Trade Preferences and Bilateral Trade in Goods and Services: A Structural Approach*

Peter Egger†, Mario Larch‡, and Kevin E. Staub§

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Abstract

The large reduction in tariff rates worldwide under several rounds of the GATT is commonly credited with being one of the most notable economic policy accomplishments since World War II. However, the remarkable progress towards free trade of goods is unparalleled in trade with services where liberalization agreements are much harder to achieve and cross-border transactions are impeded by far tighter barriers than for the exchange of goods. In any case, the question as to how trade policy affects services trade is complex for various reasons. First, services transactions are much harder to measure than goods transactions and acceptable data on service trade have only recently become available, mostly for trade of OECD countries. Second, neither production nor trade of goods and services are independent. Often they are even un-separable so that achievements towards liberalizing cross-border trade of goods should have an impact on services and, by the same token, the lack of liberalization of services trade should be responsible for there being less goods trade than possible. We provide a general equilibrium comparative static estimate of the trade and welfare effects of trade policy measures towards goods and services trade.

Key words: Goods trade; Services trade; Gravity equation; Structural estimation

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† *Affiliation:* ETH Zürich, CEPR, CESifo, Ifo Institute, GEP at University of Nottingham, and CBT at Oxford University. *Address:* ETH Zürich, WEH E6 Weinbergstrasse 35, 8092 Zürich, Germany.

‡ *Affiliation:* University of Bayreuth, CESifo, and Ifo Institute. *Address:* Universitätsstrasse 30, 95447 Bayreuth, Germany.

§ *Affiliation:* University of Zurich. *Address:* Zürichbergstr. 14, 8032 Zurich.

1 Introduction

An economy's service sector is known to grow in importance – and eventually dominate manufacturing – along the transition from a developing towards a developed country (see Schettkat and Yocarini, 2006; Francois and Hoekman, 2010). As countries develop and integrate with each other, services sector growth turns into an international phenomenon by way of cross-border services transactions (see Francois and Reinert, 1996; Mattoo and Sauvé, 2003; Francois and Woerz, 2008).

The increasing importance of services relative to goods production and trade is reflected in the growth of attention in the policy arena. Not only has services trade become a key outcome of interest in multilateral policy making – e.g., with the General Agreement on Trade in Services (GATS) under the auspices of the World Trade Organization (WTO; see Mattoo and Sauvé, 2003) – but it surfaces prominently also in the liberalization of cross-border transactions of countries with a goal of preferential market access. The latter is obvious from the increasing number of recently-concluded or -extended preferential trade agreements that are notified to the WTO and liberalize not only trade in goods but also trade in services preferentially in accordance with WTO rules (see Mattoo and Fink, 2002).

In general, cross-border services transactions are difficult to measure in comparison to goods trade. This has to do with the fact that, unlike goods trade, not all cross-border services transactions correspond to direct trade in services (e.g., the delivery of a computer program via email from the programmer's residence country to the customer's residence country, corresponding to Mode 1 in GATS jargon). Some services trade happens by way of cross-border consumption at the site of the services provider (e.g., tourism which is referred to as Mode 2). Yet other services are provided in connection with foreign direct investment and the offshore provision through affiliates (Mode 3 in GATS jargon). Finally, as a counterpart to Mode 2, some services are provided locally by the temporary foreign labor service of natural persons at the consumer's site (e.g., installation or repairs; Mode 4). The multi-faceted appearance of cross-border services transactions have deterred both data collection and provision as well as associated quantitative academic research for long. Only fairly recently, notable attempts to collect and provide data on services trade have been undertaken (e.g., by the OECD and the World Bank; or Francois, Pindyuk, and Woerz, 2009) and systematic structural quantitative work is still scarce (see Anderson, Milot, and Yotov, 2010; Francois, Pindyuk, and Woerz, 2008; or Nordås, 2010; for a few exceptions).

Unlike for goods trade, most of the existing quantitative work on services trade is of a reduced-form type (Anderson, Milot, and Yotov, 2010, are a notable exception but focus on Canada and the services sector only) or based on calibration and simulation methods in a broad sense. Three potential shortcomings flow from this treatment. First, as in models of goods trade only, reduced-form econometric work tends to ignore market-clearing conditions at the multilateral level, rendering the analysis of the consequences of big economic shocks inconsistent with general equilibrium. Second, with reduced-form econometric work market-clearing conditions at the multisectoral level within countries are ignored with qualitatively similar consequences: an analysis of big economic shocks leads to estimated effects which are likely inconsistent with limited factor supply and cross-sectoral effects through intranational factor movements (see, e.g., Eaton and Kortum, 2002, for an exception). Third, a problem with the analysis based on computable general equilibriums may be that the calibration is based on external information beyond the data which are employed. These three issues are overcome in structurally estimated models.

The goal of this paper is to provide a structural quantitative analysis of the consequences of the preferential liberalization of services and goods trade by way of agreements as notified to the WTO in multi-country general equilibrium. We outline such a model of goods and services production and propose an estimation strategy which identifies all model parameters of interest and takes the bivariate stochastic nature of data on bilateral trade in goods and services into account. The model together with the estimated parameters is then used to assess quantitatively the comparative static effects of preferential liberalization of goods and/or services trade in general equilibrium using panel data on 16 European countries for the period 1999 to 2006.

Key findings of this analysis can be summarized as follows. First, services trade reacts more elastically than goods trade to preferential trade liberalization of any kind. On average, services liberalization boosts labor demand in the services sector at the cost of labor demand in the goods sector and vice versa. However, preferential liberalization of many country-pairs at the same time induces a complex mix of direct (*trade creation*) and indirect (*trade diversion*) effects on bilateral trade. Preferential goods and services trade liberalization together in 2006 lead to welfare effects of about 0.8% of GDP in the average economy covered compared to an equilibrium without such liberalization but keeping the level of multilateral liberalization as of that year. In comparison, goods trade versus services trade liberalization alone account for welfare gains of about 0.4% and 0.3%, respectively.

The remainder of the paper is structured as follows. Section 2 presents the theoretical model and outlines how the model can be solved in counterfactual equilibrium with known data on independent variables and parameters. Section 3 introduces a stochastic version of the model and discusses how these model parameters can be estimated from the data. Section 4 summarizes features of the data, estimation results, and comparative static effects of adopting preferential trade agreements on goods versus services trade, and the last section concludes.

2 A gravity model of goods and services

2.1 Utility

Let us assume that there are two industries, services (S) and goods (G), respectively. Consumers receive utility from the consumption of goods from either industry through a constant-elasticity-of-substitution (CES) function with industry-specific elasticity of substitution, following Dixit and Stiglitz (1977), and their respective subutility functions are aggregated by the following Cobb-Douglas upper-tier utility function that translates sectoral subutility into an overall welfare level:

$$U_j = \prod_{\ell} C_{\ell,j}^{\alpha_\ell}, \qquad C_{\ell,j} = \left[\int_{v=V_\ell} c_{\ell,j}^{\frac{\sigma_\ell,-1}{\sigma_\ell}}(v)dv \right]^{\frac{\sigma_\ell}{\sigma_\ell-1}}, \qquad \ell = \{G, S\} \tag{1}$$

where α_ℓ with $\sum_\ell \alpha_\ell$ is the weight of the ℓ-th industry in total expenditure, $c_{\ell,j}(v)$ is the consumption of consumers in country j of variety v from sector ℓ, and σ_ℓ is the elasticity of substitution in consumption of varieties v in sector ℓ. A key property of $C_{\ell,j}$ is that it captures a love of variety: consumers value a given amount of consumption of either S or G higher if it consists of a larger number of varieties.

Utility in (1) is maximized subject to total income. The latter is defined as total consumption expenditures for varieties in either sector, $Y_j \equiv \sum_\ell \alpha_\ell Y_j$. Household expenditures in country j for varieties in sector ℓ and total expenditures, respectively, are defined as:

$$Y_{\ell,j} \equiv \alpha_\ell Y_j = \int_{v=V_\ell} \tilde{p}_{\ell,j}(v) c_{\ell,j}(v) dv, \qquad Y_j = \sum_\ell \int_{v=V_\ell} \tilde{p}_{\ell,j}(v) c_{\ell,j}(v) dv, \tag{2}$$

where $\tilde{p}_{\ell,j}(v)$ is the consumer price of variety v of sector ℓ in country j and $c_{\ell,j}(v)$ is the corresponding quantity consumed.

Maximization of (1) subject to 2 obtains consumption expenditures for variety v in sector ℓ and country j:

$$c_{\ell,j}(v) = \left(\frac{\tilde{p}_{\ell,j}}{P_{\ell,j}}\right)^{-\sigma_\ell} \frac{Y_{\ell,j}}{P_{\ell,j}}, \qquad , P_{\ell,j} = \left[\int_{v=V_\ell} \tilde{p}_{\ell,j}^{1-\sigma_\ell}\right]^{\frac{1}{1-\sigma_\ell}} \tag{3}$$

where $P_{\ell,j}$ denotes the consumer price index in country j and sector ℓ.

In the sequel, we use the following simplifying assumptions. First, trade costs are of the iceberg form so that we may write $\tilde{p}_{\ell,j}(v) = p_\ell(v) t_j(v)$, where $p_\ell(v)$ is the producer price of v and $t_j(v) \geq 1$ is the iceberg trade cost term for shipping variety v from wherever it is produced to consumers in j. Second, each variety is produced by a single firm which acts under monopolistic competition. Third, all producers located in a country, say, i, have access to and, in equilibrium, use the same production technology.

2.2 Production

The representative firm in country i and sector ℓ is assumed to maximize profits subject to the linear cost function:

$$l_{\ell,i} = \delta_\ell + \phi_\ell x_{\ell,i}, \tag{4}$$

where $l_{\ell,i}$ denotes labor used by the representative firm in sector ℓ and country i and $x_{\ell,i}$ denotes the output of the firm.

Hence, we assume that labor is the only factor of production. Moreover, we assume that labor is mobile across sectors but not internationally. The latter implies equalization of the reward to labor services within but not across countries and the variety index (v) with producer prices and trade costs, respectively, in sector ℓ may be replaced by a subscript denoting the residence country of producers, say, i. For consumption of a variety from country i, we may then replace $\tilde{p}_{\ell,j}(v)$ in equation (3) by $p_{\ell,i}t_{ij}$.

