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Geographical Indication Regulation and Intra-Trade in the European Union

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Abstract:
Protection of indications of geographical origin (GIs) can reduce information asymmetry between producers and consumers, and potentially enhance trade. However, GIs can also possibly divert trade. We rely on panel data about agri-food trade among the 27 countries of the European Union to investigate these issues using variations of estimators proposed by Head and Mayer (2000) and Santos Silva and Tenreyro (2006). Our findings suggest that the protection of GIs creates trade when the importing and exporting countries have GI-protected products. There is also empirical evidence regarding a trade-diverting effect when the importing country does not have GIs and a border enlargement effect arising from European GI-protection.

Résumé:
La protection des indications géographiques (IGs) est un enjeu controversé, autant dans les négociations à l'OMC que dans les négociations d'accords bilatéraux, tel que constaté lors de l'accord de libre-échange entre le Canada et l'Union Européenne (UE). En général, les pays nord-américains protègent les IGs comme des marques de commerce, considérant qu'il est possible de répliquer les méthodes de production associées à celles-ci dans un pays, autre que leur lieu d'origine. Par exemple, du fromage parmesan et du jambon de Parme sont fabriqués et commercialisés au Canada sous ces désignations. L'UE appuie une approche de terroir, soutenant que seuls les producteurs localisés dans une région donnée peuvent se prévaloir du terme géographique associé à cette région pour désigner leurs produits. Les IGs peuvent réduire les problèmes d'asymétrie d'information entre consommateurs et producteurs et faire augmenter le commerce. Toutefois, les IGs peuvent aussi en principe créer une diversion de commerce favorisant les exportateurs bénéficiant d'indications géographiques au détriment d'autres exportateurs. Nous tentons de vérifier cette assertion sur les pays de l'UE parce que ces derniers pratiquent le libre-échange entre eux et qu'ils sont tous soumis à la législation européenne sur les IGs. En utilisant des données de type panel sur le commerce des 27 pays, nos résultats indiquent que le commerce entre pays exportateurs et importateurs qui ont tous les deux des produits protégés comme IGs s'accroît de 0,76%, après avoir contrôlé pour la distance, la taille des pays, l'utilisation d'une langue commune et autres facteurs pouvant influencer le commerce. Toutefois, des effets de diversion de commerce sont aussi constatés lorsque le pays importateur ne produit pas de IGs. De plus, un effet de renforcement des frontières nationales se confirme avec le système européen de protection des IGs.

Keywords: Geographical Indications, European Union, Agri-Food Trade, Gravity Model

Classification JEL: F14, Q18

1. INTRODUCTION

Over the past two decades, global consumer concerns about food marketing have grown beyond pricing and safety issues. Nowadays, consumers want to know about production practices (organic versus conventional versus genetically modified), animal welfare, production location (local versus national versus international origins), the food's carbon footprint and whether it has functional properties and is traceable. All of these concerns add new dimensions to the concept of food quality that encompasses more traditional criteria like taste, visual appearance and safety. The relative importance of various quality attributes varies across consumers. Most consumers are willing to trade off some attributes for others quite easily, but some consumers may have lexicographic preferences (e.g., organic is a must). Even for a controversial attribute like genetic modifications, Noussair, Robin and Ruffieux (2004) showed that a majority of French consumers would be willing to buy genetically modified foods if their price was sufficiently reduced. Thus, new quality dimensions enhance product differentiation, but this differentiation can be perceived as horizontal (just different) or vertical (better). Labelling is a mean to achieve the matching of consumers with a strong valuation for a given quality attribute and suppliers of foods endowed with the quality attribute. Consumers with a strong valuation for specific quality attributes are better off because they get what they want while the suppliers of these attributes can get higher returns than by marketing their products as "generic".[1] In this context, geographical indications (GIs) can be seen as a mechanism to signal elements of food quality pertaining to the "know how", soil and weather of a given region.[2] However, another aspect of GIs is to prevent producers who have the "know how", but reside outside the designated area, from using the labelled GI.[3]

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[1] A Pareto improvement is unlikely because the reduction in the supply of generic products causes the price for generic products to rise, thus decreasing the surplus of consumers of generic products. Accordingly, aggregate consumer welfare may not improve.

[2] The link to a geographical area can be direct as for Champagne and Parma ham or indirect as for Feta cheese and Greece.

[3] For example, the Newcastle Brown Ale received a protected geographical status in 2000, but lost it in 2007 when the brewery moved from Tyneside to Tadcaster, 150 km away. It is doubtful that the quality of the beer suffered from the change in location. Furthermore, it is possible that producers outside a designated area could actually produce a higher quality product. If quality is related to climate, year to year variations may make it difficult to establish a reputation for quality. Even when quality can be controled by firms, Desquilbet and Monier-Dilhan (2012) find that GI producers may end up supplying the low quality.

GIs have a long history in Europe, and the same can be said about their regulation.[4] The link between production location and quality is perhaps best known for wines, but it has been exploited for many more products, including cheeses, Cognac, Sherry, Teruel and Parma hams, Tuscany olives, Budějovické pivo, and Budapesti téliszalámi.

In Europe, the interest of producers and consumers for geographical indications has increased over time. There were 526 GIs in 2000, 676 in 2005 and 872 in 2010. The European Commission has been a strong advocate for GIs since 1992 when a regulatory framework was put in place to define the conditions for the registration of GIs as protected. GIs are also part of the rural development strategy that was at the heart of the reform of the Common Agricultural Policy (CAP). Some interpreted this as a change in policy orientation from "increasing food quantity to increasing food quality" (Becker, 2009: 112),[5] but a more precise interpretation would focus on product differentiation, as per the European Commission's description of GIs.[6] .

The protection that accompanies GI designations has implications for international trade, including trade between members of the European Union. Article 30 of the Treaty on European Union[7] provides for a GI exception to the principle of free trade between member states. GIs are covered by WTO agreements, through Article 22 of the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement). The definition of GIs used by the WTO is similar to the one used in the European Union's legislation, but WTO members have very different views on GIs (O'Connor, 2004). The EU sees GIs as a way to

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[4] GIs were protected through the Paris convention for the protection of industrial property of 1883 (Josling, 2006).

