International Trade in Services and the Role of English

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This paper attempts to investigate to what extent English proficiency can boost international trade in services. To achieve this purpose, this paper estimates the determinants of services trade including language variables with the aggregated and disaggregated data for nine different subsectors of OECD countries. The empirical tests are based on a theory-based gravity model derived from Anderson and von Wincoop. The findings show that English proficiency has a significant influence on services trade, while other languages such as French and German have only weak and mixed effects. In particular, communication, financial, commercial, insurance, and business services are revealed to be the most impacted by the level of English proficiency. The results imply that governments can use their English policies to promote international trade in services.

Keywords: International Trade in Services; Trade Policy; English Proficiency; Gravity model; Anderson and von Wincoop model
JEL Classification: F13, F14, F15

I. Introduction

Easier communication promotes bilateral trade whether it is domestic or international. Therefore, almost all empirical studies using the gravity equations places a common language dummy variable in their models. Anderson and van Wincoop (2004) review those findings in the existing gravity literature such as Eaton and Kortum (2002) and Hummels (1999). They estimate a tax equivalent associated with speaking different languages to be about 7 percent, while policy barriers such as tariffs and NTBs are estimated at 8 percent. Although the influence of language on trade is significant, as seen in the existing literature, most studies have concentrated on direct policy measures such as tariffs and NTBs, paying little attention to language effects.1

1 The reason may be in the basic understanding that languages are indigenous and unchangeable,
Different from most existing studies which simply put the common language dummy in their gravity models, Hutchinson (2002), Meliz (2008), and Fidrmuc and Fidrmuc (2010) investigate further the effects of language on international trade. Hutchinson (2002) analyzes influence of English on US’s goods trade, pointing out that English proficiencies of trading partners have a significant impact on US’s trade. However, this research is limited only to the case of the US, where English is a native language. Therefore, it is still questionable whether English also plays an important role not only as a native language but also as an international language in global trade. Melitz (2008) focuses on the channels by which common language can boost bilateral trade. His paper concludes that the use of common language can promote international trade as a means of not only direct communication but also translation. Despite its dominant status as a world language, his findings illustrate that English is less influential in boosting bilateral trade than other European languages such as French or German. The scope of this research, however, is confined to native languages of European countries, focusing only on the use of mother tongues other than foreign languages. Fidrmuc and Fidrmuc (2010) analyze whether the main European languages such as English, French, and German can have a significant influence on the aggregate trade among European countries. They consider language skills both as a native language and as a foreign language. The results show that English has a significant effect on bilateral trade among EU member countries, whereas other European languages such as German and French show only weak and mixed results. Thereby, the study concludes that English, at least in Europe, is a main driver of international trade.

All of these studies, however, cover only the aggregate level of trade in goods. But the influence of language is expected to be much more significant in services trade since those typically require the movement of people and capital between countries and are mostly based on face-to-face business transactions (Walsh 2006; Mo 2010). Against this backdrop, this paper attempts to fill the gap in the existing literature by assessing the effects of English as a global business language on the bilateral services trade. In particular, considering the while trade policy measures can be adjustable in the short run. However, the Singaporean example provides evidence that foreign language proficiency can be utilized strategically to increase international business. Singapore adopted English as one of its four official languages after its independence in 1965, and since then has made great strides in improving the level of English proficiency in the country: the Singaporean English proficiency rate increased significantly from 56 percent in 1980 to 70.9 percent in 2000, contributing to the nation’s strategy for a global business hub (Refer to Lee (2010) for the language policy of Singapore).
idiosyncratic characteristic of the service industry where its various subsectors are largely heterogeneous, this paper analyzes the English effects at the sectoral level as well as the aggregate level. For instance, the operation of the financial or communications sectors is very different from that of transportation. This heterogeneity could give rise to different degrees of influence of English on different subsectors of services trade. To accomplish this purpose, using the theory-based gravity model of Anderson and von Wincoop (2003, 2004), we estimate the determinants of the bilateral services trade for nine different sub-sectors and total service sector of the 22 OECD member countries with their 34 different trading partners. Regarding the estimation method, we mainly use the Poisson pseudo-maximum likelihood (PPML) in order to take into account the presence of bilateral trade flows that are zero or missing from the dataset, which is common in services trade.

The results show that the OECD member countries trade more services with those countries that achieved a higher level of English proficiency. The evidence is particularly strong in such service sub-sectors as communication, finance, insurance, and commerce, which are considerably associated with face-to-face activities. The results are robust in different tests of the gravity model such as the Quantile, the year-by-year Poisson regressions, and the Poisson random-effect analysis.

The rest of the paper is organized as follows. Section 2 presents an empirical model of a theory-based gravity equation derived from Anderson and von Wincoop (2003, 2004) and describes data. In Section 3, empirical findings are provided along with the results for the robustness checks and two hypothetical simulations. Finally, Section 4 concludes by summarizing the main results and presenting policy implications.

II. Empirical Methodology

1. Empirical Specifications

The gravity model has been extensively used to examine the effects of policies such as tariff and non-tariff barriers; and institutions such as FTA and currency unions on international trade, but most empirical research has focused on goods trade. However, the gravity model can be applicable to the bilateral services trade as well (Freund and Weinhold 2002; Grunfeld and Moxnes 2003; Mirza and Nicoletti 2004; Lejour and Verheijden 2004; and Kimura and Lee 2006,
2008). In particular, Kimura and Lee (2006) show that services trade is better predicted by the gravity equation than goods trade. Those studies use various gravity specifications respectively, but for the most part, they are not based on theories. In the present paper, we attempt to use a theory-based gravity model taken from Anderson and Van Wincoop (2003, 2004). They derived a theoretically consistent gravity model of exports from economy $i$ to economy $j$ as presented in the following:

$$
\ln(X_{ij}) = \ln(E_j) + \ln(Y_i) - \ln(Y) + (1 - \sigma) \ln(\tau_{ij}) - (1 - \sigma) \ln(P_j) - (1 - \sigma) \ln(\Pi_i) + \epsilon_{ij}
$$