Let us denote the wage rate paid to workers in country i by w_i. Then, profit maximization ensures fixed-markup pricing:

$$p_{\ell,i} = \frac{\sigma_\ell}{\sigma_\ell - 1}\phi_\ell w_i. \tag{5}$$

Under monopolistic competition, zero economic profits in equilibrium ensures:

$$x_{\ell,i} = \frac{\delta_\ell}{\phi_\ell}(\sigma_\ell - 1). \tag{6}$$

Clearing of the market for labor with full employment is ensured by the factor constraint

$$L_i = \sum_\ell L_{\ell,i}, \qquad L_{\ell,i} \equiv n_{\ell,i} l_{\ell,i} = n_{\ell,i}(\delta_\ell + \phi_\ell x_{\ell,i}), \tag{7}$$

which yields:

$$n_{\ell,i} = \frac{L_{\ell,i}}{\delta_\ell + \phi_\ell x_{\ell,i}}. \tag{8}$$

where $L_{\ell,i}$ is the (endogenous) amount of labor employed in sector ℓ and country i and $\sum_\ell L_{\ell,i} = L_i$ is country i's total endowment with labor. Hence, while L_i is fixed in this model, the allocation of labor across sectors is determined endogenously in general equilibrium.

2.3 Bilateral trade flows at the sector level

Let us denote bilateral consumption of a representative variety in sector ℓ originating from country i by consumers in j by $c_{\ell,ij}$. Furthermore, denote the corresponding shipments from the perspective of a firm in i by $x_{\ell,ij} \equiv t_{\ell,ij}c_{\ell,ij}$, where $t_{\ell,ij} \geq 1$ denotes an ad-valorem iceberg trade cost factor. The value of bilateral shipments per firm, $p_{\ell,i}x_{\ell,ij}$, equals the corresponding value of consumption, $p_{\ell,i}t_{\ell,ij}c_{\ell,ij}$. With labor being perfectly mobile between sectors, GDP is defined as $Y_i \equiv w_i \sum_\ell L_{\ell,i}$ so that $w_i = Y_i/L_i$. Using equations (5), (6) andh (8), we can substitute $\sigma_\ell\phi_\ell w_i/(\sigma_\ell - 1)$ for $p_{\ell,i}$, Y_i/L_i for w_i, and $L_{\ell,i}$ for $n_{\ell,i}$ $\forall$ $\ell \in \{S, G\}$ to yield an expression for aggregate nominal bilateral export flows from country i to j in sector ℓ:

$$X_{\ell,ij} \equiv n_{\ell,i} p_{\ell,i} x_{\ell,ij} = \frac{L_{\ell,i}(Y_i/L_i)^{1-\sigma_\ell} t_{\ell,ij}^{1-\sigma_\ell} \alpha_{\ell,j} Y_j}{\sum_{k=1}^{N} L_{\ell,k}(Y_k/L_k)^{1-\sigma_\ell} t_{\ell,kj}^{1-\sigma_\ell}} = \frac{\mathfrak{Y}_{\ell,i}(Y_i/L_i)^{-\sigma_\ell} t_{\ell,ij}^{1-\sigma_\ell} \alpha_{\ell,j} Y_j}{\sum_{k=1}^{N} \mathfrak{Y}_{\ell,k}(Y_k/L_k)^{-\sigma_\ell} t_{\ell,kj}^{1-\sigma_\ell}}, \tag{9}$$

where $\mathfrak{Y}_{\ell,i} \equiv \sum_{j=1}^{J} X_{\ell,ij} = n_{\ell,i} p_{\ell,i} x_{\ell,i} = w_i L_{\ell,i}$ are total sales by country i in sector ℓ, so that $L_{\ell,i} = \mathfrak{Y}_{\ell,i}/w_i$ and

$$\mathfrak{Y}_{\ell,i} = \sum_{j=1}^{J} \frac{\mathfrak{Y}_{\ell,i}(Y_i/L_i)^{-\sigma_\ell} t_{\ell,ij}^{1-\sigma_\ell} \alpha_{\ell,j} Y_j}{\sum_{k=1}^{N} \mathfrak{Y}_{\ell,k}(Y_k/L_k)^{-\sigma_\ell} t_{\ell,kj}^{1-\sigma_\ell}}, \qquad Y_i = \sum_{\ell} \sum_{j=1}^{J} \frac{\mathfrak{Y}_{\ell,i}(Y_i/L_i)^{-\sigma_\ell} t_{\ell,ij}^{1-\sigma_\ell} \alpha_{\ell,j} Y_j}{\sum_{k=1}^{J} \mathfrak{Y}_{\ell,k}(Y_k/L_k)^{-\sigma_\ell} t_{\ell,kj}^{1-\sigma_\ell}} \tag{10}$$

where $Y_i = \sum_\ell \mathfrak{Y}_{\ell,i}$ is the multilateral balance of payments constraint which implies market clearing.

Hence, given the fundamental parameters σ_ℓ, α_ℓ, δ_ℓ, and ϕ_ℓ and the fundamental variables $t_{\ell,ij}$ and $L_{\ell,i}$ for all $\{\ell, i, j\}$, the endogenous variables of the model, namely $X_{\ell,ij}$, $\mathfrak{Y}_{\ell,i}$ and Y_i are determined. If all endogenous variables are observed in benchmark equilibrium and all parameters are assumed to be constant, knowledge or estimation of δ_ℓ and ϕ_ℓ is not necessary to determine counterfactual equilibria of $X_{\ell,ij}$, $\mathfrak{Y}_{\ell,i}$ and Y_i.

2.4 Equilibrium and equivalent variation

Market clearing implies $Y_i = \sum_\ell \mathfrak{Y}_{\ell,i}$. Dividing the left-hand side and right-hand side of the equation for $\mathfrak{Y}_i$ in (10) by $\mathfrak{Y}_i$ and by $[(\sum_\ell \mathfrak{Y}_{\ell,i})/L_i]^{-\sigma_\ell}$ and substituting Y_i by $\sum_\ell \mathfrak{Y}_{\ell,i}$ yields

$$[(\sum_\ell \mathfrak{Y}_{\ell,i})/L_i]^{\sigma_\ell} = \sum_{j=1}^{N} \left(\frac{t_{\ell,ij}^{1-\sigma_\ell} \alpha_{\ell,j} (\sum_\ell \mathfrak{Y}_{\ell,i})}{\sum_{k=1}^{N} \mathfrak{Y}_{\ell,k} [(\sum_\ell \mathfrak{Y}_{\ell,k})/L_k]^{-\sigma_\ell} t_{\ell,kj}^{1-\sigma_\ell}} \right). \tag{11}$$

Hence, with two sectors $\ell \in \{G, S\}$, (11) obtains a system of $2J$ equations that can be solved for J values of $\mathfrak{Y}_{G,i}$ and $\mathfrak{Y}_{S,i}$ each.

In order to do so, one needs data on L_i and ones underlying $t_{\ell,ij}$ (such as bilateral distance or regional trade agreement membership), and one needs estimates of $\alpha_{\ell,i}$, σ_ℓ, and the parameters relating variables behind $t_{\ell,ij}$ to $t_{\ell,ij}^{1-\sigma_\ell}$. Solving (11) based on benchmark and counterfactual estimates of $t_{\ell,ij}^{1-\sigma_\ell}$ yields the corresponding equilibria.

With the solutions at hand, we can also compute the equivalent variation corresponding to the change in $t_{\ell,ij}^{1-\sigma_\ell}$ as a measure of welfare. For this, denote benchmark and counterfactual solutions of endogenous variables by subscript b and c, respectively, and note that, in general,

$$P_{\ell,i} = \left\{ \sum_{k=1}^{N} \mathfrak{Y}_{\ell,k} [(\sum_{\ell} \mathfrak{Y}_{\ell,k})/L_k]^{-\sigma_\ell} t_{\ell,kj}^{1-\sigma_\ell} \right\}^{\frac{1}{1-\sigma_\ell}}. \tag{12}$$

to define real GDP of country i as

$$R_i = \frac{\sum_\ell \mathfrak{Y}_{\ell,k}}{\prod_\ell P_{\ell,i}^{\alpha_{\ell,i}}}. \tag{13}$$

and the equivalent variation in country i as the response of real GDP R_i in percent to some change in a fundamental variable (such as bilateral trade costs) as:

$$EV_i = 100 \frac{R_{c,i}}{R_{b,i}} - 100. \tag{14}$$

3 Stochastic process and estimation

To compute the counterfactual equilibrium, the unknown parameters σ_ℓ and α_ℓ, as well as the bilateral sectoral trade barriers $t_{\ell,ij}$ need to be estimated from the data. This section shows how these parameters can be estimated from a panel data set of country-pairs. While the estimation procedures could also be implemented with cross-sectional data, the approach discussed here is more general and allows to exploit efficiency gains resulting from repeated observations over time. Importantly, trade barriers will be identified by additional within-country-pair variation.

Notationally, the adoption of the time dimension is introduced by adding a subscript $t = 1, \ldots, T$ to the variables. This increases the parameters to be estimated to $\alpha_{\ell,t}$ and $t_{\ell,ijt}$. For sparcity reasons, we assume that consumers' tastes as captured by σ_ℓ are stable over time, but our empirical strategy does not require this assumption for identification of σ_ℓ.

With data on $\mathfrak{Y}_{\ell,jt}$ and Y_{jt} at hand, the share of income which is spent on sector ℓ can easily be solved for each country j from

$$\alpha_{\ell,jt} = \frac{\mathfrak{Y}_{\ell,jt}}{Y_{jt}} = \frac{\mathfrak{Y}_{\ell,jt}}{\sum_\ell \mathfrak{Y}_{\ell,jt}}. \tag{15}$$

In contrast, obtaining $t_{\ell,ijt}$ and σ_ℓ requires more assumptions, and we devote the remainder of the section to this problem.

3.1 Empirical bisectoral gravity model

Following the standard specification in the empirical literature on gravity models for trade, we specify unobserved trade barriers to be an exponential function of K observed proxy variables $Z_{ijt} = (Z_{1,ijt}, \ldots, Z_{K,ijt})$:

$$\tau_{\ell,ijt} = \exp(Z'_{\ell,ijt} b_\ell), \tag{16}$$

where b is a conforming parameter vector. This reduces the problem of estimating $N \times (N-1) \times T$ trade barriers to that of estimating two K-dimensional vectors b_ℓ. For this purpose, a stochastic counterpart to (9) may be written as

$$X_{\ell,ij} = \exp(Z'_{\ell,ijt} b_\ell)^{1-\sigma_\ell} \mu_{\ell,it} m_{\ell,jt} u_{\ell,ijt}, \tag{17}$$

where $u_{\ell,ijt}$ denotes the random disturbances or measurement error of exports, assumed to be identically distributed over the non-negative real numbers and mean-independent of the remaining terms of the right-hand side of (17). Errors $u_{\ell,ijt}$ are allowed to be correlated over time and across sectors.