[5] In 1992, the EU established a regulatory framework by the Regulation (EEC) *No 2081/92* defining the conditions for registration of GIs as protected. In 2006, this framework was revised in the Regulation (EC) *No 510/2006* of 20 March 2006 on *the protection of geographical indications and designations of origin for agricultural products and foodstuffs.* That is result of complaints by the United States and Australia against the European Regulation (EEC) *No 2081/92*. On 18 August 2003, the United States and Australia requested separately the establishment of a Panel. They claim that the EC measure appears to be inconsistent with the EU's obligations pursuant to WTO Agreements. On 20 April 2005, Panel reports were adopted (see Panel reports: WT/DS290/R - Complaint by Australia; and WT/DS174/R – Complaint by United States). Since January 3th 2013, Regulation (EU) *No 1151/2012* of 21 November 2012 on *quality schemes for agricultural products and foodstuffs* entered into force. It repealed and replaced Council Regulation (EC) *No 510/2006.*

[6] GI protection allows rural communities to exploit quality, reputation and other characteristics linked to their location http://ec.europa.eu/trade/policy/accessing-markets/intellectual-property/geographical-indications/.

[7] The Treaty on European Union (EU) was signed in Maastricht in 1992 and the Treaty of Rome which established the European Economic Community in 1958 are the core treaties laying out how the EU operates.

inform consumers, to foster rural development and to secure cultural and biological diversity. The EU has an elaborate GI regulatory system that was designed to accommodate the different views about GIs among European countries and avoid intra-EU conflicts resulting from national initiatives (Josling, 2006). Other countries (such as the United States, Canada, Australia and South Africa) are reluctant to adopt such protection, preferring to rely on their system of trademarks and certification marks (Addor and Grazioli, 2002). These countries consider GIs primarily as property rights that can be used by individual firms or producers to enhance their competitiveness (as marketing tool to boost exports). The EU has been aggressively promoting its view on GIs in the Doha Round of multilateral negotiations, but also in bilateral negotiations with Canada, Moldova, Georgia and Vietnam. Even though the final text to the Canada-European Union Trade Agreement (CETA) is not yet available, it has been reported that Canada has accepted to recognize 179 GIs (Plan d'Action Canada, 2013).

The literature on GIs is thoroughly reviewed by Teuber and al (2011). Most contributions have focused on the overall welfare implications of GIs or on specific welfare components. Some estimated consumers' willingness to pay for GI labelled foods (e.g., Scarpa Philippidis and Spalatro, 2005; van Ittersum and al., 2007). Other studies compared the welfare implications of different GI certification systems on producers and consumers (e.g. Lence and al., 2007; Bouamra-Mechemache and Chaaban, 2010; Menapace and Moschini, 2012). Much attention has been given to the measurement of horizontal product differentiation/elasticities of substitution in empirical trade models (Feenstra, 2004). However, vertical product differentiation has recently been integrated into trade models to account for observed phenomena like larger firms paying more for their inputs and getting higher prices for their products (e.g. Hallak and Sivadasan, 2013; Crozet and al., 2012, Kugler and Verhoogen, 2012; Hallak, 2006).[8] There is also a vast literature on standards and non-tariff measures and their effect on prices (e.g. Bradford, 2003; Dean and al., 2009; Kee and al., 2009) and on trade flows (e.g. Winchester and al., 2012). Our analysis of GIs falls in this category.

The objective of this paper is to quantify the effect of GI regulation on bilateral agri-food trade between member states of the European Union. We rely on a generalization of the

[8] Data on quality is scarce. Hallak (2006) used the exporting country's per capita income as a proxy for quality. Crozet and *al.* (2012) used the number of stars that a wine expert assigns as a measure of wine quality.

gravity model developed by Head and Mayer (2002) and on Santos Silva and Tenreyro's (2006) Pseudo Poisson. Maximum Likelihood (PPML) estimator on a sample that covers three years: 1999, 2004 and 2009, and 27 European countries. Our findings indicate that the European protection of geographical indications, namely protected designation of origin (PDO) and protected geographical indication (PGI), impacts on bilateral trade differently depending on whether trading nations have GI protected products. When two countries have GI protected products, bilateral trade is enhanced. This effect is large and it likely impacts positively on trade in non-GI products between countries that have GI protection. One could conjecture that consumers in countries that have GIs tend to have preferences that are more alike. In this light, the effect of GIs on trade is akin to the effect of sharing a common language/culture. Because non-GI countries tend to be poorer countries in our population, our GI effects may also pick up effects related to non-homothetic preferences and differences in the average level and distribution of wealth across countries.[9] Countries that have GIs tend to export less to countries that do not have GIs. We also found that the protection of GIs has a trade depressing effect by increasing the thickness of the average border between EU countries. This adverse effect, which is equivalent to a "home bias" tax of 1%, matters mainly for poorer countries without GIs.

The remainder of the paper is structured as follows. We specify our conceptual model based on the odds ratio method in section 2. We introduce a set of GI Regulation variables and discuss four different estimators to ascertain the robustness of our results to differences in variable definitions and econometric estimators. We discuss data requirements and sources in section 3. Estimation results are presented and interpreted in section 4, beginning with the direct impact of indications of geographical origin on trade before discussing their indirect effect through the border effect. The last section summarizes our results and their implications.

2. A GRAVITY MODEL WITH GIs

[9] GIs can alter rivalries between domestic and foreign firms by influencing the degree of vertical product differentiation, provided that enough consumers respond to the GI indication. Hallak (2006) showed that rich countries tend to import relatively more from countries that produce high quality goods.

We rely on a gravity model estimated on disaggregated data to disentangle the effects of most trade impediments, like distance, trade taxes and non-tariff barriers, while taking into account trade-promoting factors like cultural and political "likeness" variables such as the sharing of a common language. Gravity modelling was long considered a purely ad hoc empirical success whose theoretical foundation rested on some analogy to the law of gravity in physics. It was shown starting in the late 1970s and throughout the 1990s that the gravity model can originate from different theoretical trade models. Many of the recent issues about gravity models have focussed on empirical specification and estimation. For example, Anderson and van Wincoop (2003) demonstrated that *"multilateral resistance terms"* are essential in the specification of gravity models. They proposed a complex non-linear estimation procedure to integrate these "price effects". Feenstra (2002) proposed to account for them through the addition of fixed effects for importing and exporting countries. The notorious problem stemming from the large number of zero trade flows has been addressed by Santos Silva and Tenreyro (2006) and Helpman, Melitz and Rubinstein (2008). A solution that has been explored involves using the multiplicative structure of gravity model to eliminate the monadic terms (Head and Mayer, 2013: 21). The *odds* ratio method (or *odds* specification) advocated by Head and Mayer (2000)[10] provides an alternative framework to deal with multilateral resistance terms.[11] This approach exploits the multiplicative functional form of the gravity equation by making either the exporters' (see Anderson and Marcouiller, 2002) or the importers' (Martin and al., 2008 or De Sousa and Disdier, 2006) fixed effects redundant.

