 2 or 3 of the GATS. The examination about the other service sectors and supply modes would lead to further understanding on the role of regulatory barriers in the industrial development context. In addition, as for sectoral analysis, overall indexes for market regulation may fail to properly proxy for sector-specific regulation policy. It is left for future research to employ more sector-specific and appropriate regulation indexes as proxy for the intensity of regulatory barriers.

Appendix: Data Summary

[Table A1] Summary Statistics of the Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
lgdp_exporter	7874	12.878	1.472	9.402	16.523
lgdp_importer	6750	13.236	1.479	9.402	16.523
lfdi	6684	5.743	6.024	-1.099	18.012
ldist	7887	8.121	1.149	4.088	9.870
comlang_off	7887	0.079	0.269	0.000	1.000
r_ovr_exporter	6142	19.182	4.900	11.000	29.500
r_ovr_importer	5574	23.135	10.750	11.000	65.700
rta	7182	0.584	0.493	0.000	1.000

[Table A2] Correlation of the Variables

	lgdp_ exporter	lgdp_ importer	lfdi	ldist	comlang _off	r_ ovr_ exporter	r_ ovr_ importer	rta
lgdp_exporter	1.000							
lgdp_importer	0.009	1.000						
lfdi	0.290	0.124	1.000					
ldist	0.080	0.269	-0.031	1.000				
comlang_off	0.069	0.049	0.076	-0.054	1.000			
r_ovr_exporter	0.177	0.018	0.117	0.066	-0.094	1.000		
r_ovr_importer	0.028	0.135	0.006	0.361	-0.002	-0.013	1.000	
rta	-0.175	-0.506	-0.105	-0.710	-0.014	-0.037	-0.465	1.000

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