Writing $\beta_\ell = b_\ell \times (1 - \sigma_\ell)$ and including a constant in Z_{ijt}, the conditional expectation of (17) is

$$\mathrm{E}(X_{\ell,ij} | Z_{ijt}, \mu_{\ell,it}, m_{\ell,jt}) = \exp(Z'_{ijt} \beta_\ell) \mu_{\ell,it} m_{\ell,jt} \tag{18}$$

which can serve as estimating equations for a number of moment-based estimators of β, $\mu_{\ell,it}$ and $m_{\ell,jt}$.

The terms $\mu_{\ell,it}$ and $m_{\ell,jt}$ collect the sectoral exporter-time and importer-time specific structural components of (9). In addition, they may contain sectoral unobserved exporter-time and importer-time specific trade costs, say $\phi_{\ell,it}$ and $\varphi_{\ell,jt}$, respectively:

$$\mu_{\ell,it} \equiv \mathfrak{Y}_{\ell,it} (Y_{it}/L_{it})^{-\sigma_\ell} \phi_{\ell,it}^{1-\sigma_\ell}, \tag{19}$$

$$m_{\ell,it} \equiv \frac{\alpha_{\ell,jt} Y_{jt}}{\sum_{k=1}^{N} \mathfrak{Y}_{\ell,kt} (Y_{kt}/L_{kt})^{-\sigma_\ell} \tau_{\ell,kjt}^{1-\sigma_\ell} \phi_{\ell,kt}^{1-\sigma_\ell} \varphi_{\ell,jt}^{1-\sigma_\ell}} \varphi_{\ell,jt}^{1-\sigma_\ell}. \tag{20}$$

According to this notation, $t_{\ell,ijt}^{1-\sigma_\ell} = \tau_{\ell,ijt}^{1-\sigma_\ell}\phi_{\ell,it}^{1-\sigma_\ell}\varphi_{\ell,jt}^{1-\sigma_\ell}$.

This distinction is important for computing the counterfactual equilibrium where the unobserved exporter-time and importer-time specific trade costs $\phi_{\ell,it}$ and $\varphi_{\ell,jt}$ are held constant, while the remaining, structural parts of $\mu_{\ell,it}$ and $m_{\ell,jt}$ change. Note that $\phi_{\ell,it}^{1-\sigma_\ell}$ can be solved for directly from (19) provided estimates of $\mu_{\ell,it}$ and σ_ℓ, and data on $\mathfrak{Y}_{\ell,it}, Y_{it}, L_{it}$ are available. Similarly, with the same information, solutions for $\varphi_{\ell,it}^{1-\sigma_\ell}$ can be obtained for all countries and years as implicit solutions to the system in (20) when additionally employing estimates for $m_{\ell,it}$ and $t_{\ell,kjt}^{1-\sigma_\ell}$ along with data on $\alpha_{\ell,jt}$ and Y_{jt}.

Before showing how estimates of σ_ℓ can be obtained, we discuss possible estimators for β, $\mu_{\ell,it}$ and $m_{\ell,jt}$ based on (18) in more detail. Without further assumptions on the error $u_{\ell,ijt}$, the Poisson pseudo-likelihood estimator applied to (18) separately for the goods and services sectors is the most convenient choice. Poisson's favorable properties in trade gravity settings have been documented by previous research. It has been argued that Poisson's good finite sample performance compared to other asymptotically unbiased estimators –such as nonlinear least squares or Gamma pseudo-likelihood– may stem from Poisson's equal weighting of observations in its first order conditions (Santos Silva and Tenreyro, 2006). It is important to emphasize that the OLS estimator of the logarithm of equation (17) is not asymptotically unbiased under the postulated error assumptions, because higher-order dependence between $u_{\ell,ijt}$ and Z_{ijt} will lead to mean-dependence between $\ln(u_{\ell,ijt})$ and Z_{ijt} in general.

Moment-based estimation of (18) can account for the exporter-time and importer-time specific terms, $\mu_{\ell,it}$ and $m_{\ell,jt}$, by treating them as fixed effects to be estimated. Due to the quadratic nature of the data, the number of observations available increases at a much faster rate than the additional parameters $\mu_{\ell,it}$ and $m_{\ell,jt}$ when the number of countries grows without bound. This implies that estimation is not affected by the classical incidental parameters problem arising under standard asymptotics.[1]

[1]Formally, the asymptotic bias of fixed effects estimators in nonlinear panels is proportional to the square root of the ratio of the number of fixed effects to the number of observations available to estimate any specific fixed effect (see Hahn and Newey, 2004). In a quadratic panel, this ratio is zero asymptotically.

3.2 System estimation of the bisectoral gravity model

Since the error in the services equation is very likely to be correlated with the error in the goods equation ($\ell = S$ and $\ell = G$ in equation (17), respectively), this suggests developing a system estimator in the tradition of seemingly unrelated regression. Such an estimator should be able to exploit the error correlation to increase efficiency. To implement it, the assumptions on the stochastic process of the errors need to be extended to second moments. While potential efficiency gains require these assumptions to be correct, violating them will not compromise consistency as long as the conditional expectation function (18) is correctly specified.

In addition to the correlation between sectors, the specification of the variance of the system should also account for serial correlation. Neglecting potential correlation over time might mislead inference, reporting standard errors which overestimate the precision of the estimated parameters. A parsimonious way of modeling autocorrelation is through a random effects framework which imposes equicorrelated errors. Thus, assume the disturbances of exports to be composed of two independent parts, a time-invariant component $\eta_{\ell,ij}$ and an idiosyncratic component $\nu_{\ell,ijt}$:

$$u_{\ell,ijt} = \eta_{\ell,ij}\nu_{\ell,ijt}, \quad \eta_{\ell,ij} \sim \text{IID}(1, \omega^2_{\ell,\eta}), \quad \nu_{\ell,ijt} \sim \text{IID}(1, \omega^2_{\ell,\nu}), \quad \eta_{\ell,ij} \perp\!\!\!\perp \nu_{\ell,ijt}. \tag{21}$$

To model correlation between sectors assume that both idiosyncratic shocks $\nu_{\ell,ijt}$ at a given time and country-pair-specific components $\eta_{\ell,ij}$ are correlated between sectors. Between time periods, however, random shocks $\nu_{\ell,ijt}$ are assumed independent between sectors:

$$\text{Cov}(\eta_{S,ij}, \eta_{G,ij}) = \omega_{SG,\eta}, \quad \text{Cov}(\nu_{S,ijt}, \nu_{G,ijt}) = \omega_{SG,\nu}, \quad \nu_{S,ijt} \perp\!\!\!\perp \nu_{G,ijs} \;\text{ for } t \neq s. \tag{22}$$

This set of assumptions on the errors together with the multiplicative model (17) imply a specific conditional variance for the vector of a country-pair's exports over time and over sectors. Efficient estimation based on the moment condition of zero conditional-expectation residuals of country-pairs should weight these by the inverse of the covariance matrix. We will refer to this estimator as the system generalized nonlinear least squares estimator (SGNLS). Collecting the parameters to be estimated in the vector $\theta_0 = (\beta, \mu, m)$, the SGNLS estimator $\hat{\theta}$

of θ_0 is

$$\hat{\theta} = \arg\min_{\theta} Q_N(\theta) = \sum_{i=1}^{N}\sum_{j=1}^{N} R_{ij}(\theta)'\Omega_{ij}^{-1}R_{ij}(\theta), \tag{23}$$

where $R_{ij}(\theta)$ is the $2T$-vector of country-pair ij's conditional expectation residuals evaluated at θ,

$$R_i(\theta_0) = \begin{pmatrix} R_{S,ij}(\theta_{S,0}) \\ R_{G,ij}(\theta_{G,0}) \end{pmatrix} = \begin{pmatrix} X_{S,ij} - \exp(Z_{ij}'\beta_S)\mu_{S,i}m_{S,j} \\ X_{G,ij} - \exp(Z_{ij}'\beta_G)\mu_{G,i}m_{G,j} \end{pmatrix} = X_{ij} - \exp(Z_{ij}'\beta)\mu_i m_j,$$

with $X_{\ell,ij} = (X_{S,ij1}, \ldots, X_{S,ijT})'$ and similarly for Z_{ij}, $\mu_{\ell,i}$ and $m_{\ell,j}$. The inverse weighting matrix in (23) is

$$\Omega_{ij} = \text{Var}(X_{ij}|Z_{ij}, \mu_i, m_j) = \text{diag}(\exp(Z_{ij}'\beta)\mu_i m_j)\ \mathbf{\Omega}\ \text{diag}(\exp(Z_{ij}'\beta)\mu_i m_j), \tag{24}$$

where $\text{diag}(\cdot)$ denotes the zero matrix with the vector in the argument as diagonal. $\mathbf{\Omega}$ is the $2T \times 2T$-variance matrix of the error vector of country-pair ij, $u_{ij} = (u_{S,ij}', u_{G,ij}')'$, and $u_{\ell,ij}$ is $(u_{\ell,ij1}, \ldots, u_{\ell,ijT})'$. The structure (21) and (22) imposed on the errors yields the following form for $\mathbf{\Omega}$:

$$\mathbf{\Omega} = \text{Var}(u_{ij}) = \begin{pmatrix} \Omega_S & \Omega_{SG} \\ \Omega_{SG} & \Omega_G \end{pmatrix}, \tag{25}$$

with

$$\Omega_S = \begin{pmatrix} o_S^2 & & & \\ \bar{o}_S^2 & \ddots & & \\ \vdots & \ddots & \ddots & \\ \bar{o}_S^2 & \cdots & \bar{o}_S^2 & o_S^2 \end{pmatrix}, \quad \Omega_G = \begin{pmatrix} o_G^2 & & & \\ \bar{o}_G^2 & \ddots & & \\ \vdots & \ddots & \ddots & \\ \bar{o}_G^2 & \cdots & \bar{o}_G^2 & o_G^2 \end{pmatrix}, \quad \Omega_{SG} = \begin{pmatrix} o_{SG} & & & \\ \bar{o}_{SG} & \ddots & & \\ \vdots & \ddots & \ddots & \\ \bar{o}_{SG} & \cdots & \bar{o}_{SG} & o_{SG} \end{pmatrix}. \tag{26}$$