The utility of the representative consumer in country i is represented by a constant elasticity of substitution utility function (CES), which is conditioned by the quantities consumed c_{ijh}, where $h = 1,...,n_j$ stands for a given variety exported by country $j = 1,...,N$. All varieties are differentiated from each other, but products from the same country are weighted equally in the utility function.

[10] Head and Mayer (2000) as well as Eaton and Kortum (2002) normalized bilateral flows by trade with self for a given industry/year. Certain papers use a similar approach, but refer country to other than self (e.g. Martin and al., 2008; and Anderson and Marcouiller, 2002). Another trade ratio approach was proposed by Caliendo and Parro (2012) who estimate the trade cost elasticity from tariff data, using asymmetries in protectionism as an identification strategy.

[11] Some studies have used an extension of the above ratio approach, the ratio of ratios approach, to eliminate monadic terms, including multilateral resistance terms/time-varying exporter an importer fixed effects (see Head and al., (2010), Romalis (2007) and Hallak (2006). However, gravity equation estimators that use dyadic transformations require measures that relate country-internal distances to external distances of countries.

$$U_i = \left(\sum_{j=1}^{N} \sum_{h=1}^{n_j} \left(a_{ij} c_{ijh} \right)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \quad (1)$$

We denote a_{ij} as the preference weight given to exporting country *j* by consumers in country *i*. Parameter σ is the elasticity of substitution between varieties. m_{ij} is defined as the C.I.F[12] value of country *i*'s imports from *j* ($m_{ij} = c_{ij} p_{ij}$) and $m_i \equiv \sum_k m_{ik}$ represents expenditures of country *i* from all sources (including domestic ones). Thus, bilateral imports are given by:

$$m_{ij} = \frac{a_{ij}^{\sigma-1} n_j \left(p_{ij} \right)^{1-\sigma}}{\sum_k a_{ik}^{\sigma-1} n_k \left(p_{ik} \right)^{1-\sigma}} \cdot m_i \quad (2)$$

where p_{ij} is the price of imported varieties from country *j*. The proportionality between the value of production (denoted v_j) and the number of varieties, $n_j = \frac{v_j}{q.p_j}$, that arise from firms having identical technologies, facing identical demands and hence producing the same quantity *q*, , allows us to replace n_j and n_k in equation (1) to obtain a gravity equation expressed in terms of prices p_{ij} and consumer preferences a_{ij}.

The price[13] p_{ij} paid by consumers in country *i* for products from country *j* is specified as a multiplicative function of the mill price (p_j), distance between both countries (d_{ij}) and trade barriers (tariff and non-tariff barriers). Typically, the *ad valorem* value (ψ_{ij}) of trade barriers (tariff and non-tariff barriers) is equal to zero for domestic products and positive for imported products (i.e., equal to ψ for $i \neq j$) such that:

$$p_{ij} = \left(1 + \psi_{ij} \right) d_{ij}^{\delta} p_j \quad (3)$$

[12] CIF stands for "Cost, Insurance, and Freight". The seller is responsible for the loading at the port of export, the transport to and unloading at the port of import and insurance. The costs for these services are included in CIF import prices.

[13] This price embodies trade cost. The latter can also be random, capturing unobserved trade impediments (De Sousa and al., 2011).

Because we focus on intra-EU trade, tariffs are zero and goods can move freely between countries. Because there is one less factor impacting on trade flows, it should be easier to measure the impact of GIs on trade.

Consumer preferences a_{ij} are decomposed into a deterministic component and a random component (e_{ij}) that is normally distributed. The deterministic component involves a home bias parameter (β) that measures the consumers' relative preference for domestic products, GI policy indicators[14], and dummy variables that equal one when countries *i* and *j* share a common border (*CB*), a common language (*CL*) and time binary variables to account for various phenomena such as the changes in the number of countries using a common currency and the last recession.[15] Consumer preferences can be depicted as follows:

$$a_{ij} = \exp\left[e_{ij} - B_{ij}\left(\beta - \eta CB_{ij} - \mu CL_{ij} - \varphi Label\right)\right] \tag{4}$$

The GI policy indicators are meant to capture the trade creation and trade diversion effects stemming from GIs being used by the importing country, the exporting country or both.[16] However, given the large difference in the number of GIs across countries that have GIs, we feel that GI policy indicators should also account for the presence or absence of GIs and the number of GIs. We specify our set of GI policy indicators as follows:

$$\begin{aligned} I_a\_adj. &= I_a * N_i \\ I_b\_adj. &= I_b * N_j \\ I_c\_adj. &= I_c * \left(N_i + N_j\right) \end{aligned} \tag{5}$$

where N_i and N_j are the number of GIs in the importing country *i* and exporting country *j* and I_a, I_b, I_c are defined as:

[14] We consider only GI products effectively protected by the European Union with the mention "registered."

[15] In 1999, the year the Euro zone was created, there were only 11 countries. In 2004, their number increased to 12 (with the entry of Greece on 1 January 2001), and in 2009, the Euro zone had 16 members (with Slovakia, the last entry, on 1 January 2009). To date, there are 17 European countries using the euro as its currency (Estonia joined the Euro zone on 1 January 2011).

[16] Poncet (2002) used a model similar to ours to analyse the trade impact of the Chinese diaspora by defining a variable measuring the importance of people of Chinese heritage in the population of China's trade partners. De Sousa and Disdier (2006) also used a quantitative variable to measure the impact of differences in legal frameworks.

$$I_a = \begin{cases} 1, \text{if importer has GIs and exporter does not} \\ 0, \text{otherwise} \end{cases}$$

$$I_b = \begin{cases} 1, \text{if exporter has GIs and importer does not} \\ 0, \text{otherwise} \end{cases}$$

$$I_c = \begin{cases} 1, \text{if importer and exporter have GIs} \\ 0, \text{otherwise} \end{cases}$$

This specification of GI policy indicators has the advantage of accounting for differences in the number of GIs across country in any given year and in the evolution in the number of GIs over time. GIs should have a demand-expanding effect when consumers value the geographical designations and exporters benefit from GI protection.[17] As such, the coefficient on $I_c\_adj.$ is expected to be positive. If trade creation is to occur, it should be strongest amongst trading partners with GIs. This is more so if GIs generate positive externalities on the demand for non-GI products in countries that have GIs. Consumers living in countries without GIs may not value significantly more GI protected products than unprotected products. If this is the case, exporters of GI products are likely to pursue opportunities elsewhere and sell less in countries without GIs. If on the other hand consumers living in a country without GIs perceive GIs as quality signals, they might express a larger demand for products from countries with GIs. Thus the sign of $I_b\_adj.$ is a priori ambiguous. If consumers in countries with GI products perceive products from non-GI countries as inferior, they will buy less from such countries all else equal. However, GI-responsive consumers might value more intensely product differentiation and be more inclined to buy from different sources. Therefore, the coefficient for $I_a\_adj.$ can be negative or positive.