Where $(P_j)^{1-\sigma} = \sum_{i=1}^N \Pi_i^{\sigma-1} \omega_i (\tau_{ij})^{1-\sigma}$ denotes inward resistance and captures the fact that country $j$’s imports from country $i$ rely on trade costs across all exporters. Outward resistance $(\Pi_i)^{1-\sigma} = \sum_{j=1}^N P_j^{\sigma-1} \omega_j (\tau_{ij})^{1-\sigma}$, by contrast, captures the dependence of exports from country $i$ to country $j$ on trade costs across all importers. Other variables are defined as follows:

Where $X_{ij}$ is export from country $i$ to $j$; $E_j$ is expenditure of country $j$; $Y_i$ is output of country $i$; $Y$ is aggregate (world) output; $\sigma$ is elasticity of substitution; $\tau_{ij}$ is trade costs facing exports from country $i$ to country $j$; $\omega_i$ is country $i$’s output share; $\omega_j$ is country $j$’s expenditure share; and $\epsilon_{ij}$ is random error term satisfying the usual assumptions.

As in other gravity models, the bilateral trade costs $\tau_{ij}$ can be specified as:

$$
\ln(\tau_{ij}) = \theta_1 \ln(D_{ij}) + \theta_2 \ln(AREA_{ij}) + \theta_3 \ln(Lang_{ij}) + \theta_4 Col_{ij} + \theta_5 Cont_{ij} + \theta_6 FTA_{ij}
$$

Where $Dis_{ij}$ is the distance between the principal cities in countries $i$ and $j$; $Area_{ij}$ is the product of the land areas of countries $i$ and $j$; $Lang_{ij}$ is the probability that two randomly chosen individuals from countries $i$ and $j$ can communicate in a given language (More specific explanation about this variable is presented in Section II.2); $Col_{ij}$ is a binary dummy variable that takes a value of one if the countries have the colonial relationship and zero otherwise; $Cont_{ij}$ is a binary dummy variable that takes a value of one if both nations are adjacent each other and zero otherwise; $FTA_{ij}$ is a binary dummy variable that takes a value of one if both nations formed an FTA and zero otherwise.

By substituting equation (2) into equation (1) and including exporter and
importer fixed effects, sector fixed effects, and year fixed effects, we get our baseline estimation equation (3): The term \( \ln(Y) \) in equation (1) is common across all exporters and importers; thus, it can be captured through a constant in the regression model. The term \( \ln(E_j) + \ln(P_j) \) in equation (1) is constant across all importers for a given exporter; thus it can be captured through an importer dummy variable (importer fixed effect). The term \( \ln(Y_i) + \ln(P_i) \) in equation (1) is constant across all exporters for a given importer; thus, it can be captured through an exporter dummy variable (exporter fixed effect) (Shepherd 2010).

\[
\ln(X_{ijkt}) = \beta_0 + \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(Dis_{ij}) + \beta_4 \ln(Area_{ij}) + \\
\beta_5 \ln(Lang_{ij}) + \beta_6 Col_{ij} + \beta_7 Cont_{ij} + \beta_8 FTA_{ij} + \mu_i + \mu_j + \gamma_k + \lambda_t + \epsilon_{ijkt}
\]  

Where \( i, j, k \) and \( t \) refer to exporters, importers, industries, and years, respectively; all other variables are the same as in the previous equations (1) and (2).

The AvW Marginal Resistance (MR) terms contain the general problem of unobserved heterogeneity. Thus fixed effect methods are particularly preferred to deal with such problems. (Regarding the popularity of country-fixed effects, refer to Eaton and Kortum (2002), Helpman et al. (2007), and Shepherd (2010).

We estimate equation (3) mainly using the Poisson pseudo-maximum likelihood (PPML) in order to take into account the presence of bilateral trade flows that are zero or missing from the dataset.\(^2\) This problem can often arise in data of services trade because trades in services are not easily captured due to the various types of transactions.

2. Data Description

We use the data of services exports for our dependent variable, from 22 OECD member countries to their 34 trading partners including OECD and non-OECD countries whose English proficiency data are available. More specifically, we

\(^2\) The intuition of taking PPML method lies in the following. The first-order conditions for Poisson estimation are mathematically equivalent to those for weighted least squares of the non-linear model given by exponentiation of equation (3). Thus, the potential problem posed by taking the logarithm of zero on the left-hand side is avoided (Helble et al. 2009).
use bilateral services trade data disaggregated into nine sub-sectors: (1) communication, (2) computer and information, (3) finance, (4) insurance, (5) business, (6) commerce, (7) royalties and license fees, (8) transportation, and (9) travel. The Anderson and von Wincoop (2003, 2004) gravity model needs trade data in nominal value terms and unidirectional flow data between a pair of countries, e.g. exports from $i$ to $j$, not total trade in both directions, or the average, etc. (Shepherd 2010). These data are taken from OECD OLIS (On Line Information Service) database which assembles balance of payments data on trade in services at the most detailed partner-country level available.\(^3\)

Language data are mainly taken from Eurobarometer (2006) which surveyed people of EU member and candidate countries about their language proficiency in late 2005. On the survey, the respondents were asked to choose their mother tongue, allowing multiple entries, and up to three other languages that they speak well enough to have a conversation. These surveys are nationally representative and therefore we can use them to estimate the share of each country’s population that speaks each language. English data for non-European countries are taken from Mo (2010) which compiled English proficiency rates of some nations from the governments’ official homepages. The survey data is better than, for example, results of TOEFL tests, which are used by IMD as an index representing English proficiency of nations, because they provide a representative picture of the population. In comparison, TOEFL test results only show English skills of a partial group of people taking the exam (Fidrmuc and Fidrmuc 2010). Our data set covers more languages besides English, such as French and German, which are taken from Eurobarometer (2006) and Melitz (2008). Following earlier literature (e.g. Meliz 2008 and Fidrmuc and Fidrmuc 2010) we estimate the probability $P_{ij}$ that two randomly chosen individuals from countries $i$ and $j$ will be able to communicate in a given language by calculating the product of the average proficiency rates, $\varphi_i$ and $\varphi_j$, in the countries:

$$P_{ij} = \varphi_i \varphi_j$$

Our GDP data are sourced from the World Development Indicators Online database.\(^4\) AvW’s multilateral resistance terms effectively take care of the question of deflating prices, whether we are talking about trade values, GDP,

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\(^3\) http://stats.oecd.org/index (Accessed in November 2011).