In terms of the six error variances from (22), the six distinct entries of $\mathbf{\Omega}$ are

$$\begin{aligned}
o_\ell^2 &= \text{Var}(u_{\ell,ijt}) = \omega_{\ell,\eta}^2\omega_{\ell,\nu}^2 + \omega_{\ell,\mu}^2 + \omega_{\ell,\nu}^2, \\
\bar{o}_\ell^2 &= \text{Cov}(u_{\ell,ijt}, u_{\ell,ijs}) = \omega_{\ell,\eta}^2, \\
o_{SG} &= \text{Cov}(u_{S,ijt}, u_{G,ijt}) = \omega_{SG,\eta}\omega_{SG,\nu} + \omega_{SG,\eta} + \omega_{SG,\nu}, \\
\bar{o}_{SG} &= \text{Cov}(u_{S,ijt}, u_{G,ijs}) = \omega_{SG,\eta}.
\end{aligned}$$

Two comments need to be made regarding the SGNLS estimator presented here. First, because of the exponential conditional mean function and the conditional variance Ω_{ij} which is quadratic in the mean, this model bears a close resemblance to some count data panel models that have been proposed in the literature. SGNLS estimation of the model, consequently, is very much in the spirit of Gourieroux, Monfort and Trognon's (1984a, 1984b) quasi-generalized PML estimator and Brännäs and Johansson's (1996) sequential GMM estimator for panel count data models. The weighting implied by the variance-covariance structure of this application is different from the weighting proposed in count data articles, since there the consideration of count models conveys an additional stochastic component even when controlling for unobserved heterogeneity, while in this application X_{ijt} is deterministic given Z_{ijt}, the fixed effects and u_{ijt}.

Second, in contrast to a linear specification of the model, the multiplicativity of this model implies a heteroskedastic export variance even though homoskedastic errors have been postulated, cf. (24), capturing a fundamental stylized fact of trade data. The assumption of constant variance of exports implicitly imposed in many linear applications has been seriously challenged by a strand of the recent empirical trade literature. Thus, multiplicative models with homoskedastic errors incorporate much of this critique.

The SGNLS estimator cannot be used in practice because its weighting matrix is unknown. A system *feasible* generalized nonlinear least squares (SFGNLS) estimator for the bisectoral gravity model replaces the unobserved Ω_{ij} in (23) with consistent estimates: Estimates for β_ℓ, $\mu_{\ell,it}$ and $m_{\ell,jt}$ can be obtained by Poisson pseudo-likelihood estimation; estimates for the six elements of the error variance matrix can then be obtained using these Poisson estimates in auxiliary regressions, as explained below.

Let $\Lambda_{\ell,ijt}$ denote the conditional expectation function (18), and $\hat{\Lambda}_{\ell,ijt} = \exp(Z_{ijt}'\hat{\beta}_\ell)\hat{\mu}_{\ell,it}\hat{m}_{\ell,jt}$

the corresponding prediction using the Poisson estimates. Under the error assumptions,

$$\mathrm{Var}(X_{\ell,ijt}|Z_{ijt}, \mu_{\ell,it}, m_{\ell,jt}) = o_\ell^2(\Lambda_{\ell,ijt})^2,$$

so that a consistent estimator of o_ℓ^2 may be obtained as the solution to OLS estimation of the two auxiliary regressions

$$\hat{R}_{\ell,ijt} = \mathrm{o}_\ell^2(\hat{\Lambda}_{\ell,ijt})^2 + error, \quad \ell = S, G$$

where $\hat{R}_{\ell,ijt}$ is the conditional expectation residual evaluated at Poisson estimates. Under correct specification of the model, standard asymptotic arguments imply that plim $\hat{\mathrm{o}}_\ell^2 = o_\ell^2$.

As $\mathrm{Cov}(X_{S,ijt}, X_{G,ijt}) = o_{SG}\Lambda_{S,ijt}\Lambda_{G,ijt}$ one can procede analagously to before and obtain the desired estimate from OLS estimation of

$$\hat{R}_{S,ijt}\hat{R}_{G,ijt} = \mathrm{o}_{SG}\,\hat{\Lambda}_{S,ijt}\hat{\Lambda}_{G,ijt} + error.$$

Estimates for the remaining three elements $(\bar{o}_S^2, \bar{o}_G^2, \bar{o}_{SG}^2)$ can be obtained as the OLS estimates from the following three linear regressions:

$$\hat{R}_{\ell,ijt}\hat{R}_{\ell,ijs} = \bar{\mathrm{o}}_\ell^2\hat{\Lambda}_{\ell,ijt}\hat{\Lambda}_{\ell,ijs} + \text{error}, \quad \ell = S, G$$
$$\hat{R}_{S,ijt}\hat{R}_{G,ijs} = \bar{\mathrm{o}}_{SG}\hat{\Lambda}_{S,ijt}\hat{\Lambda}_{G,ijs} + \text{error}.$$

Note that since the equations are valid for all $t \neq s$, the number of observations that can be used for each of these regressions is larger than the total number of observations in the dataset, $N(N-1)T$, as soon as $T > 2$. Because the six auxiliary regressions are run independently, the elements of $\mathbf{\Omega}$ are estimated without constraint. Therefore, if $\hat{o}_\ell^2 < \hat{\bar{o}}_\ell^2$ or $\hat{o}_{SG}^2 < \hat{\bar{o}}_{SG}^2$, this would have to be interpreted as a sign of model misspecification. In the results presented in the following section, the magnitude ordering of the variance components conformed to the logical predictions.

Standard errors for the SFGNLS estimator are given in the appendix. If the error structure is misspecified, this variance estimator is inconsistent. In this case, a more general heteroscedasticity-robust Eicker-White variance estimator can be used to conduct valid inference. Details on such robust standard errors can be found in the appendix, too.

3.3 Sectoral elasticities of substitution

The final parameters needed to conduct counterfactual analysis are the sectoral elasticities of substitution. As in the standard one-sector model, without further assumptions neither σ_S nor σ_G are identified. However, the basic model structure of (9) is sufficient to identify the difference between sectoral elasticities of substitution, $\sigma_G - \sigma_S$.

To see this, consider (9) again, but with exporter-time and importer-time specific terms collected in μ_{it} and m_{jt} as in (17):

$$X_{\ell,ijt} = \tau_{\ell,ijt}^{1-\sigma_\ell} \mu_{it} m_{jt}$$

If a base exporting country, say i', can be found that exports to every other country, exports can be normalized by the base country's, $\widetilde{X}_{S,ijt} \equiv X_{S,ijt}/X_{S,i'jt}$. Normalizing $\mathfrak{Y}_{\ell,i}$ and $t_{\ell,ijt}$ in the same way, using (9) and the equation above one obtains

$$\frac{\widetilde{X}_{S,ijt}/\widetilde{\mathfrak{Y}}_{S,it}}{\widetilde{X}_{G,ijt}/\widetilde{\mathfrak{Y}}_{G,it}} = \left(\frac{\widetilde{Y}_{it}}{\widetilde{L}_{it}}\right)^{\sigma_G - \sigma_S} \frac{\widetilde{t}_{S,ijt}^{1-\sigma_S}}{\widetilde{t}_{G,ijt}^{1-\sigma_G}}. \tag{27}$$

Hence, $\sigma_G - \sigma_S$ can be estimated directly as a parameter on normalized per-capita GDP in a Poisson pseudo-likelihood regression of (27), i.e. a regression of the left-hand side of (27) on normalized per-capita GDP and $\widetilde{Z}_{ijt}$.

Finally, we will use additional data on custom tariffs to estimate σ_G from the sample. Denoting the average custom tariff rate for goods trade agreement (GTA) members as $\bar{b}_{GTA}$ and the rate corresponding to country-pairs not sharing a GTA as $\bar{b}_{non-GTA}$, note that the β-coefficient on a GTA indicator variable ($GTA_{ijt} = 1$ if countries i and j have a GTA in year t) in the goods-sector gravity regressions of (18) is

$$\beta_{GTA} = (1 - \sigma_G)[(\ln(1 + \bar{b}_{GTA}) - (\ln(1 + \bar{b}_{non-GTA})]. \tag{28}$$

Thus, σ_G can be readily solved for when knowing $\bar{b}_{GTA}$, $\bar{b}_{non-GTA}$ and having an estimate of β_{GTA}.

4 The effect of adopting trade agreements

The goal of the empirical analysis is to quantify the impact of preferential liberalization of goods and services trade on the two types of trade flows consistent with multi-country general equilibrium. Two ingredients are vital for such an analysis. First, we aim at obtaining parameter estimates which are consistent with the data and with multi-country and two-sector general equilibrium. Second, we want to quantify the impact of a change in preferential trade agreements of either kind on outcome in a comparative static analysis which is based on the multi-country two-sector model outlined above.

4.1 Data

We utilize data on bilateral goods and services exports published by the Organisation for Economic Co-operation and Development (OECD). In particular, we use yearly data on bilateral exports among all pairs of 16 European OECD countries[2] from the OECD's Monthly Statistics of International Trade and the Statistics on International Trade in Services for the years 1999 to 2006. Neither goods trade exports nor services trade exports display a large number of zeros in this set of European countries (there is no observation of zero bilateral services trade in the data). Most of the covered countries trade of either type is intra-EU trade. About 75% of the observations are covered by a goods trade agreement, *GTA*, and 72% are covered by a services trade agreement, *STA*. In the data, services trade agreements do never come in isolation (i.e., without a goods trade agreement), but not all units whose goods trade is liberalized preferentially entertain a similar liberalization of services trade. These facts are summarized in Table 1. Information about these types of liberalization is available from the World Trade Organization (WTO).

— Table 1 about here —

[2] Austria, Belgium, Czech Republic, Denmark, Spain, Finland, France, Great Britain, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Slovakia, and Sweden.

Moreover, the table suggests that the average distance is somewhat more than 1,000 kilometers. This is less than in trade data-sets with many more countries, since the services data covered by the OECD are concentrated in Europe in our sample focuses on European economies entirely. Therefore, more than 10% of the country pairs also share a common land border, somewhat less than 8% had colonial ties in the past, and somewhat more than 4% share a common language. The information on these geographical and cultural variables stems from the Centre d'É´tudes Prospectives et d'Informationons Internationales (CEPII).