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[17] To see this, consider that the marginal rate of substitution between a pair of imported varieties by country *i* and originating from exporting countries 1 and 2 is given by: $\frac{c_{i2k}}{c_{i1h}} = \left(\frac{p_{i1h}}{p_{i2k}}\right)^{\sigma}\left(\frac{a_{i1h}}{a_{i2k}}\right)^{1-\sigma}, \sigma > 1.$ Thus, if a_{i2k} increases because of GIs, then the relative demand for variety *k* from country 2 will increase.

Using $n_j = \frac{v_j}{q.p_j}$, substituting for terms (2), (3) and n_j in equation (1) and taking logs, we obtain the following gravity equation:

$$\begin{aligned} \ln m_{ij} &= \ln m_i + \ln v_j - (\sigma-1)\delta \ln d_{ij} - \sigma \ln p_j - IC_i \\ &-(\sigma-1)\left[\beta - \eta CB_{ij} - \mu CL_{ij} - \varphi Label + \ln(1+\psi)\right] B_{ij} + (\sigma-1) e_{ij}. \end{aligned} \tag{6}$$

where IC_i is the importer's inclusive value which describes the "full range of potential suppliers to a given importer, taking into account their size, distance and relevant border effects" (Head and Mayer, 2000: 290).

$$IC_i = \ln\left(\sum_k \exp\left[\ln v_k - \sigma \ln p_k + (\sigma-1)\times\left(-\delta \ln d_{ik} - \left[\beta - \eta CB_{ik} - \mu CL_{ik} - \varphi Label + \ln(1+\psi) B_{ik} + e_{ik}\right]\right)\right]\right).$$

Equation (4) models country *i*'s imports from partner *j* as a function of exporter j's output, aggregate imports from all sources, distance between the importing and exporting countries, F.O.B[18] price levels (p_j), common border, common language, *"Label"* which embodies GI indicator variables (I_a*_adj.*, I_b*_adj.*, I_c*_adj.*), the importing country's inclusive value (IC_i) and the constant, which can be interpreted as a border effect measure. The presence of IC_i complicates the estimation[19] and we follow Head and Mayer (2000) in using the log odds ratio to get rid of it.[20] This results in the following estimable gravity equation:

$$\begin{aligned} \ln\left(\frac{m_{ijt}}{m_{iit}}\right) &= \ln\left(\frac{GDP_{jt}}{GDP_{it}}\right) - (\sigma-1)\delta \ln\left(\frac{d_{ij}}{d_{i.}}\right) - \sigma \ln\left(\frac{p_{jt}}{p_{it}}\right) - (\sigma-1)\left[\beta + \ln(1+\psi)\right] \\ &+ (\sigma-1)\eta CB_{ij} + (\sigma-1)\mu CL_{ij} + (\sigma-1)\xi Time_{ijt} + (\sigma-1)\varphi Label_t + \varepsilon_{ijt}, \end{aligned} \tag{7}$$

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[18] Free On Board (F.O.B) entails that the seller pays for transportation of goods to the port of shipment and, loading cost. The buyer pays the cost of marine freight transportation, insurance, uploading and transportation cost from the arrival port to destination.

[19] First, because it depends on parameters that are already in the equation to be estimated; and second, this term putatively contains attributes of all possible origin countries for the product (Head and Mayer, 2000).

[20] Head and Ries (2001) propose to cancel the exporter terms, multiplying $\frac{m_{ij}}{m_{ii}}$ by $\frac{m_{ji}}{m_{jj}}$. This leads to a simple index equal: $\sqrt{\frac{m_{ij} m_{ji}}{m_{ii} m_{jj}}}$, that Eaton and al. (2011) call the *Head-Ries Index* (HRI). The problem with this index is that it cannot be calculated without a measure of trade inside a country (Head and Mayer, 2013).

with $\varepsilon_{ij} = (\sigma - 1)(e_{ij} - e_{ii})$. $Time_{ij}$ is a binary variables set defined as follows: year2004 = 1 if year=2004 and 0 otherwise, and year2009 = 1 if year=2009 and 0 otherwise. These binary variables are used to capture different phenomena like changes in the EU's member states that have joined the common currency area, technological progress, and changes in global macroeconomic conditions. This way, "Time" needs not have a monotonic effect. In addition, we assume in equation (5) that $\ln\left(\frac{v_j}{v_i}\right) \approx \ln\left(\frac{GDP_j}{GDP_i}\right)$. Variable m_{ii} measures intra-national trade: the total volume of trade occurring within a country. Following Wei (1996), m_{ii} is equal to the overall production of the country minus its total exports, which gives the value of goods shipped from a country to its own consumers. d_i is a measure of internal distance that accounts for the fact that internal trade is harder when cities within a country are farther rather than closer apart.

The inclusion of the GDP and price ratios are particularly important control variables in isolating the effects of the GI policy indicators because countries without GIs are typically poorer countries (e.g. Bulgaria, Estonia, Lithuania, Latvia, Malta, Romania) and richer countries tend to trade more with one another.

3. DATA REQUIREMENTS

Our panel is made up of three years: 1999, 2004 and 2009. We use aggregated flows of agri-food imports between the 27 countries of the European Union (EU). The data set covers agri-food products (classification: 0, 1, 4 and 22) following the SITC (*Standard International Trade Classification*) Revision 3. The regression analysis uses a total of 2045 observations when the Head and Mayer (2000) approach is used and 2106 when the Pseudo Poisson. Maximum Likelihood (PPML) estimator is used. Some of our data came from databases that use other classification systems such as *International Standard Industrial Classification* (ISIC), *Broad Economic Categories* (BEC) and the *Harmonised System* (HS). We merge these data sets using methods given by Muendler (2009) and Zerai (2007).