\(^4\) http://databank.worldbank.org (Accessed in November 2011).
etc. Thus it is appropriate to use value data in nominal terms. In addition to the exclusion of price terms, AvW theory suggests that per capita GDP probably should not be systematically included in gravity models (Shepherd 2010). Thus we use GDP data in nominal terms. Data for such other variables as distance, land area, colony, and contiguity are compiled from CEPII’ Gravity Database.\(^5\) Data for FTA dummy are taken from the WTO homepage.\(^6\)

| Variable                  | Obs. | Mean   | Std.Dev. | Min   | Max   |
|---------------------------|------|--------|----------|-------|-------|
| year                      | 18279|        | 2000     | 2008  |       |
| trade (Mil.US$)           | 18279| 404.53 | 1588.49  | 0.00  | 49619.84 |
| gdp_exporter (Bil.US$)    | 18279| 1324.49| 2405.68  | 22.60 | 14400.00 |
| gdp_importer (Bil.US$)    | 18279| 1104.29| 2741.10  | 3.85  | 14400.00 |
| comlang_off               | 18279| 0.13   | 0.34     | 0.00  | 1.00  |
| comlang_eng               | 18279| 0.09   | 0.29     | 0.00  | 1.00  |
| probability_eng (%)       | 18279| 33.02  | 20.47    | 5.52  | 87.22 |
| colony                    | 18279| 0.06   | 0.24     | 0.00  | 1.00  |
| contiguity                | 18279| 0.10   | 0.29     | 0.00  | 1.00  |
| distance (miles)          | 18279| 5872.72| 5575.73  | 59.62 | 19335.40 |
| FTA                       | 18279| 0.52   | 0.50     | 0.00  | 1.00  |
| area_ex (km\(^2\))       | 18279| 1187996.00| 2758827.00| 2586.00| 9976139.00 |
| area_im (km\(^2\))       | 18279| 1588895.00| 3218962.00| 316.00| 9976139.00 |

### III. Empirical Results

#### 1. Main Results

Table 2 presents the findings for exports of total service. The columns (5) - (8) represent our baseline results which are estimated by using the Poisson

\(^5\) http://www.cepii.fr/anglaisgraph/bdd/gravity.htm (Accessed in November 2011).

\(^6\) http://www.wto.org/english/tratop_e/region_e/region_e.htm (Accessed in November 2011).
pseudo-maximum likelihood (PPML) with importer fixed effect, exporter fixed effect, year fixed effect and sector fixed effect. The estimation results show that the AvW gravity model works very well for services trade of the OECD member countries. The model explains a high proportion of the data variation with R-squared value of about 87 percent. More specifically, distance and land area reduce services trade in a way similar to goods trade. However, GDP of exporting countries does not reveal any statistically meaningful estimated coefficient, while GDP of importing countries increases services trade. This could be because services exports depend more on the per-capita GDP of exporters rather than their economic mass (GDP). Exports of services tend to arise from most advanced nations. Other gravity variables such as colony, contiguity, and FTA are found to increase services trade as expected, and those results are highly significant statistically. Finally, the communicative probability variable of English, which is of our greatest interest, shows a positive influence on services trade at one percent significance level (Column 5). The finding indicates that when English communication probability increases by one percent between trading nations, service exports can be boosted by 2.23 percent. This effect is quite significant considering that forming an FTA between trading partners is associated with about a 0.62 percent increase in bilateral services trade \( \left( e^{0.479} - 1 \approx 0.62 \right) \). Different from the effects of English, French and German exhibit negative influences on services trade, respectively (Columns (6) - (8)). In addition, the results of the pooled OLS show similar patterns (Columns (1) - (4)) in which the coefficient value of English is even greater at 4.382 with statistical significance, whereas other languages such as French and German show mixed results (Columns (2) - (4)). Forming an FTA is estimated to increase trade in services by 0.22 percent in the OLS estimation \( \left( e^{0.202} - 1 \approx 0.22 \right) \).

Now we insert the variable “common official language dummy” instead of the variable “language proficiency rate” in our estimation model.\(^8\) Table 3 shows the results of a common official language dummy by pooled OLS (Columns (1) - (5)) and Poisson regressions (Columns (6) - (10)). The findings indicate

\(^7\) The result of the Hausman test shows that the value of \( \chi^2 \) is 18.24 and the p-value is 0.0001.

\(^8\) Mo (2010) provides evidence that nations adopting English as a common official language are not necessarily consistent with those having higher levels of English proficiency. For instance, Northern European countries such as Finland and the Netherlands have not adopted English as their official language, but their proficiency in English surpasses those countries adopting English as an official language (refer to Appendix Table 1).

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Table 2. Determinants of Services Trade: Language Communicative Probability

|                     | Pooled OLS   | Poisson   |
|---------------------|--------------|-----------|
|                     | (1)          | (2)       | (3)       | (4)       | (5)       | (6)       | (7)       | (8)       |
| Distance            | -0.799***    | -0.794*** | -0.803*** | -0.802*** | -0.179*** | -0.159*** | -0.192*** | -0.172*** |
|                     | (0.235)      | (0.023)   | (0.024)   | (0.024)   | (0.033)   | (0.035)   | (0.034)   | (0.040)   |
| Prod. of land area  | 0.395***     | -0.011    | -0.013    | 0.117**   | 0.286***  | -0.138*** | -0.137*** | -0.080    |
|                     | (0.742)      | (0.037)   | (0.037)   | (0.058)   | (0.104)   | (0.024)   | (0.024)   | (0.068)   |
| GDP (Importer)      | 0.646***     | 0.645***  | 0.647***  | 0.647***  | 0.709***  | 0.707***  | 0.710***  | 0.708***  |
|                     | (0.077)      | (0.077)   | (0.077)   | (0.077)   | (0.133)   | (0.133)   | (0.133)   | (0.133)   |
| GDP (Exporter)      | 0.054        | 0.053     | 0.054     | 0.053     | 0.076     | 0.073     | 0.076     | 0.074     |
|                     | (0.137)      | (0.137)   | (0.137)   | (0.137)   | (0.182)   | (0.182)   | (0.182)   | (0.182)   |