4.2 Parameter estimates

Table 2 contains our baseline Poisson pseudo-likelihood estimates of the empirical gravity equation (18) for goods exports X_G and services exports X_S. The first two columns with results are for a traditional log-distance specification, while the last two columns depict estimates from a specification where log-distance's impact on exports is estimated freely for every quintile of the distance distribution.

— Table 2 about here —

While our primary purpose of running these regressions is to get estimates for the trade barriers $t_{\ell,ijt}^{1-\sigma_\ell}$, the estimated β shown in the table can be interpreted in their own as average partial equilibrium effects of these regressors, i.e., as (approximate) percentage changes of bilateral trade barriers.

The effect of distance between trading partners seems to have a similar quantitative impact on services and goods exports when considering the log-distance specification, but the estimates of the more flexible log-distance quintile specification reveal substantial differences, which suggests that the first specification may be too restrictive. Distance is about twice as hindering to trade in the services sector, this ratio holding roughly for all quintiles. Compared to this stark contrast between sectors, the effect across quintiles is less pronounced, the trade-impeding effect of distance slightly magnifying for country-pairs farther apart.

The remaining variables, including the key variables of interest *GTA* and *STA*, are all binary, so that questions about the correct functional form are less important. The fact that their estimated coefficients vary little between the two specifications indicates that they are only weakly related to distance in our data.

Both *GTA* and *STA* are positive and statistically significant, a result which is in line with trade-enhancing effects of trade liberalization. The estimated coefficient of *STA* is about three times as large as *GTA*'s, suggesting that trade in services may react more sensitively to liberalization. Taken at face value, the estimates imply that the partial effects of liberalization are about 48.75% more trade in goods and about 219.63% more services trade.

The results relating to the other variables reinforce the picture of heterogeneous effects across sectors. For instance, sharing a common border has a large and statistically significant effect on trade, but between 25% to 40% less so for services than for goods exports. Having historical ties seem to matter only for the goods sector. The importance of such ties is much more modest (only about 15% in the first specification) in the set of developed countries we are analyzing than comparable estimates from work using data which includes developing countries. The coefficient on sharing a common language is small and insignificant for the services sector. For the goods sector, it is negative, which is counterintuitive and poses a riddle since in the raw data country-pairs with common languages trade almost five times the volume of country-pairs with different languages. The explanation here probably relates to the tight geographic area that we are considering and the fact that we are controlling for common border: Among contiguous countries a shared language is related to more trade, as expected. But among non-contiguous countries only Austria and Belgium share a common language, and their trade volume is low. Since there are much more country-pairs that are non-contiguous than contiguous, conditional on having a common border the incidentally negative relationship between language and trade dominates in our data.

An alternative measure for services exports

An important concern relates to the quality of the services exports measure. Sources vary with regards to what is included in or qualifies as a service. To assess the sensitivity of our data to potential misclassification or measurement error in our dependent variable we consider an alternative measure that is based on data from GTAP and provided by Francois, Pindyuk, and Woerz (2009). Table 3 replicates the services exports estimations from Table 2 with this alternative variable. As can be read off Table 1 the mean of the alternative X_S variable is about 10% smaller than the one from the OECD data, and its distribution has also a more narrow waist (the standard deviation is about 12% smaller than in the OECD sample). While in the services exports reported by Francois, Pindyuk, and Woerz (2009) there are 11.72% of observations with zero services export flows, all services exports are positive in the sample based on OECD data. The correlation between the two variables is only 84.95% (and 86.85% in the sample of positive exports of the original variable) which suggests that there are some substantial differences between the two considered measures.

— Table 3 about here —

Comfortingly, however, a glance at Table 3 shows that despite these differences the estimated coefficients are remarkably similar to the ones presented before. The estimates are less precise, a consequence of the reduced variation in the alternative dependent variable. We interpret these results as a sign of robustness, and proceed with our previous measure of services trade.

System estimation of the bisectoral gravity model

The Poisson estimates can be used as preliminary estimates to construct the efficient weight matrices needed for the system feasible generalized nonlinear least squares (SFGNLS) estimator presented in the previous section. In contrast to Poisson regression, the objective function of nonlinear least squares with exponential mean function is known not to be globally concave (Gourieroux et al.,1984b) which can complicate optimization. The additional weighting of the SFGNLS can exacerbate this problem. We encountered some difficulties maximizing the SFGNLS objective function. In addition to the coefficients of the variables Z the optimization is over the complete set of exporter-year and importer-year indicator variables, which amounts to 256 extra coefficients in our data per sector. To ease the problem, we replaced the set of indicator variables with a new variable containing the predicted fixed effects from the Poisson regression. This restriction on the SFGNLS fixed effects to be proportional to the Poisson estimates reduces the 512 fixed effects to be estimated to only one parameter per sector. Table 4 presents the SFGNLS estimates with this simplification. The row named *Estimated FE* in the lower part of the table displays the estimated coefficient on the Poisson fixed effects. It is remarkable that they are all close to one, suggesting that SFGNLS FE estimates should be similar to Poisson's.

— Table 4 about here —

It is equally reassuring to note that SFGNLS estimates are comparable to the Poisson estimates. This is an important result because it increases our confidence in our specification of the conditional expectation function, since both estimators should deliver consistent — and therefore similar— estimates of β. The table contains two standard errors per estimated coefficient. The first standard error is based on the SFGNLS variance specification. While these standard errors are comparable in magnitude to the Poisson standard errors for most variables, they are about one order of magnitude smaller for GTA and STA. This suggests that efficiency gains from system estimation are largest for variables excluded from one sector.

The fact that in general the standard errors are about as large as those obtained from separate sector-wise estimation implies that the efficiency gains from joint estimation of both sectors are offset by accounting for intertemporal correlation. Table 5 gives an overview of the estimated error correlations. The upper panel shows the estimated elements of the error variance-covariance matrix from the auxiliary OLS regressions, and the lower panel displays the error correlations calculated from these. The correlations suggest that country-pair specific, time-invariant components are responsible for most of the error, the services sector being affected more by temporary shocks. The correlation between sectors is estimated to be about 30%.

— Table 5 about here —

While the random effects structure of the error is likely to pick up some autocorrelation, its structure is quite rigid. It is unable, for instance, to map correlation fading over time. Moreover, it imposes homoskedasticity. The second parentheses below the coefficient estimates of Table 4 show clustered standard errors which are robust to any kind of autocorrelation and heteroskedasticity. Since these standard errors are asymptotically equivalent to the first if the error assumptions hold, the large discrepancies imply that the random effects error structure is not supported by the data. The cluster-robust standard errors are substantially larger than the ones presented in Table 2, but they do not overthrow the inference conducted so far (with the exception of the coefficient on colonial ties in the log-distance specification of X_G which is now insignificant).

Elasticities of substitution for goods and for services

The last input for the calculation of the comparative static effects are the elasticities of substitution, σ_ℓ. Table 6 contains the corresponding estimates, obtained from regressions (27) and (28). Again, the differences between the two specifications are minor. There is a visible difference between the sectors, though, the services substitution elasticity being smaller. The estimates in Table 6 lie within in the interior of the distribution of elasticities reported by previous literature, which generally range from about five to fifteen.

— Table 6 about here —

4.3 Comparative static effects of adopting trade agreements

In this subsection, we will assess the impact of trade preferences on outcomes such as goods and services trade, welfare, and the sectoral allocation of labor in three alternative comparative static experiments: (i) adopting goods trade agreements (GTAs) only from a situation without any GTAs but service trade agreements (STAs) as observed; (ii) adopting STAs only from a situation without any STAs but GTAs as observed; and (iii) adopting both types of preferences simultaneously from a situation without and preferential trade agreements in the outset in the sample of 16 countries considered in general equilibrium. We use the parameters from the distance-quintiles specification in Table 2 (last two columns). Notice that (i) corresponds to setting GTA_{ijt} to zero in the model of $X_{G,ijt}$. Analogously, (ii) corresponds to setting STA_{ijt} to zero in the model of $X_{S,ijt}$, while (iii) corresponds to setting both GTA_{ijt} and STA_{ijt} to zero in both models. We will do so from the perspective of the year 2006 in the data. Hence, the comparative static experiments will compare model predictions for observed trade costs as of 2006 and counterfactual trade costs with GTA_{ij2006} and/or STA_{ij2006} set counterfactually to zero.

According to the structure of the above model, such changes will induce effects on economies through three channels. First, they will affect the relative consumer (and, through general equilibrium, producer) prices and thereby change relative bilateral and multilateral demand for goods versus services. Second, induced by the latter, they will change labor demand and, hence, equilibrium employment in the two sectors.

We report on the three counterfactual experiments in two tables each. One summarizes changes in intranational and (average bilateral) international nominal trade flows for goods and services, for net flows of workers into (in case of a positive sign) or out of (in case of a negative sign) a sector GDP, and welfare for each country and for the average economy covered. A second table for each experiment sheds light on the heterogeneity of responses of international trade flows (for each country and for the average) to the adoption of trade preferences. The source of this heterogeneity are heterogeneous endowments and trade costs across countries and country-pairs in multi-country nonlinear general equilibrium. Throughout, we use the first country in alphabetical order (Austria) as the numéraire. Accordingly, the comparative static changes in nominal GDP for that country are zero in all experiments.

— Tables 7 and 8 about here —

Tables 7 and 8 summarize the findings for the comparison of a world with preferences as observed in 2006 in comparison to an unobserved counterfactual situation without any goods preferences (but services preferences as observed). Table 7 clearly indicates that goods preferences raise GDP for half of the countries but not for the other half of them (see the first column in the table). Hence, that (unweighted) average GDP rises in response to the introduction of goods preferences is largely driven by the strong positive responses of some small countries GDP (e.g., Belgium-Luxembourg's or Ireland's). Clearly, weighting those responses by GDP would lead to an average negative effect. The source of these negative effects (relative to Austria) is the destruction of jobs in half of the countries' manufacturing (i.e., goods) sector through trade diversion within the sample of countries. Clearly, this destruction of jobs in goods production is accommodated by a creation of jobs in the respective countries' service sector (by way of the assumption of labor market clearing). Yet, this does not accommodate the negative impact of goods preferences in half of the countries on the average wage relative to Austria) and, hence, GDP. However, the detrimental effects on some countries' average wage does not mean that consumers would not be in favor of goods preferences. The reason is that goods preferences directly reduce the consumer price index for goods and the effect on the latter may – and actually does – outweigh the loss in nominal income (relative to Austria). The impact of goods preferences on welfare is summarized in the second column of Table 7. Obviously, each and every country in the sample gains from the corresponding preferences. This would not need to be the case, since we consider a simultaneous implementation of preferences and welfare losses from trade diversion in a country through the introduction of trade preferences elsewhere could outweigh trade creation effects from preferences in that country. As said before, the positive welfare response to goods preferences does not so much root in the large response of international goods trade (see column 6 of Table 7) or the simultaneous increase in services trade (the last column of Table 7). These gains are offset to a significant extent by diversion of consumption from domestic producers in either sector (see column 5 and the penultimate column of Table 7). The reason for the gains is the direct reduction of goods price indices.