We use labour costs (wage and social charges) as a proxy for F.O.B price levels, as in De Sousa and Disdier (2006), to measure differences in production costs between countries. The data on labour costs come from *EUROSTAT Statistics* (NACE – Rev.2: Statistical

Classification of Economic Activities in the European Community) and from the *United Nations Industrial Development Organization (UNIDO) database.* Our bilateral trade flows come from the *COMTRADE database*. Agri-food production data are borrowed from the agricultural production data sets of the *Food and Agriculture Organization (FAO) database* and from the industrial production data sets of the *UNIDO database*. National income data (GDP) are from World Bank statistics. Data on variables *common border* (CB) and *common language* (CL) come from CEPII-Gravity Dataset.[21]

Our empirical implementation requires the measurement of two distances: internal distance *($d_{i.}$)* and external (bilateral) distance *(d_{ij})*. Data for both distances come from CEPII. The internal distance can be defined as an index of distances between major areas of economic activity within a country,[22] whereas external distance measures the distance between states. The external (bilateral) distances are calculated between regions and weighted by the economic size of the regions. This method is also applied to compute the internal distance *($d_{i.}$)* following the disk methodology. The calculation of both external and internal distances is defined as follows:

$$d_{ij} = \sum_{r_j} \left(\sum_{r_i} P_{r_i} d_{r_i} \right) \bullet P_{g_j} \text{, with } P_{r_i} = \frac{Population_{r_i}}{Population_i} \text{ and } P_{r_j} = \frac{Population_{r_j}}{Population_j}.$$

$d_{i.} = 0{,}67\sqrt{\left(S/\pi \right)}$, with S measures area of the region. Taking the value of π, we obtain $d_{i.}$ with a coefficient ($\pi^{-1/2}$) equal to 0,376. Thus, $d_{i.} = 0{,}376\sqrt{S}$.

The variable *"label"* is defined as the number of protected geographical indications (PGI) and Protected designations of origin (PDO) under the European Regulation (EC) 2081/92 for agricultural products. Data is available by product and type of protection from the *European DOOR database*. We focus on indications of geographical origin (GI) in force (with status: *"registered"*).[23] We then use the Label variable to define our indicator variables

[21] See online http://www.cepii.fr/anglaisgraph/bdd/gravity.htm (Accessed on 2012.11.04).

[22] Several measures have been proposed to calculate the internal distance. Wei (1996) uses one-quarter of the distance to the nearest foreign economic center. Wolf (1997, 2000) uses the distance between the two largest cities in each country. As Nitsch (2000), Leamer (1997) and Head and Mayer (2000), we use the disk methodology which assumes that internal distance is proportional to the square root of the area of the country.

[23] GI products with a notification status (received, published or recorded) are not considered because they are effectively not yet protected.

I_a, I_b and I_c. Table 1 above gives the number of GI protected in 2009. For the 1999-2009 period, the average number of *GI* protected *labels* per country is 24 (with a standard deviation of 42.72). This suggests that there is much variation across countries and over time. The per country averages for 1999 and 2009 are 16 and 32 labels respectively (100% increase in 10 years). The difference in the number of *GI* protected *labels* (per country) is significant over the period: the standard deviation increases from 28.43 in 1999 to 54.24 in 2009.[24] Table 1 shows the extent of cross-country differences between countries. Italy and France are leading with 192 and 167 labels respectively, but several countries do not have any.

[Table 1. About here]

4. EMPIRICAL IMPLEMENTATION

4.1. Econometric Estimation

Zeros are a common feature of bilateral trade data involving a large number of geographically dispersed countries. Zeros are particularly frequent when the model focuses on disaggregated products, as in Head and Mayer's (2000) data involving 98 industries.[25] In our case, our sample includes only EU countries and the trade flows are for all agricultural products. As a result, there are less than 3% of the observations that are zero and a first-stage selection correction is not needed. The coefficients of equation (5) are typically estimated with Ordinary Least Squares (OLS). Cluster-robust standard errors are computed to account for correlation in the residuals over years within trade pairs. Because we have a short panel, the estimation of equation (5) can also be done with a random effects estimator or a fixed effects/within estimator. Both estimators treat the country pair intercept as a random variable, but the fixed effects estimator has the advantage of being consistent when the intercept is correlated with explanatory variables.

[24] Table 2 reports descriptive statistics for bilateral import and GI number by country in our sample between 1999 and 2009.

[25] It has also been recognized that only a small fraction of domestic firms engage in export activities. Melitz (2003) explains this by introducing fixed export costs and heterogenous productivity across firms.

However, the fixed effects estimator does not permit the estimation of the coefficients of time-invariant variables like distance, a variable of great interest in gravity modelling. Furthermore, the fixed effects estimator may not estimate precisely the coefficients of time-varying variables when the latter do not vary very much over time. As a result, we also report on a random-effects estimator with cluster robust standard errors. Santos Silva and Tenreyro's (2006) PPML estimator has been widely used to estimate gravity equations on cross-section data because it addresses heteroskedasticity problems that are most pervasive in trade data. As argued by Santos Silva and Tenreyro (2006: 642), the data does not have to be Poisson and the dependant variable does not have to be an integer/a count variable for the Poisson estimator to be consistent. Anderson and Yotov (2010) exploit this feature when estimating a gravity model with a dependant variable defined by a ratio of ratios[26] with the PPML estimator. The PPML estimator requires that the dependent variable be expressed in level, not log-transformed. Thus, our dependant variable is the ratio $\frac{m_{ijt}}{m_{iit}}$ when we use a Poisson estimator, as opposed to the log of this ratio. In addition to the PPML estimator, we also report results from a random-effects Poisson estimator to account for the panel structure of our data.

4.2. Estimation Results

The estimation results based on adjusted GI policy indicators are reported in Table 3. This set of indicators is made up of dummy variables interacting with the sum of GIs in the exporting and importing countries to capture the marginal effects of GIs depending on whether only the importing country has GIs or only the exporting country has GIs or both countries in the trading pair have GIs. Table 3 provides results from the OLS, random effects, PPML and random effects Poisson estimators.[27] All of the coefficients associated with continuous

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[26] Their dependent variable is $\left(\frac{m_{ij}^k}{E_i^k}\right)\left(\frac{y_j^k}{y^k}\right)^{-1}$, where E_i^k stands for total expenditures on product k in country i, y_j^k is the production of good k in country i, y^k is the world's production of good k and m_{ij}^k stands for country j's exports to country i of product k. This specification makes it easy to deal with potential endogeneity issues related to supply and expenditures.