Communicative Probability

| Language          | Pooled OLS | Poisson   |
|-------------------|------------|-----------|
|                   | (1)        | (2)       | (3)       | (4)       | (5)       | (6)       | (7)       | (8)       |
| - English         | 4.382***   | 1.502***  | 2.229***  | 0.927***  |
|                   | (0.527)    | (0.214)   | (0.546)   | (0.374)   |
| - French          | 0.004*     | 0.005**   | -0.005*** | -0.003    |
|                   | (0.002)    | (0.002)   | (0.001)   | (0.002)   |
| - German          | -0.002     | -0.005*   | -0.010*** | -0.005    |
|                   | (0.002)    | (0.003)   | (0.003)   | (0.004)   |
| Colony (0,1)      | 0.650***   | 0.648***  | 0.649***  | 0.261***  |
|                   | (0.036)    | (0.036)   | (0.036)   | (0.055)   |
|                   | 0.262***   | 0.269***  | 0.267***  |
|                   | (0.054)    | (0.054)   | (0.054)   |
|                        | Pooled OLS          |                           | Poisson          |                           |
|------------------------|---------------------|---------------------------|------------------|---------------------------|
|                        | (1) | (2)  | (3)  | (4)  | (5)  | (6)  | (7)  | (8)  |
| Contiguity (0,1)       | 0.521*** (0.042)    | 0.534*** (0.043)          | 0.516*** (0.043) | 0.528*** (0.043)          | 0.795*** (0.053)    | 0.791*** (0.053)    | 0.783*** (0.054)    | 0.786*** (0.054)    |
| FTA (0,1)              | 0.202*** (0.047)    | 0.145*** (0.056)          | 0.245*** (0.071) | 0.215*** (0.071)          | 0.479*** (0.062)    | 0.572*** (0.072)    | 0.670*** (0.082)    | 0.647*** (0.082)    |
| Imp. country FE        | yes              | yes                        | yes              | yes                        | yes              | yes                        | yes              | yes                        |
| Exp. country FE        | yes              | yes                        | yes              | yes                        | yes              | yes                        | yes              | yes                        |
| Year FE                | yes              | yes                        | yes              | yes                        | yes              | yes                        | yes              | yes                        |
| Sector FE              | yes              | yes                        | yes              | yes                        | yes              | yes                        | yes              | yes                        |
| N                      | 15855            | 15855                      | 15855            | 15855                      | 18279            | 18279                      | 18279            | 18279                      |
| R-squared              | 0.765            | 0.765                      | 0.765            | 0.765                      | 0.869            | 0.869                      | 0.870            | 0.870                      |
| Pseudo Likelihood      | -1821293         | -1819377                   | -1819626         | -1819072                   |

Notes: Robust standard errors in brackets: *** significant at 1%; ** significant at 5%; * significant at 10%.
that the use of a common official language between trading nations has a significant influence on trade in services. A careful look at the coefficient values of individual languages reveals that the English dummy has the biggest coefficient value followed by French and German, meaning that English as a common official language has the greatest effects on the services trade among the three languages. The coefficient values of English variable from pooled OLS and Poisson regressions are 0.815 and 0.884, respectively. The variable of a German dummy has a positive sign but is not significant statistically in the OLS regression, while being statistically significant in the Poisson regression. The coefficient value (0.884) of English, which resulted from the Poisson regression, means that if trading nations adopt English as their official language, the services trade can increase by 1.42 percent ($e^{0.884} - 1 \approx 1.42$).

Table 4 presents the effects of English on nine different services sectors. Among the nine sectors, the coefficient value of “communication service” is the biggest at 6.018 and is statistically significant at one percent level. This finding indicates trade in communication service is the most sensitive to English proficiency among the nine service industries. The coefficient values of the financial and commercial services are 2.958 and 2.083, respectively, and both are statistically significant at 1 percent level. In addition, for insurance services the coefficient of the English variable is revealed to be 1.476 at 1 percent significance level, and 0.509 for the business service industry at 10 percent significance level. These results make sense economically, considering that a language barrier could significantly restrict international trade in those sectors. On the other hand, in cases of “computer and information services” and “royalties and license fees,” English variables have positive signs but are not significant statistically. For the transportation industry, which is greatly affected by geographic locations rather than languages, the English variable shows a negative sign and is not significant statistically. Meanwhile, the English variable in the travel sector has a negative sign at 1 percent significance level. This result is a bit contradictory to our expectations but understandable in certain respects, considering that non-English-speaking countries such as Spain, Italy, and France are the greatest tourist attractions among OECD countries.

2. Robustness Checks

In general, services trade data tend to be much more imbalanced between nations and times, compared to the case of goods trade. Therefore, we need
|                | Pooled OLS                  | Poisson                   |
|----------------|----------------------------|---------------------------|
|                | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| **Distance**   |     |     |     |     |     |     |     |     |     |      |
|                | -0.773*** | -0.776*** | -0.796*** | -0.798*** | -0.771*** | -0.271*** | -0.258*** | -0.181*** | -0.191*** | -0.275*** |
|                | (0.023) | (0.023) | (0.023) | (0.023) | (0.023) | (0.032) | (0.033) | (0.034) | (0.032) | (0.032) |
| **Prod. of land area** | 0.049 | 0.521*** | 0.071* | 0.073* | 0.526*** | -0.132*** | -0.138*** | -0.137*** | -0.136*** | -0.134*** |
|                | (0.037) | (0.097) | (0.037) | (0.037) | (0.097) | (0.022) | (0.022) | (0.024) | (0.024) | (0.022) |
| **GDP (Importer)** | 0.651*** | 0.666*** | 0.648*** | 0.644*** | 0.667*** | 0.700*** | 0.724*** | 0.705*** | 0.701*** | 0.709*** |
|                | (0.077) | (0.077) | (0.077) | (0.078) | (0.077) | (0.124) | (0.122) | (0.133) | (0.133) | (0.122) |
| **GDP (Exporter)** | 0.076 | 0.091 | 0.052 | 0.054 | 0.090* | 0.121 | 0.096 | 0.078 | 0.086 | 0.115 |
|                | (0.137) | (0.136) | (0.137) | (0.137) | (0.136) | (0.174) | (0.176) | (0.182) | (0.181) | (0.175) |
| **Common lang. (0,1)** | 0.501*** |     |     |     |     |     | 0.747*** |     |     |     |
|                | (0.040) |     |     |     |     |     | (0.058) |     |     |     |
| - **English (0,1)** |     | 0.815*** |     | 0.831*** |     | 0.884*** |     | 0.896*** |     | 0.896*** |
|                |     | (0.057) |     | (0.057) |     | (0.082) |     | (0.080) |     | (0.080) |
| - **French (0,1)** |     | 0.251*** |     | 0.352*** |     | 0.385*** |     | 0.496*** |     | 0.496*** |
|                |     | (0.069) |     | (0.071) |     | (0.090) |     | (0.094) |     | (0.094) |
| - **German (0,1)** |     |     | 0.104 | 0.069 |     | 0.369*** |     | 0.493*** |     | 0.493*** |
|                |     |     | (0.073) | (0.073) |     | (0.094) |     | (0.091) |     | (0.091) |
Table 3. Continued