Several remarks are in order. First, notice that the net labor flows in percent are quite small (less than one-tenth of a percent in all countries except Ireland). A structural model which would not allow trade costs to play as much role as we do would come up with larger responses of labor flows.[3] In the Appendix, we document this in tables corresponding to Tables 7 and 8 (and also to the ones for the other experiments). While Tables 7 and 8 do not assume that the trade costs called $\phi_{\ell,it}$ and $\varphi_{\ell,jt}$ in Section 3.1 are zero, the tables in the Appendix do.

Second, there are responses of international services trade rather than of goods trade only to goods preferences. There are several reasons for this. Most importantly, the cross-sectoral effects are not due to direct links between goods and services production through, e.g., input-output relations. Hence, the service trade responses are fully due to general equilibrium effects. We can dissect those effects in the following way. A comparison of the net labor flow changes in columns 3 and 4 of Table 7 clearly indicates that most countries after the change employ less workers in goods production than in services production. This can be seen from the fact

[3]For instance, Eaton and Kortum (2002), Anderson and van Wincoop (2003), or Anderson and Yotov (2010), do not interpret the exporter-specific and importer-specific components of exports beyond the price index, firm numbers (which corresponds to average productivity in Eaton and Kortum (2002) and to a preference parameter in Anderson and van Wincoop (2003)) as trade costs that may be correlated with other variables in the model. However, the procedure adopted here minimizes the discrepancy between the data and the model without trivially (and, from a philosophy-of-science point of view, very problematically) eliminating it as in some calibration studies.

that the change in net labor flows in the goods sector in percent tends to be larger in absolute value than the corresponding change in the service sector. The countries which see a net loss of workers in the services sector in response to goods preferences also tend to loose out on international trade in services. However, the majority of countries experiences an increase in services trade which is mainly stimulated by changes in wages and, in turn, indirect changes in services price indices. The overall welfare response in a country is a weighted average of the welfare change associated with the goods sector and the one associated with the services sector. It is possible that the services component is negative. However, with an introduction of goods preferences alone the outcome is dominated by changes in the goods sector so that indirect effects in the services sector only modify the quantitative effects.

While effects on international trade in goods and services as in Table 7 are useful to understand (weighted) average responses of bilateral trade, it should be recognized that those effects vary largely across trading partners. We shed light on this fact in Table 8. This table summarizes location parameters of the distribution of nominal bilateral goods trade responses at the top and ones of nominal bilateral services trade responses at the bottom. At the bottom of each block, we report unweighted average location parameters. The table clearly indicates that the treatment effect of an introduction of goods trade preferences is largely heterogeneous. This is a general feature of new trade theory models, where responses to homogeneous changes in trade costs are heterogeneous as long as countries differ in trade cost levels, endowments, and possibly other fundamental dimensions. Clearly, there is heterogeneity of the responses across importers (compare the numbers within a row across columns) and there is heterogeneity across exporters (compare the numbers within a column across rows). The reason is not that countries did not provide and were not granted goods preferences in a homogeneous way. All countries in the sample were covered by goods preferences by 2006. Bilateral goods trade is stimulated unambiguously by goods preferences, since there is no scope for goods trade diversion between autarky and full coverage with such preferences by 2006. But countries differ in other regards (e.g., Ireland is small, while the United Kingdom is large; some of them have services preferences but not all do; etc.), rendering them quite heterogeneously responsive to the introduction of goods preferences. For instance, the difference between the average maximum-to-minimum response is almost 150 percent of the average median response. Most of the country-pairs display changes in bilateral goods trade in the double digits in response to introducing goods preferences.

The responsiveness of the indirectly affected services trade is even more heterogeneous. The average interquartile range (25 percent to 75 percent) includes zero. More than half of the country-pairs faces a decline of bilateral services trade in response to goods preferences. Here, the difference between the average maximum-to-minimum response is about ten times as high as the absolute value of the average median response. While most country-pairs' service trade responses to goods preferences are in the single digits, some country-pairs face double-digit reductions and some of them double-digit increases of services trade.

— Tables 9 and 10 about here —

Tables 9 and 10 summarize the comparative static effects of an equilibrium with (goods and) services preferences as of 2006 relative to one without any services preferences (but goods preferences as observed). The insights gained about the effects goods preferences from Table 7 are useful to cut the associated discussion of responses to services preferences comparatively shorter. Similar to goods preferences, services preferences have ambiguous effects on GDP, labor flows, intra- and international goods trade, and on intra-national services sales. However, as goods preferences, they induce positive welfare effects and positive effects on the trade they directly address throughout. Notice that, unlike as with goods preferences, the unambiguous welfare gains from services preferences in the sample were less predictable. The reason is that the coverage of services preferences in the sample is smaller than that for goods preferences in 2006. Hence, there is scope for detrimental trade diversion effects. Those do not materialize in a dominant way according to Table 9. Moreover, the response of services trade to services preferences is much stronger than that of goods trade to goods preferences. The two reasons for this greater sensitivity of services trade are the higher elasticity of substitution among different traded services than among traded goods and that the amount of services trade and production is smaller due to higher overall trade costs in that sector relative to goods trade.

Table 10 sheds light on the heterogeneity of trade responses within and across exporters akin to Table 8. Similar to goods preferences, services preferences induce great heterogeneity in international bilateral trade responses. Bilateral services trade is stimulated unambiguously by services preferences, so that there is no evidence of negative net trade diversion with such preferences as of 2006. The difference between the average maximum-to-minimum response is with less than 50 percent of the average median response smaller than the corresponding heterogeneity of goods trade to goods preferences was in Table 8. But it would be obviously inadequate to assume a homogeneous treatment effect of services preferences on services trade across all country-pairs. All of the country-pairs display changes in bilateral services trade in the triple digits in response to introducing services preferences.

The responsiveness of the indirectly affected goods trade is more heterogeneous in relative terms (analogous to the insights gained from Table 8). The average interquartile range (25 percent to 75 percent) includes zero. Almost one-half of the country-pairs faces a decline of bilateral goods trade in response to services preferences. The difference between the average maximum-to-minimum response (about 40 percent) is almost five times as high as the absolute value of the average median response (about 8 percent). Many country-pairs' goods trade responses to services preferences are in the double digits.

— Tables 11 and 12 about here —

The joint inception of goods and services preferences relative to no preferences whatsoever using data of 2006 is studied in Tables 11 and 12. The cells in those Table 11 represent convex combinations of the respective cells in Tables 7 and 9, and those in Table 12 are convex combinations of the respective cells in Tables 8 and 10. A simultaneous inception of goods and services preferences raises welfare in the average country by about 0.8 percent. The corresponding change was about 0.4 percent for goods preferences alone and about 0.3 percent for services preferences alone. International goods trade and services trade are predicted to rise by about 37 percent and about 218 percent, respectively, for the average economy through a joint inception of both types of preferences. Recall that goods preferences raised international goods trade by about 37 percent in Table 7 and services preferences raised international services trade by about 218 percent in Table 9. Similarly, the conclusions regarding the heterogeneity of responses of bilateral trade in Table 12 largely correspond to the effects of preferences on those trade flows which are directly affected by the preferences in Tables 8 and 10.

5 Conclusions

This paper proposes a structural systems estimation strategy for multi-sectoral trade models. We outline procedures which entertain the desirable properties of single-equation estimators for gravity models as proposed by Santos Silva and Tenreyro (2006) for the multi-equation case. These procedures are utilized to estimate a gravity model with two sectors, goods and services, using data for 16 European economies bilateral goods and services trade data are both available for. In that data-set, we focus our interest on the relative importance of preferential access to goods versus services markets for welfare and other outcomes. We determine a full set of key parameters from this system of equations so that a comparative static analysis of the consequences of preferences does not have to rely on assumptions about parameters of variables beyond the ones measured or estimated from the data at hand.

We use data from 2006 to conduct three comparative static experiments regarding the relative importance of goods and services trade preferences. In particular, we compare ceteris paribus a situation *with* versus one *without* specific types of preferences. These comparative static experiments suggest that the welfare effects of services preferences in Europe are comparable and only slightly smaller than those of goods preferences for the average covered economy. Preferences stimulate trade of the kind the preferences are in a significant way. The responsiveness of services trade is much bigger than that of goods trade to the respective preferences. Yet, in general, welfare gains from preferences mainly accrue to changes in consumer prices. A joint inception of goods and services preferences as of 2006 is found to have increased welfare in the 16 countries covered by about 0.8 percent. This is somewhat bigger than the sum of the welfare effects of independent inceptions of goods preferences and services preferences alone.

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Appendix A: Variance of the SFGNLS estimator

The asymptotic variance of the SFGNLS estimator (i.e. $\hat{\theta}$ in (23) with Ω_{ij} replaced by an estimate $\widehat{\Omega}_{ij}$) can be estimated consistently by

$$\widehat{\text{Var}}(\hat{\theta}) = \frac{1}{M}\left(\frac{1}{M}\sum_i\sum_j \hat{\Delta}'_{ij}\widehat{\Omega}_{ij}^{-1}\hat{\Delta}_{ij}\right)^{-1},$$

with $M = N(N-1)$ the number of country-pairs, provided the model assumptions hold. Here, $\hat{\Delta}_{ij}$ represents

$$\Delta_{ij} = \frac{\partial\Lambda_{ij}}{\partial\beta} = \begin{pmatrix} \frac{\partial\Lambda_{S,ij}}{\partial\beta_S} & \frac{\partial\Lambda_{S,ij}}{\partial\beta_G} \\ \frac{\partial\Lambda_{G,ij}}{\partial\beta_S} & \frac{\partial\Lambda_{G,ij}}{\partial\beta_G} \end{pmatrix} = \begin{pmatrix} \text{diag}(\Lambda_{S,ij})Z_{ij} & \mathbf{0}_{(T\times K)} \\ \mathbf{0}_{(T\times K)} & \text{diag}(\Lambda_{G,ij})Z_{ij} \end{pmatrix},$$

evaluated at $\hat{\theta}$. The notation $\mathbf{0}_{(T\times K)}$ denotes the $T \times K$-dimensional matrix of zeros.