[27] We considered the possibility that our GI indicators be endogenous, perhaps countries that have many GIs would have a tendency to trade more with one another even if they did not have GIs. Several authors have pointed out the need to account for this sort of issue when estimating the effects of regional trade agreements on

variables can be interpreted as elasticities for all four estimators. Dummy variables can also be given an elasticity interpretation in models with log-transformed dependent variables. If $\hat{\beta}$ is the estimated coefficient of the dummy variable of interest, then the estimated elasticity is $100 * \left[\exp\left(\hat{\beta} - 0.5\,\mathrm{var}\left(\hat{\beta}\right)\right) - 1\right]$, where $\mathrm{var}\left(\hat{\beta}\right)$ is the variance of the estimated coefficient (Giles, 1982).

Except for the GI coefficients, the estimation results are less affected by the manner with which GI variables are defined than by the estimation methods. From Table 3, we can see that the estimated coefficients on relative GDP are relatively close to one, as predicted by the theory (Anderson and van Wincoop, 2003; Vancauteren and Weiserbs, 2011). This is especially true for the OLS and random effects estimators in columns (1) and (2). Relative distance coefficients are highly significant and have the expected negative sign. However, the PPML distance elasticity is very large, even after considering that our application focusses on agricultural products.[28] As expected, the log of relative prices has a negative effect on trade and this comes out from all four estimators. Our priors about common language and common border are for positive effects even though mixed signs have been found in the literature (e.g. Helpman, Melitz and Rubsinstein, 2008). The estimated coefficients from all four estimators for common language are significant at the 95% confidence level. The OLS and random effects coefficients for common border are positive and highly significant while their PPML and Poisson-random effects counterparts are negative and significant. The control variables for time, "year2004" and "year2009", are highly significant (at 1% level). The estimated coefficient on "year2004" is positive, but that of "year2009" is negative. The positive effect associated with "year2004" is possibly due to the creation of the Euro currency in 1999 and the elimination of "old" currencies in the years that followed. The negative effect of "year2009" is due to the worldwide recession of 2008/2009. Using the coefficients from the random effects estimator (column 2) in Table 3, the 2004 and 2009 time elasticities are

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the volume of trade (e.g., Vicard, 2011; Magee, 2008; Baier and Bergstrand, 2007). One way to deal with this issue is to use exporter-year, importer-year and exporter-importer fixed effects. Because all of our countries either have or do not have GIs in all 3 years in our sample, we cannot have exporter-importer fixed effects and GI indicators. The instrumental variable approach, using the number of wine and spirits GIs (by European country) as instruments, did not produce robust results.

[28] The results for different types of products in Anderson and Yotov (2010: 2165) confirm that "distance is a bigger obstacle to trade for low value/high weight commodities". Their distance elasticity for agriculture is -1.091 which is similar to the ones for our models (1), (2) and (4). These high elasticities suggest that distance captures much more than just transport costs.

respectively 106% and -119%. They reflect the fast growth of agricultural trade between 1999 and 2004 and the drastic adverse effect of the 2009 recession on international trade.

Given our specification, the exponential of the negative of the constant can be interpreted as the border effect which measures the lack of fluidity in international trade relative to internal trade after controlling for distance, economic size and other factors influencing trade. A significant negative constant term is expected and all of our estimators meet this requirement except for the Poisson estimators (PPML) in Table 3. The magnitude of the border effect varies a lot across estimators and definitions of GI policy variables. Our estimates from models (1) and (2) are 17.6 and 20.49. To put these numbers in perspective, the Canada-US border effects for agricultural trade estimated by Furtan and van Melle (2004) exceed 100 while the EU border effect for 98 industries in Head and Mayer (2000) is 19.5. Using the coefficients of the random effects estimator in column (2) of Table 3, we find that crossing the border is equivalent to multiplying internal distance by a factor $[\exp(-3.0265/-1.1079)=15.37]$. Given that the average internal distance inside the EU is 81.15 miles, the "width" of the average border is 15.37x81.15=1246 miles or 2005 km. Although no tariff barriers hinder trade between European countries, the border effect is particularly high. The thickness of the border has been attributed to the prevalence of nationalism, the heterogeneity of standards and regulations applied in countries and differences in language and culture between European countries (e.g. Allaire and al., 2005; Poncet, 2002). Similar conclusions about the so-called "fragmentation" of the EU market were reached by the European Commission in the late 1980s.[29]

[Table 3. About here]

4.3. Impact of the Indications of Geographical Origin (GIs)

The trade creating and trade diverting effects of GIs on trade can be qualitatively ascertained by glancing at the coefficients for GI variables in Table 3. Columns (1) and (2) attribute a significant trade-creating effect to GIs when the importing and exporting countries have GIs. The PPML and random effects Poisson estimators show no significant trade creation effect.

[29] The European Commission's *White Paper* (1988) diagnosed three primary barriers to intra-EU trade: differences in technical standards, delays and administrative burdens caused by frontier controls, and national biases in government procurement.

Because they were not able to identify a well-documented intra-EU border effect either, we put less weight on these estimators when interpreting our results. The empirical evidence is not as clear when either the importing country or the exporting country does not have GIs. The random effects estimator (column 2) identifies a significant GI trade-creating effect when the importer has GI products and the exporter does not. In contrast, the Poisson random effects estimator in column (4) uncovered a trade-diverting effect when the importing country has GIs and the exporting country does not. Results across models are more consistent when the exporting country has GIs and the importing country does not. All of the $I_b\_adj.$ coefficients are negative, suggesting trade diversion, but they are not statistically different from zero when a two-tailed test is used. If the alternative hypothesis under the t-test is about a negative effect as opposed to a non-zero effect, then the coefficient for $I_b\_adj.$ in column (2) is significant at the 5.4% level. This would mean that exporting countries with GI products export less to non-GI countries as their number of GI products increase. The coefficient measuring the diversion effect is smaller in magnitude than the coefficients measuring trade creation. Overall, the regression results support a net trade-creation effect.

Because the Poisson estimators do not seem to perform as well in terms of the sign and magnitude of estimated coefficients, we rely on the random effects results to pursue the investigation of the quantitative effects of GIs (see column 2 of Table 3). The estimated coefficients $I_a\_adj.$ and $I_c\_adj.$ are respectively 0.0075 and 0.0076. These can be interpreted as semi-elasticities. The first one tells us that an additional GI product increases the ratio of external and internal trade by 0.75% when the importing country has GI products and the exporting country does not have any. This percentage increase in trade is due to the addition of a new GI. This marginal effect is almost identical to that obtained when both countries in the trading pair have GIs (0.76%). These effects are fairly large considering that there are hundreds of agricultural products. They can possibly be attributed to consumers in countries with GIs having a stronger "love for variety" than consumers in countries without GI protection for varieties originating in countries with GI protection. Perhaps GI protection produces external benefits that can be likened to national branding that improve the image of GI and non-GI protected products in countries with GI protection. However, it should also be pointed out that countries that do not have GIs tend to be poorer countries whose consumers might be more incline to buy cheaper non-GI varieties. Our model accounts partially for that by explicitly accounting for differences in relative prices and relative economic size. However, consumer preferences in our model are assumed homothetic to express aggregate demand simply in terms of aggregate income, thus neutralizing distribution effects on aggregate demand. It could be that our GI variables pick up also wealth effects.[30] The gains for exporting countries with GIs are partially offset by a reduction in trade with importing countries without GIs given that $I_b\_adj = -0.45$.