| Test                        | Pooled OLS | Poisson |
|-----------------------------|------------|---------|
|                             | (1)        | (2)     | (3)   | (4) | (5)   | (6) | (7) | (8)   | (9) | (10) |
| Colony (0,1)                | 0.491***   | 0.502***| 0.630***| 0.646***| 0.468***| -0.044   | 0.008   | 0.251***| 0.230***| -0.049 |
|                             | (0.039)    | (0.038) | (0.036) | (0.036) | (0.039) | (0.061) | (0.059) | (0.055) | (0.056) | (0.061) |
| Contiguity (0,1)            | 0.450***   | 0.508***| 0.517***| 0.512***| 0.496***| 0.453***   | 0.540***   | 0.785***| 0.746***| 0.459*** |
|                             | (0.049)    | (0.042) | (0.042) | (0.042) | (0.042) | (0.054) | (0.056) | (0.053) | (0.052) | (0.054) |
| FTA (0,1)                   | 0.071      | -0.038***| 0.202***| 0.205***| -0.039   | 0.186***   | 0.148***   | 0.488***| 0.462***| 0.136**  |
|                             | (0.049)    | (0.051) | (0.047) | (0.047) | (0.051) | (0.063) | (0.067) | (0.062) | (0.062) | (0.065) |
| Imp. country FE             | yes        | yes     | yes     | yes     | yes     | yes        | yes       | yes     | yes     | yes     |
| Exp. country FE             | yes        | yes     | yes     | yes     | yes     | yes        | yes       | yes     | yes     | yes     |
| Year FE                     | yes        | yes     | yes     | yes     | yes     | yes        | yes       | yes     | yes     | yes     |
| Sector FE                   | yes        | yes     | yes     | yes     | yes     | yes        | yes       | yes     | yes     | yes     |
| N                           | 15855      | 15855   | 15855   | 15855   | 15855   | 18279      | 18279     | 18279   | 18729   | 18729   |
| R-squared                   | 0.766      | 0.767   | 0.765   | 0.765   | 0.768   | 0.877      | 0.875     | 0.870   | 0.870   | 0.877   |
| Pseudo Likelihood           | -1713871   | -1739621| -1813659| -1811810| -1716374|

Notes: Robust standard errors in brackets: *** significant at 1%; **significant at 5%; *significant at 10%.
| Sector                  | Communication | Computer & Information | Finance | Insurance | Business | Commerce | Royalties & License Fees | Transportation | Travel     |
|------------------------|---------------|------------------------|---------|-----------|----------|----------|--------------------------|----------------|------------|
| Distance               | -0.880***     | -0.381***              | -0.538*** | 0.084     | -0.713*** | -0.191*** | -0.124                   | -0.408***      | -0.335*** |
|                        | (0.108)       | (0.131)                | (0.078) | (0.161)   | (0.071)  | (0.059)  | (0.100)                  | 0.037          | (0.045)   |
| Prod. of land area     | 0.813***      | 0.358***               | 0.471*** | -0.366    | 0.035    | 0.361*** | -0.195                   | -0.070         | -0.394*** |
|                        | (0.132)       | (0.117)                | (0.125) | (0.380)   | (0.083)  | (0.102)  | (0.137)                  | 0.108          | (0.150)   |
| GDP (Importer)         | 0.452*        | 0.673***               | 0.708*** | 1.180     | 0.681*** | 0.524*** | 0.341*                   | 0.644***       | 1.233***  |
|                        | (0.235)       | (0.241)                | (0.178) | (0.812)   | (0.163)  | (0.121)  | (0.198)                  | 0.151          | (0.200)   |
| GDP (Exporter)         | -2.101***     | 0.521                  | -0.527** | 0.590     | 0.226    | 0.391**  | 1.122**                  | 0.765***       | 0.332     |
|                        | (0.508)       | (0.636)                | (0.215) | (0.749)   | (0.358)  | (0.157)  | (0.344)                  | 0.210          | (0.377)   |
| English                | 6.018***      | 0.815                  | 2.958*** | 1.476***  | 0.509*   | 2.083*** | 0.658                    | -0.305         | -1.131*** |
|                        | (0.806)       | (0.178)                | (0.685) | (0.405)   | (0.296)  | (0.492)  | (0.826)                  | 0.872          | (0.407)   |
| Colony (0,1)           | 0.453***      | 0.898***               | -0.132  | 0.712***  | 0.551*** | 0.297*** | 0.119                    | 0.329***       | 0.502***  |
|                        | (0.157)       | (0.178)                | (0.108) | (0.205)   | (0.123)  | (0.068)  | (0.119)                  | 0.060          | (0.090)   |
| Contiguity (0,1)       | 0.195         | 0.306                  | -0.079  | 1.574***  | -0.012   | 0.713*** | 0.780***                 | 0.631***       | 0.961***  |
|                        | (0.147)       | (0.196)                | (0.158) | (0.258)   | (0.146)  | (0.112)  | (0.182)                  | 0.057          | (0.066)   |
| FTA (0,1)              | -0.151        | 0.966***               | 0.176   | 0.753***  | 0.440*** | 0.460*** | 0.063                    | -0.066         | 0.590***  |
|                        | (0.192)       | (0.177)                | (0.116) | (0.203)   | (0.124)  | (0.090)  | (0.156)                  | 0.068          | (0.099)   |
| Imp. country FE        | yes           | yes                    | yes     | yes       | yes      | yes      | yes                      | yes            | yes       |
| Exp. country FE        | yes           | yes                    | yes     | yes       | yes      | yes      | yes                      | yes            | yes       |
| Year FE                | yes           | yes                    | yes     | yes       | yes      | yes      | yes                      | yes            | yes       |
| N                      | 1470          | 1397                   | 1212    | 1024      | 1636     | 1744     | 1305                     | 4479           | 4012      |
| Pseudo R-squared       | 0.898         | 0.914                  | 0.963   | 0.863     | 0.943    | 0.971    | 0.969                    | 0.882          | 0.885     |
| Pseudo Likelihood      | -8483.4       | -13589.6               | -17467.3| -22271.7  | -52403.1 | -116159.6| -22919.4                 | -252342.2      | -325790.3 |