Under misspecification of the weighting matrix, a consistent estimate of the asymptotic variance can be calculated using

$$\widehat{\text{Var}}_{\text{robust}}(\hat{\theta}) =$$
$$\frac{1}{M}\left(\frac{1}{M}\sum_i\sum_j \hat{\Delta}'_{ij}\widehat{\Omega}_{ij}^{-1}\hat{\Delta}_{ij}\right)^{-1}\left(\frac{1}{M}\sum_i\sum_j \hat{\Delta}'_{ij}\widehat{\Omega}_{ij}^{-1}\widehat{\Xi}_{ij}\widehat{\Omega}_{ij}^{-1}\hat{\Delta}_{ij}\right)\left(\frac{1}{M}\sum_i\sum_j \hat{\Delta}'_{ij}\widehat{\Omega}_{ij}^{-1}\hat{\Delta}_{ij}\right)^{-1}$$

with $\widehat{\Xi}_{ij} = \hat{R}_{ij}\hat{R}'_{ij}$. This variance estimator is fully robust against any kind of misspecification of the error variance-covariance assumptions, with the exception of cross-sectional dependence.

Variance adjustment for two-step estimation

The SFGNLS estimation procedure is carried out in two steps. First, consistent estimates of θ are obtained via Poisson pseudo-likelihood, and these are used to estimate the variance elements. Second, θ is estimated efficiently by SFGNLS using weights constructed with the estimated variance matrix. Thus, in principle, the variance of the SFGNLS estimator needs to be adjusted to take into account the fact that the weighting matrix is measured with sampling error. Some two-step (M-) estimators' asymptotic variance does not depend on the variance of the first step estimation. The following is to show that this is the case for the SFGNLS estimator.

A sufficient condition for the second step variance not to depend on the first step estimates is that the partial derivative of the expected gradient of the second-step estimator with respect to the first-step parameters, evaluated at their true values, is zero (cf. Wooldridge, 2002). For the estimator under consideration, the gradient is $\sum_i \sum_j (R'_{ij}\Omega_{ij}^{-1}\Delta_{ij})'$. Every one of the rows is a linear combination containing elements of R_{ij}, Δ_{ij} and Ω_{ij}^{-1}. The derivative is to be taken with respect to the distinct six elements of $\mathbf{\Omega}$ of which Ω_{ij}^{-1} is a function. The kth row of one element in the sum of the gradient can be written down as

$$\sum_{t=1}^{2T} \Delta_{tk} \left(\sum_{s=1}^{2T} R_s \Omega_{ts}^{-1} \right)$$

where the subscript ij has been neglected. All elements in the preceding formula are scalars, so that derivatives with respect to elements of $\mathbf{\Omega}$ will yield expressions of the form

$$\sum_{s=1}^{2T} R_s f(\Lambda, \mathbf{\Omega})$$

The function $f(\Lambda, \mathbf{\Omega})$ is constant if Z is conditioned for, so that by a standard law of iterated expectations argument

$$\mathrm{E}[\sum_i \sum_j \sum_{s=1}^{2T} R_{ijs} f(\Lambda_{ij}, \mathbf{\Omega})] = \mathrm{E}[\sum_i \sum_j \sum_{s=1}^{2T} E(R_{ijs}|Z) f(\Lambda_{ij}, \mathbf{\Omega})] = 0$$

as long as the conditional expectation function is correctly specified. This implies that the asymptotic variance of this estimator is independent of the variance of the first stage estimators. Hence, for a sufficiently large number of observations the variance adjustment may be neglected.

Table 1: Descriptive Statistics, N=1,920

Variable	Mean	Std. deviation
X_G (Goods exports)	4,363.2359	7,860.7053
X_S (Services exports)^a	1,130.3192	2,480.8476
Alternative ${X_S}^b$	1,014.8738	2,184.2832
Goods Trade Agreement (GTA)	0.7500	0.4331
Service Trade Agreement (STA)	0.7188	0.4497
Colonial ties	0.0708	0.2566
Land border	0.1250	0.3308
Language	0.0417	0.1999
(log-)Distance	6.9660	0.6664
(log-)Distance, 1th quintile	1.1819	2.3775
(log-)Distance, 2th quintile	1.3557	2.7126
(log-)Distance, 3th quintile	1.4196	2.8402
(log-)Distance, 4th quintile	1.4682	2.9374
(log-)Distance, 5th quintile	1.5406	3.0830

^{a}*Source*: OECD, ^{b}*Source*: Francois, Pindyuk and Woerz (2009)

Table 2: Gravity models for goods and services trade - Poisson fixed effects PML estimates

Specification	*(log-)Dist.*		*(log-)Dist. quintiles*	
Dep. var.	X_G	X_S	X_G	X_S
Goods Trade Agreement (GTA)	0.3971		0.3790	
	(0.0456)		(0.0466)	
Service Trade Agreement (STA)		1.1620		1.1836
		(0.1943)		(0.2011)
Colonial ties	0.1565	0.0196	0.2769	-0.0202
	(0.0489)	(0.1151)	(0.0505)	(0.1245)
Land border	0.7886	0.5693	0.7370	0.4813
	(0.0276)	(0.0657)	(0.0270)	(0.0685)
Language	-0.3249	0.0002	-0.2663	0.0795
	(0.0525)	(0.1087)	(0.0530)	(0.1181)
(log-)Distance	-0.6910	-0.7485		
	(0.0247)	(0.0428)		
(log-)Distance, 1st quintile			-0.2872	-0.7891
			(0.0529)	(0.0868)
(log-)Distance, 2nd quintile			-0.3370	-0.7970
			(0.0487)	(0.0780)
(log-)Distance, 3rd quintile			-0.3422	-0.7617
			(0.0458)	(0.0728)
(log-)Distance, 4th quintile			-0.3643	-0.7801
			(0.0448)	(0.0737)
(log-)Distance, 5th quintile			-0.4179	-0.8329
			(0.0442)	(0.0706)
Observations	1,920			
Countries	16			
Time period	1999 – 2006			

Notes: Robust standard errors in parentheses. All regressions include exporter-year and importer-year fixed effects.

Table 3: Gravity models for services trade, alternative dep. var. - Poisson fixed effects PML estimates

Specification	*(log-)Dist.*	*(log-)Dist. quintiles*
Service Trade Agreement (STA)	1.2854	1.3459
	(0.1771)	(0.1859)
Colonial ties	-0.1067	-0.1414
	(0.0856)	(0.0904)
Land border	0.5881	0.4840
	(0.0503)	(0.0541)
Language	0.0467	0.1490
	(0.0765)	(0.0846)
(log-)Distance	-0.6512	
	(0.0400)	
(log-)Distance, first quintile		-0.7062
		(0.0726)
(log-)Distance, second quintile		-0.7033
		(0.0649)
(log-)Distance, third quintile		-0.6742
		(0.0605)
(log-)Distance, fourth quintile		-0.7000
		(0.0615)
(log-)Distance, fifth quintile		-0.7484
		(0.0592)
Observations	1,920	
Countries	16	
Time period	1999 – 2006	

Notes: Robust standard errors in parentheses. All regressions include exporter-year and importer-year fixed effects.

Table 4: Gravity models for goods and services trade - System FGNLS estimates

Specification	*(log-)Dist.*		*(log-)Dist. quintiles*	
Dep. var.	X_G	X_S	X_G	X_S
Goods Trade Agreement (GTA)	0.2436		0.2396	
	(0.0021)		(0.0026)	
	(0.0255)		(0.0229)	
Service Trade Agreement (STA)		1.0628		1.1993
		(0.0096)		(0.0113)
		(0.0852)		(0.0763)
Colonial ties	0.2202	0.0092	0.5372	0.0142
	(0.0322)	(0.0696)	(0.0316)	(0.0807)
	(0.2144)	(0.3726)	(0.1196)	(0.2526)
Land border	0.8254	0.5620	0.7958	0.5718
	(0.0263)	(0.0535)	(0.0267)	(0.0611)
	(0.1285)	(0.2680)	(0.0760)	(0.1524)
Language	-0.3129	0.0156	-0.4149	0.1782
	(0.0339)	(0.0681)	(0.0334)	(0.0734)
	(0.1781)	(0.2987)	(0.1210)	(0.2337)
(log-)Distance	-0.7664	-0.9068		
	(0.0024)	(0.0071)		
	(0.0306)	(0.0630)		
(log-)Distance, first quintile			-0.3268	-0.9816
			(0.0036)	(0.0092)
			(0.0259)	(0.0543)
(log-)Distance, second quintile			-0.3660	-0.9461
			(0.0026)	(0.0091)
			(0.0177)	(0.0608)
(log-)Distance, third quintile			-0.3850	-0.9449
			(0.0028)	(0.0086)
			(0.0225)	(0.0592)
(log-)Distance, fourth quintile			-0.4189	-0.9862
			(0.0028)	(0.0080)
			(0.0208)	(0.0551)
(log-)Distance, fifth quintile			-0.4544	-1.0115
			(0.0025)	(0.0116)
			(0.0196)	(0.0705)
Estimated FE	1.0727	1.1533	1.0570	1.1469
	(0.0018)	(0.0050)	(0.0023)	(0.0056)
	(0.0282)	(0.0554)	(0.0251)	(0.0456)
Observations	1,920			
Countries	16			
Time period	1999 – 2006			

Notes: (Robust) standard errors in (second) parentheses.

Table 5: Gravity models for goods and services trade - Estimated error correlations

Panel A. Estimated error variance matrix elements

Specification	(log-)Dist.		(log-)Dist. quintiles	
	o^2	$\bar{o}^2$	o^2	$\bar{o}^2$
Services sector	0.0870	0.0687	0.0778	0.0573
	(0.0260)	(0.0130)	(0.0219)	(0.0112)
Goods sector	0.0110	0.0106	0.0099	0.0091
	(0.0014)	(0.0006)	(0.0010)	(0.0005)
Between sectors	0.0093	0.0080	0.0076	0.0064
	(0.0022)	(0.0008)	(0.0028)	(0.0010)

Panel B. Implied error correlations

Specification	(log-)Dist.	(log-)Dist. quintiles
Within sectors:		
Serial correlation services	78.97%	73.65%
Serial correlation goods	96.17%	91.85%
Between sectors:		
Correlation services/goods	30.01%	27.26%
Serial corr. services/goods	25.95%	23.14%

Notes: Robust standard errors in parentheses.