We can also analyse the effect of the GIs in terms of distance equivalents, as in Engel and Rogers (1996) and Head and Mayer (2000). Relying again on the random effects estimator results in Table 3, the trade creation effect of $I_c\_adj.$ is equivalent to reducing the ratio of external and internal distance by a factor of 1.0066 $\left[= \exp\left(0.0076/1.1079\right)\right]$. Since the average internal distance is 81.15 miles, the trade creation effect when both countries have GIs, measured in distance reduction, is 81.71 miles or 131.50 km $\left[= 1.0069 \times 81.15\right]$.

4.4. Is GI Protection a Non-tariff Measure for Countries without GIs?

The WTO negotiations on the protection of GIs (discussed under the TRIPS agreements) are particularly difficult because of substantial differences between the European Union, which defends the expansion of high-level protection (accepted for wines and spirits) to all agricultural products, and the United States and Canada, who fear that GI protection would be a trade-impediment (Rangnekar, 2003; AITIC, 2005). In this section, we want to estimate the effect of GI protection on the border effect, which embodies non-tariff barriers and a home bias effect. We follow the approach used in De Sousa and Disdier (2006) by first reestimating the random effects model of Table 3 without the GI variables. Comparing the constants in columns (1) and (2) in Table 4 confirm that the protection of GI products has a

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[30] We wish to thank a reviewer for bringing this issue to our attention. We experimented with an ad hoc specification that replaced GDP by per capita GDP and population, but this did not have a strong effect on the coefficients of the GI policy variables. A better way would have been to replace the CES utility function in our framework by a non-homothetic utility function. We also estimated models with I_a, I_b, I_c, but got a significant coefficient of 1.24 for I_c, meaning that pairs of countries with GIs trade with one another 2.4 times more with one another than pairs of countries that do not have GIs. Because this specification generated GI effects that appeared unrealistic to us, we did not report them.

significant effect increase on the border effect. However, we cannot draw definite conclusions on the effective impact of this policy on the home bias because the inclusion of the GI variables affects the coefficients of other explanatory variables, including the constant (the border effect). To address this problem, De Sousa and Disdier (2006) suggest estimating a constrained model in which all of the coefficients, except for the coefficients of the GI variables ($I_a\_adj., I_b\_adj.$ and $I_c\_adj.$) and the constant, are constrained at the values in column (1). The results of this restricted model are in column (3) and can be compared to the ones in column (1).

[Table 4. About here]

The constant (-2.9615) in column (3), is larger in absolute value than the constant (-2.7152) in column (1), and slightly smaller than that (-3.0265) of column (2). This outcome can be interpreted as a GI-induced increase in home bias. From the constant in column (3), international trade under GI regulation is on average 19 times less fluid than domestic trade while the estimated border effect from column (1) is 15. Thus, GI protection leads to a hardening of the borders between European countries. One possible interpretation of this result on domestic bias would be that GIs make consumers more aware of the importance of the geographical origin of foods which in the end favors domestic foods.[31]

This indirect GI effect (observed on border effect) can be likened to a general trade depression effect. This allows us to conclude that GIs have a depressing effect on trade flows involving countries that do not have GIs. Trade flows involving countries with GI protection are also affected by this indirect effect, but these countries benefit from a direct trade creating effect.

The trade depressing effect of GI protection can be converted into a tariff equivalent (*ad valorem tariff*). This approach requires an estimate for the elasticity of substitution between varieties *(σ)*. Thus, the tariff equivalent of the border effect is equal to $\{\exp[c/(\sigma - 1)] - 1\}$, where c is equal to the absolute value of the estimated constant. The price coefficients in

[31] According to Teuber and al. (2011), consumer ethnocentrism does always imply that products from the home region or home country are preferred. As suggested by a reviewer, GI products can be fully appreciated by consumers only when the latter are familiar with the GI concept. GI awareness is likely to vary across countries, notably because of government regulations vis-à-vis food labels and GIs, but also across products. Most consumers can probably relate more easily to GIs for wines and spirits.

Tables 4-5 are estimated values of σ. As in Head and Mayer (2000), they are unrealistically small and like them, we assume that $\sigma = 9$ to measure border effects in tariff equivalents. Our border effect in tariff equivalent based from column 3 is 44.80% while the one for column 1 is 40.41% (according to Table 4). The GI effect on the thickness of the border is equivalent to a 4.39% tariff increase. If we assume $\sigma = 6$, the increase in the thickness of the border amounts to a 8.69% tariff increase while the tariff increase falls to 2.90% when $\sigma = 12$ is assumed. In short, the European *sui generis* Regulation of protection of GI products can be seen as a Non-tariff Measure by countries without GIs because it increases the thickness of the border between EU countries. However, this indirect effect is small, considering the effects of other factors contributing to the thickness of the average border between EU countries and the trade creation effect of GI protection on trade flows involving pairs of countries that have GIs.

5. CONCLUSION

This study analyses the impact of GI protected under the European Regulation on relative trade flows. Using the "border effects" model developed by Head and Mayer (2000) and focusing on EU countries, we confirm that the domestic bias may be greatly increased by the effect of the indications of geographical origin (GI). Our findings suggest that the protection of indications of geographical origin (PGI and/or PDO products) significantly affects trade between EU countries. It has been alleged that GI protection reduces information asymmetry between producers and consumers about product "quality" and hence creates trade. We found evidence of trade creation when importing and exporting countries have GIs. This was expected because producers of GI products will seek markets where the specificity of their products is most likely to be appreciated by consumers. We also found a trade creation effect when the importing country has GIs and the exporting country does not, possibly reflecting a greater love for variety by consumers in countries with GIs. However, we found evidence of trade diversion when exporting countries have GIs and importing countries do not. It is hypothesized that it is harder to secure a price premium for exporters under these conditions and as a result there is substitution between export destinations favouring importing countries with GIs at the expense of importing countries without GIs. We also found that GIs have an adverse indirect effect on trade through the so-called border effect. GIs increase the thickness of the border between EU countries. This home-bias is not surprising because a country's GI products are possibly most appreciated at home, when they evoke culture and tradition most vividly. Fortunately, non-tariff measure-like effect is small.