Notes: Robust standard errors in brackets: *** significant at 1%; **significant at 5%; *significant at 10%. 
|                        | Poisson                                    |
|------------------------|--------------------------------------------|
|                        | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| Distance               |      |      |      |      |      |      |      |      |      |
|                        | -0.181 | -0.204* | -0.082 | -0.078 | -0.138 | -0.144* | -0.234*** | -0.236*** | -0.211** |
|                        | (0.131) | (0.108) | (0.101) | (0.095) | (0.091) | (0.087) | (0.086) | (0.088) | (0.096) |
| Prod. of land area    |      |      |      |      |      |      |      |      |      |
|                        | -0.200*** | -0.099* | -0.189*** | -0.168*** | -0.183*** | -0.155*** | -0.146*** | -0.152*** | -0.113 |
|                        | (0.028) | (0.051) | (0.024) | (0.053) | (0.055) | (0.051) | (0.050) | (0.023) | (0.103) |
| GDP (Importer)         |      |      |      |      |      |      |      |      |      |
|                        | 1.182*** | 0.913*** | 1.119*** | 1.047*** | 0.977*** | 0.952*** | 0.890*** | 0.792*** | 0.904*** |
|                        | (0.080) | (0.120) | (0.073) | (0.085) | (0.088) | (0.077) | (0.078) | (0.082) | (0.123) |
| GDP (Exporter)         |      |      |      |      |      |      |      |      |      |
|                        | 0.927*** | 0.910*** | 0.704*** | 0.713*** | 0.770*** | 0.669*** | 0.837*** | 0.838*** | 0.787*** |
|                        | (0.057) | (0.093) | (0.122) | (0.131) | (0.138) | (0.130) | (0.080) | (0.059) | (0.159) |
| English                |      |      |      |      |      |      |      |      |      |
|                        | 0.660** | 0.075 | 0.970*** | 0.630*** | 0.044 | 0.694*** | 0.506*** | 0.709*** | 0.552*** |
|                        | (0.299) | (0.611) | (0.280) | (0.118) | (0.180) | (0.122) | (0.127) | (0.195) | (0.158) |
| Colony (0,1)           |      |      |      |      |      |      |      |      |      |
|                        | 0.364* | 0.286 | 0.350** | 0.345** | 0.298** | 0.275** | 0.222 | 0.207 | 0.257* |
|                        | (0.209) | (0.194) | (0.145) | (0.143) | (0.145) | (0.135) | (0.142) | (0.143) | (0.142) |
| Contiguity (0,1)       |      |      |      |      |      |      |      |      |      |
|                        | 0.584*** | 0.627*** | 0.782*** | 0.796*** | 0.847*** | 0.861*** | 0.805*** | 0.810*** | 0.770*** |
|                        | (0.219) | (0.183) | (0.154) | (0.151) | (0.150) | (0.141) | (0.142) | (0.144) | (0.150) |
| FTA (0,1)              |      |      |      |      |      |      |      |      |      |
|                        | 0.778*** | 0.683*** | 0.729*** | 0.793*** | 0.572*** | 0.491*** | 0.337*** | 0.319*** | 0.401*** |
|                        | (0.200) | (0.161) | (0.167) | (0.153) | (0.154) | (0.144) | (0.158) | (0.157) | (0.172) |
| Imp. country FE        | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Exp. country FE        | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Sector FE              | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| N                      | 1746 | 1899 | 1943 | 1939 | 2073 | 2137 | 2235 | 2250 | 2057 |
| Pseudo R-squared       | 0.919 | 0.901 | 0.883 | 0.876 | 0.874 | 0.872 | 0.862 | 0.858 | 0.850 |
| Pseudo Likelihood      | -77078.9 | -98078.3 | -133251.4 | -154411.4 | -187578.5 | -202924.5 | -256226.0 | -309103.8 | -329924.9 |

Notes: Robust standard errors in brackets: *** significant at 1%; ** significant at 5%; * significant at 10%.
to examine whether the analysis results are sensitive to specific years or outliers.

In this context, we examined the robustness of the above findings in two ways: the Poisson regression on a year-by-year basis and the Quantile regression.

First, Poisson regression by year shows in every year, except 2000 and 2004, that the English variable has a positive influence on services trade at 1 percent significance level. Taking a look at year-by-year results, the coefficient value of English is the biggest in 2002 at 0.970, and in the rest of the years those values show a stable pattern, ranging between 0.606 and 0.709.