Finally, one should be careful about trying to generalize our results in the context of bilateral negotiations between the EU and third countries, like Canada and the United States. Because we focused only intra-EU trade, our importers did not have to contend with exporters from non-designated areas that use GI labels because they own a trademark or consider the GI label generic. The joint recognition of GIs and trademarks by non-EU countries should have a positive effect on EU exports because their GI products will be marketed under the GI label, but in some cases it might prove challenging to take market share away from the competing trademarked product. In such instances, the level of trade creation will not be substantial.

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Table 1: Number of Geographical Indications (GIs) by EU country in 2009

Italy	(192)	Luxembourg	(4)
France	(167)	Slovakia	(4)
Spain	(126)	Denmark	(3)
Portugal	(116)	Finland	(3)
Greece	(83)	Sweden	(2)
Germany	(65)	Cyprus	(1)
United Kingdom	(32)	Slovenia	(1)
Czech Republic	(22)	Bulgaria	(0)
Austria	(13)	Estonia	(0)
Poland	(9)	Lithuania	(0)
Belgium	(7)	Latvia	(0)
Ireland	(7)	Malta	(0)
Netherlands	(6)	Romania	(0)
Hungary	(4)	Total: 867 *Labels GI protected*	

Source: GI products registered in European DOOR database.

Table 2: Summary Statistics for Bilateral import values and GI numbers by Country (1999-2009)

	Import (in E+07)		GI Number	
	Mean	SD	Mean	SD
Austria	22.9	60.7	11.666	1.255
Belguim	69.9	167	4.666	1.710
Bulgaria	2.76	5.13	0	0
Cyprus	2.24	4.30	0.333	0.474
Denmark	21.3	41.1	1.666	1.255
Estonia	2.38	3.29	0	0
Finland	8.83	13.4	1.666	0.948
France	102	177	124.666	34.518
Germany	142	228	55.666	7.411
Greece	19.0	29.8	78.333	5.283
Hungary	8.01	14.6	1.333	1.897
Ireland	16.6	55.6	6	0.821
Italy	92.1	157	139.666	41.953
Latvia	2.98	6.22	0	0
Lituania	4.24	7.71	0	0
Luxembourg	6.32	16.9	3.333	0.948
Malta	1.49	2.98	0	0
Netherlands	66.5	143	5.333	0.948
Poland	16.8	33.9	3	4.270
Portugal	20.3	57.8	92	18.301
Republic of Czech	12.1	23.8	10.333	8.393
Romania	7.04	13.8	0	0
Slovak Republic	5.55	13.6	1.333	1.897
Slovenia	3.49	6.77	0.333	0.474
Spain	55.3	96.1	78.333	37.876
Sweden	21.3	36.2	1.666	0.474
United Kingdom	104	165	27	4.108
All Countries	31.0	95.5	24.012	42.727

Table 3: Estimated gravity coefficients accounting for the presence and number of GIs

	(1) OLS	(2) Random Effects	(3) PPML	(4) Poisson with Random Effects
Log relative GDP	0.9821***	0.9106***	0.8662***	0.7780***
	(0.0467)	(0.0480)	(0.1077)	(0.0883)
Log relative distance	-1.1324***	-1.1079***	-2.0853***	-1.3372***
	(0.1121)	(0.1136)	(0.5236)	(0.2875)
Log relative price	-0.6845***	-0.3304***	-0.8617***	-0.7038***
	(0.0759)	(0.0789)	(0.1226)	(0.0972)
Common border	0.7483***	0.9272***	-2.0372***	-1.1685***
	(0.2256)	(0.2319)	(0.5523)	(0.4010)
Common language	1.4447***	1.4535***	1.4820***	1.7885***
	(0.3657)	(0.3560)	(0.4174)	(0.5148)
Year 2004	0.6293***	0.7235***	2.0800***	2.0343***
	(0.0674)	(0.0562)	(0.2859)	(0.2959)
Year 2009	-0.9761***	-0.7825***	-0.5967***	-0.7931***
	(0.1028)	(0.0991)	(0.1669)	(0.1662)
$I_a\_adj.$	0.0025	0.0075***	-0.0661	-0.0296***
	(0.0024)	(0.0022)	(0.0490)	(0.0082)
$I_b\_adj.$	-0.0043	-0.0045	-0.0037	-0.0025
	(0.0029)	(0.0028)	(0.0064)	(0.0078)
$I_c\_adj.$	0.0107***	0.0076***	0.0016	0.0017
	(0.0010)	(0.0009)	(0.0023)	(0.0020)
Constant (border effect)	-2.8672***	-3.0265***	1.1751	-0.4705
	(.2946)	(0.2964)	(0.9788)	(0.5671)
N	2045	2045	2106	2106

Notes: Cluster-robust standard errors in parentheses, pooled data by pair (importer-exporter)
***significance at the 1% level, **significance at the 5% level, and *significance at the 10% level

Table 4: Estimated coefficients for Head and Mayer's log of relative trade gravity equation (Results from Random Effects Estimation of Table 3)

	(1)	(2)	(3)
Log relative GDP	0.8702***	0.9106***	0.8702
	(0.0479)	(0.0480)	
Log relative distance	-1.1743***	-1.1079***	-1.1743
	(0.1147)	(0.1136)	
Log relative price	-0.3308***	-0.3304***	-0.3308
	(0.0815)	(0.0789)	
Common border	1.0040***	0.9272***	1.0040
	(0.2495)	(0.2319)	
Common language	1.4288***	1.4535***	1.4288
	(0.3585)	(0.3560)	
Year 2004	0.8047***	0.7235***	0.8047
	(0.0525)	(0.0562)	
Year 2009	-0.5345***	-0.7825***	-0.5345
	(0.0837)	(0.0991)	
$I_a\_adj.$	–	0.0075***	0.0033
		(0.0022)	(0.0021)
$I_b\_adj.$	–	-0.0045	-0.0053*
		(0.0028)	(0.0028)
$I_c\_adj.$	–	0.0076***	0.0097***
		(0.0009)	(0.0009)
Constant (Border effect)	– 2.7152***	-3.0265***	-2.9615***
	(0.2939)	(0.2964)	(0.0950)
Number of observations	2045	2045	2045

Notes: Cluster-robust standard errors in parentheses, pooled data by pair (importer-exporter) ***significance at the 1% level, **significance at the 5% level, and *significance at the 10% level