Second, we ran the median and quantile regressions. The median regression

Table 6. Determinants of Services Trade by Percentile: English Communicative Probability

|                      | Pooled OLS | Quantiles |          |          |          |          |
|----------------------|------------|-----------|----------|----------|----------|----------|
|                      |            | 0.10      | 0.25     | 0.50     | 0.75     | 0.90     |
| Distance             | -0.790***  | -0.576*** | -0.722*** | -0.849*** | -0.887*** | -0.879*** |
|                      | (0.235)    | (0.031)   | (0.023)  | (0.025)  | (0.026)  | (0.031)  |
| Prod. of land area   | 0.395***   | 0.361***  | 0.324*** | 0.292*** | 0.383*** | 0.189**  |
|                      | (0.742)    | (0.095)   | (0.070)  | (0.075)  | (0.074)  | (0.088)  |
| GDP (Importer)       | 0.646***   | 0.694***  | 0.782*** | 0.713*** | 0.742*** | 0.653*** |
|                      | (0.077)    | (0.117)   | (0.080)  | (0.082)  | (0.077)  | (0.090)  |
| GDP (Exporter)       | 0.054      | 0.303*    | 0.383*** | 0.331**  | -0.022   | -0.049   |
|                      | (0.137)    | (0.176)   | (0.132)  | (0.140)  | (0.138)  | (0.162)  |
| English              | 4.382***   | 3.680***  | 3.671*** | 3.759*** | 4.938*** | 3.443*** |
|                      | (0.527)    | (0.694)   | (0.516)  | (0.538)  | (0.522)  | (0.607)  |
| Colony (0,1)         | 0.650***   | 0.896***  | 0.876*** | 0.805*** | 0.667*** | 0.409*** |
|                      | (0.036)    | (0.060)   | (0.042)  | (0.044)  | (0.041)  | (0.048)  |
| Contiguity (0,1)     | 0.521***   | 0.399***  | 0.307*** | 0.299*** | 0.473*** | 0.631*** |
|                      | (0.042)    | (0.057)   | (0.041)  | (0.046)  | (0.048)  | (0.059)  |
| FTA (0,1)            | 0.202***   | 0.778***  | 0.470*** | 0.205*** | -0.048   | -0.134** |
|                      | (0.047)    | (0.065)   | (0.048)  | (0.052)  | (0.053)  | (0.065)  |
| Imp. country FE      | yes        | yes       | yes      | yes      | yes      | yes      |
| Exp. country FE      | yes        | yes       | yes      | yes      | yes      | yes      |
| Year FE              | yes        | yes       | yes      | yes      | yes      | yes      |
| Sector FE            | yes        | yes       | yes      | yes      | yes      | yes      |
| N                    | 15855      | 15855     | 15855    | 15855    | 15855    | 15855    |
| Pseudo R-squared     | 0.765      | 0.521     | 0.363    | 0.548    | 0.548    | 0.043    |

Notes: Robust standard errors in brackets: *** significant at 1%; **significant at 5%; *significant at 10%.
Table 7. Determinants of Services Trade: English Communicative Probability

| Sector | ALL SECTORS | Communication | Computer & Information | Finance | Insurance | Business | Commerce | Royalties & License Fees | Transportation | Travel |
|--------|-------------|---------------|------------------------|---------|-----------|----------|----------|--------------------------|----------------|--------|
| Distance | -0.290*** | -0.486*** | -0.667*** | -0.069 | -0.242 | -0.604*** | -0.463*** | -0.563*** | -0.513*** | -0.120 |
|         | (0.046)    | (0.142)      | (0.199)                | (0.246) | (0.190) | (0.124) | (0.105) | (0.187) | (0.085) | (0.109) |
| Prod. of land area | -0.055*** | -0.072*** | 0.006 | -0.320*** | -0.003 | -0.107*** | -0.070*** | 0.019 | -0.075*** | 0.103*** |
|         | (0.009)    | (0.026)      | (0.044)                | (0.039) | (0.036) | (0.022) | (0.020) | (0.033) | (0.016) | (0.022) |
| GDP (Importer) | 0.791*** | 0.824*** | 0.808*** | 1.723*** | 0.716*** | 0.773*** | 0.615*** | 0.382*** | 0.584*** | 0.995*** |
|         | (0.003)    | (0.032)      | (0.028)                | (0.016) | (0.024) | (0.012) | (0.005) | (0.013) | (0.007) | (0.008) |
| GDP (Exporter) | 0.474*** | 0.518*** | 0.972*** | 0.485*** | 0.191*** | 0.604*** | 0.768*** | 1.392*** | 0.733*** | -0.007 |
|         | (0.003)    | (0.030)      | (0.026)                | (0.021) | (0.026) | (0.010) | (0.005) | (0.020) | (0.006) | (0.006) |
| English | 0.680*** | 0.942*** | 1.016*** | 1.277*** | 0.846*** | 0.694*** | 0.962*** | 1.227*** | 0.617*** | 0.340*** |
|         | (0.043)    | (0.111)      | (0.189)                | (0.244) | (0.178) | (0.105) | (0.093) | (0.183) | (0.072) | (0.098) |
| Colony (0,1) | 0.667*** | 0.397 | 0.197 | -0.052 | 0.001 | 0.341 | 0.578** | 0.261 | 0.075 | 1.455*** |
|         | (0.132)    | (0.364)      | (0.603)                | (0.577) | (0.468) | (0.383) | (0.231) | (0.456) | (0.232) | (0.291) |
| Contiguity (0,1) | 1.065*** | 0.811** | 0.330 | 2.068*** | 1.087** | 0.536* | 1.006*** | -0.229 | 0.889*** | 1.470*** |
|         | (0.121)    | (0.322)      | (0.513)                | (0.678) | (0.450) | (0.320) | (0.279) | (0.476) | (0.202) | (0.250) |
| FTA (0,1) | 0.239** | 0.195 | -1.161** | 0.165 | -0.328 | -0.210 | -0.121 | -0.943** | -0.626*** | 1.583*** |
|         | (0.108)    | (0.322)      | (0.473)                | (0.517) | (0.429) | (0.283) | (0.234) | (0.397) | (0.203) | (0.250) |
| N      | 18279      | 1470         | 1397                   | 1212    | 1024    | 1636     | 1744     | 1305     | 4479     | 4012    |
| Log Likelihood | -230767.1 | -5957.3 | -7393.5 | -11251.3 | -18795.8 | -23687.9 | -34840.4 | -12563.1 | -51395.4 | -47350 |

Note: Standard errors in brackets: *** significant at 1%; **significant at 5%; *significant at 10%.
is frequently used when standard OLS regression may be biased by outliers. While the least squares regression estimates the sum of the squared residuals, which gives much weight to outliers, the median regression finds the regression line that balances the number of positive and negative residuals. This property makes the median regression more robust for influential observations. Koenker and Bassett (1978) generalized this concept into a quantile regression, in which selected quantiles of the conditional distribution of the dependent variable are expressed as functions of observed explanatory variables (Fidrmuc and Fidrmuc 2010). Table 6 reports the results for the 10th, 25th, 75th and 90th percentiles in addition to the median regression. The results of the quantile regression show that each percentile is significant statistically. In addition, the coefficient value of English is the biggest at 75 percentile showing 4.938, and has a tendency that the greater the trade volume, the bigger is the influence of English proficiency on the services trade.

Finally, we ran additionally the random-effects Poisson regression with all sectors and each of the nine sectors, in order to examine whether the effects of English on trade in services are still significant. As shown in Table 7, English communicative probability has significant effects on trade in all and nine different service sectors.

3. Simulation of Possible Gains from Improved English Skills

We formulated two hypothetical scenarios to see how much of an increase in English proficiency can boost trade in services. The two scenarios are as follows:

Scenario I: Among 22 OECD member countries analyzed in this paper, those with English proficiency rates below the current average (58 percent) improve their English proficiency rates by 5 percent each. (Other countries are assumed to hold their English proficiency rates at their current levels)

Scenario II: Among 22 OECD member countries analyzed in this paper, those with English proficiency rates below the current average (58 percent) improve their English proficiency rates up to the average level (similar to Austria’s level). (Other countries are assumed to hold constant their English proficiency rates at their current levels).

Appendix A-Table 2 shows simulated export gains by economy when we are based on the baseline result (column (5) in Table 2). The results tell us that Scenario I can boost trade in services of the OECD countries by 8.4 percent.
on average. In particular, Portugal, Spain and Germany are expected to benefit the most from the improvement. The findings also show that Scenario II can increase trade in services of the OECD nations by 146.8 percent on average. The countries benefiting most from Scenario II are Hungary, Spain, and the Czech Republic.

IV. Conclusions

In this paper, we investigate empirically the issue of how much proficiency in English can raise trade in services at the aggregate level and in nine different sectors: (1) communication, (2) computer and information, (3) finance, (4) insurance, (5) business, (6) commerce, (7) royalties and license fees, (8) transportation, and (9) travel. We used the Poisson regression method as our baseline to deal with a zero or missing data problem which is common in services trade data.

The findings show that English communicative probability, both as a global business language and as a common official language, has a fairly great influence on services trade, and is statistically significant. Our results indicate that English has more influence than French or German on trade in services. In particular, the findings suggest that such service sectors as communication, finance, commerce, insurance and business are impacted to a greater degree by English proficiency than other service sectors. These results make economic sense, considering that those sectors are highly associated with face-to-face business activities.

The robustness checks based on the year-by-year Poisson regression, the Quantile regression, and the random-effects Poisson analysis by sector all add credibility to our empirical results. Also, simulation results based on two different scenarios indicate that an improvement in the English proficiency level of OECD member nations could bring about significant increases in services trade among OECD countries. These findings imply that enhancing English ability could be a very effective method for promoting trade in services, particularly those sectors having many face-to-face operations.

9 This result is consistent with the findings of Fidrmuc and Fidrmuc (2010), but different from those of Melitz (2008). This may be due to the difference in the language variables used in each study. Both of this paper and Fidrmuc and Fidrmuc (2010) consider languages as a global communication method, whereas Melitz (2008) is focused on the use of mother tongues other than foreign languages.
## Appendix

A-Table 1. English Proficiency Rate by Economy

| Economy | English Proficiency Rate |
|---------|--------------------------|
| AUS     | 81                       |
| AUT     | 58                       |
| BEL     | 52                       |
| CAN     | 77                       |
| CZE     | 24                       |
| DEU     | 56                       |
| DNK     | 86                       |
| ESP     | 27                       |
| EST     | 46                       |
| FIN     | 63                       |
| FRA     | 36                       |
| GBR     | 98                       |
| GRC     | 48                       |
| HKG     | 45                       |
| HUN     | 23                       |
| IRL     | 87                       |
| ITA     | 29                       |
| LTU     | 32                       |
| LUX     | 60                       |
| LVA     | 39                       |
| MLT     | 88                       |
| MYS     | 27                       |
| NLD     | 87                       |
| NZL     | 86                       |
| PHL     | 52                       |
| POL     | 29                       |
| PRT     | 32                       |
| ROU     | 29                       |
| SGP     | 71                       |
| SVK     | 32                       |
| SVN     | 57                       |
| SWE     | 89                       |
| USA     | 89                       |
| ZAF     | 24                       |

Source: Eurobarometer (2006) for European countries; Mo (2010, p.25) for other economies.
A-Table 2. Simulated Export Gains by Economy (% of Baseline)

|    | Scenario I | Scenario II |
|----|------------|-------------|
| AUS | 3.1        | 23.9        |
| AUT | 4.4        | 60.5        |
| BEL | 2.5        | 37.6        |
| CAN | 3.7        | 45.8        |
| CZE | 14.1       | 403.5       |
| DEU | 15.6       | 77.5        |
| DNK | 3.1        | 43.1        |
| ESP | 15.8       | 365.6       |
| FIN | 3.2        | 46.0        |
| FRA | 13.6       | 193.6       |
| GBR | 3.8        | 52.1        |
| GRC | 15.1       | 115.7       |
| HUN | 13.3       | 405.1       |
| IRL | 2.9        | 39.4        |
| ITA | 13.5       | 285.8       |
| LUX | 2.7        | 36.5        |
| NLD | 2.7        | 38.7        |
| POL | 13.9       | 292.5       |
| PRT | 16.7       | 299.4       |
| SVK | 14.7       | 290.9       |
| SWE | 2.6        | 36.5        |
| USA | 3.4        | 39.7        |
| Average | 8.4 | 146.8 |

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