Table 6: Estimates for sectoral elasticities of substitution

Specif.	*(log-)Dist.*	*(log-)Dist. quintiles*
$\hat{\sigma}_G$	7.9849	7.6663
	(0.8015)	(0.8193)
$\hat{\sigma}_S$	5.9591	5.5543
	(0.9306)	(0.9633)

Table 7: Comparative static effects in percent of incepting goods preferences

			Net labor flow between sectors into (+)/out(-)		Goods trade		Services trade	
Country	GDP in %	EV in %	Goods in %	Serivces in %	Intra in %	Inter in %	Intra in %	Inter in %
Austria	0.000	0.002	0.000	0.000	-0.005	37.018	-0.010	1.504
Belgium-Luxembourg	2.019	2.098	0.028	-0.014	-31.606	25.325	1.233	-9.407
Czech Republic	0.651	0.008	0.000	0.000	0.558	30.784	0.634	-1.717
Denmark	-0.165	0.630	-0.005	0.003	-10.491	38.886	-0.036	2.684
Finland	-0.406	0.383	-0.001	0.001	-6.095	41.432	-0.357	3.675
France	-0.796	0.247	-0.003	0.001	-5.709	45.174	-0.768	5.703
Hungary	0.880	0.007	0.001	-0.001	0.813	28.707	0.843	-2.842
Ireland	1.883	1.948	0.089	-0.063	-25.350	33.822	-2.130	-13.413
Italy	-0.893	0.136	-0.002	0.001	-3.257	46.142	-0.866	6.174
Netherlands	-0.168	0.636	-0.005	0.003	-11.070	39.039	-0.048	2.640
Poland	0.879	0.001	0.000	0.000	0.864	28.642	0.872	-2.791
Portugal	0.200	0.013	0.000	0.000	0.002	35.148	0.180	0.482
Slovak Republic	0.742	0.006	0.000	0.000	0.652	29.963	0.725	-2.152
Spain	-0.813	0.089	-0.002	0.002	-2.271	45.089	-0.760	5.828
Sweden	-0.285	0.513	-0.003	0.002	-8.243	40.135	-0.184	3.194
United Kingdom	-0.433	0.149	-0.005	0.003	-3.070	40.893	-0.294	4.013
Average	0.206	0.429	0.006	-0.004	-6.517	36.637	-0.060	0.223

Table 8: Heterogeneity of comparative static effects in percent of incepting goods preferences across countries on their bilateral trade flows

	Heterogeneity of international goods trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	11.097	11.0967	30.2496	33.7022	52.0126	56.1738	56.174
Belgium-Luxembourg	2.016	2.0159	18.0081	21.8798	36.7129	40.4552	40.455
Czech Republic	6.419	6.4194	24.7661	28.0733	41.2913	49.5987	49.599
Denmark	11.738	11.7378	31.9717	36.3016	52.8898	57.0749	57.075
Finland	13.990	13.9895	33.641	39.0481	55.9706	60.2402	60.240
France	16.851	16.8505	37.258	42.5383	59.8855	64.2621	64.262
Hungary	4.866	4.8655	22.9441	26.2032	39.2281	47.4143	47.414
Ireland	6.809	6.8091	26.1504	30.2892	46.1458	50.1463	50.146
Italy	17.764	17.7644	38.0669	43.6531	61.1359	65.5468	65.547
Netherlands	11.811	11.8113	32.0585	36.3914	52.9904	57.1782	57.178
Poland	4.820	4.8199	22.8907	26.1484	39.1675	47.211	47.211
Portugal	9.682	9.6817	28.5907	31.9994	49.6091	54.1845	54.185
Slovak Republic	5.805	5.8049	24.0454	27.3336	40.4751	48.7347	48.735
Spain	17.040	17.0397	37.2172	40.8544	60.1443	64.5283	64.528
Sweden	12.849	12.8489	32.3039	37.6571	54.4101	58.637	58.637
United Kingdom	13.805	13.8046	33.4244	36.9614	55.7177	59.9802	59.980
Average	10.460	10.460	29.599	33.690	49.862	55.085	55.085

	Heterogeneity of international services trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	-4.921	-4.9208	-2.4773	-1.0848	4.7871	13.6969	13.697
Belgium-Luxembourg	-14.438	-14.4382	-12.2393	-10.9862	-6.3476	2.3158	2.316
Czech Republic	-7.714	-7.7144	-5.3426	-3.991	1.7083	10.3563	10.356
Denmark	-3.885	-3.8845	-1.4143	1.0795	5.9292	14.9361	14.936
Finland	-3.032	-3.0322	-0.39	1.9758	6.8685	15.9553	15.955
France	-1.274	-1.2742	1.6025	3.8246	8.806	18.0575	18.058
Hungary	-8.691	-8.6907	-6.3441	-5.0068	-0.0566	9.1888	9.189
Ireland	-18.156	-18.1563	-16.053	-14.8543	-10.4173	-3.166	-3.166
Italy	-0.460	-0.4604	2.0231	4.2544	9.2565	18.5463	18.546
Netherlands	-3.924	-3.9244	-1.4553	1.0375	5.8852	14.8884	14.888
Poland	-8.644	-8.6442	-6.2964	-4.9584	-0.0058	9.2443	9.244
Portugal	-5.808	-5.8082	-3.3875	-2.0079	3.8091	12.6357	12.636
Slovak Republic	-8.091	-8.091	-5.729	-4.3829	1.1678	9.9059	9.906
Spain	-1.164	-1.1635	1.7164	3.941	8.928	18.1899	18.190
Sweden	-3.445	-3.4453	-0.9639	1.5413	6.4132	15.4613	15.461
United Kingdom	-2.732	-2.7322	0.102	2.2913	7.1992	16.314	16.314
Average	-6.024	-6.024	-3.541	-1.708	3.371	12.283	12.283

Table 9: Comparative static effects in percent of incepting service preferences

Country	GDP in %	EV in %	Net labor flow between sectors into (+)/out(-)		Goods trade		Services trade	
			Goods in %	Serivces in %	Intra in %	Inter in %	Intra in %	Inter in %
Austria	0.000	0.191	0.000	0.000		-6.052	-1.438	204.728
Belgium-Luxembourg	0.380	0.557	0.025	-0.013	0.000	-6.217	-4.449	195.538
Czech Republic	-3.151	0.030	0.002	-0.002	2.245	18.375	-3.509	255.588
Denmark	0.297	0.693	-0.004	0.002	-3.084	-8.381	-4.454	201.753
Finland	0.166	0.236	0.003	-0.002	0.671	-6.886	-1.828	201.647
France	0.702	0.137	-0.015	0.007	0.240	-12.056	0.297	196.353
Hungary	-4.374	0.049	0.003	-0.003	-0.038	29.623	-4.866	278.152
Ireland	0.199	1.820	0.111	-0.076	-4.307	3.060	-18.210	180.830
Italy	0.765	0.098	-0.005	0.003	8.986	-11.533	0.253	194.138
Netherlands	0.272	0.406	0.001	0.000	0.491	-7.781	-2.520	200.797
Poland	-4.343	0.009	0.001	0.000	-0.008	28.984	-4.436	278.297
Portugal	-1.761	0.090	0.003	-0.002	-4.330	7.021	-2.501	231.841
Slovak Republic	-3.666	0.032	0.003	-0.002	-1.671	23.001	-3.958	265.164
Spain	0.886	0.143	-0.004	0.003	-0.156	-12.203	-0.028	192.366
Sweden	0.213	0.441	0.002	-0.001	-3.592	-7.314	-3.146	201.581
United Kingdom	-0.021	0.215	0.003	-0.002	-0.249	-5.643	-1.635	204.535
Average	-0.840	0.322	0.008	-0.006	-0.320	1.625	-3.527	217.707

Table 10: Heterogeneity of comparative static effects in percent of incepting service preferences across countries on their bilateral trade flows

	Heterogeneity of international goods trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	-29.206	-29.2063	-19.6387	1.062	2.2512	7.1758	7.176
Belgium-Luxembourg	-29.217	-29.2174	-19.6513	-0.0154	2.0849	7.159	7.159
Czech Republic	-12.164	-12.1641	11.888	25.3907	26.8661	32.9762	32.976
Denmark	-30.852	-30.8521	-21.507	-2.3246	-0.2431	4.6841	4.684
Finland	-29.782	-29.7823	-20.2925	-0.8133	1.4193	6.3038	6.304
France	-33.443	-33.4425	-24.4474	-5.9836	-4.0087	0.7625	0.763
Hungary	-3.877	-3.8773	21.8964	36.6069	38.2143	44.871	44.871
Ireland	-22.374	-22.374	-11.8831	10.8154	12.1194	17.5193	17.519
Italy	-33.040	-33.0402	-23.9908	-5.4154	-3.4285	1.3716	1.372
Netherlands	-30.423	-30.4233	-21.0202	-1.7188	0.4934	5.3333	5.333
Poland	-4.758	-4.7577	21.3225	35.9638	37.5636	44.189	44.189
Portugal	-20.087	-20.0865	-5.8191	14.081	15.4234	20.9824	20.982
Slovak Republic	-8.933	-8.9334	16.0034	30.0027	31.5324	37.8673	37.867
Spain	-33.503	-33.5029	-24.516	-6.0689	-4.0957	-0.2038	-0.204
Sweden	-30.088	-30.0884	-20.6401	-1.2458	0.977	5.8403	5.840
United Kingdom	-28.920	-28.9204	-19.3142	1.4701	2.6641	7.6086	7.609
Average	-23.792	-23.792	-10.101	8.238	9.990	15.278	15.278

	Heterogeneity of international services trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	154.095	154.0949	177.6643	219.7805	223.4567	239.0462	239.046
Belgium-Luxembourg	146.427	146.4266	169.2811	210.1287	213.6939	228.8115	228.812
Czech Republic	193.366	193.3657	237.5604	271.1866	273.4442	291.4424	291.442
Denmark	151.266	151.2658	174.5737	217.9197	219.8539	235.2696	235.270
Finland	151.630	151.6304	174.9705	216.6741	219.2177	235.7575	235.758
France	147.865	147.8654	170.8556	211.9365	214.4453	230.7303	230.730
Hungary	211.931	211.931	257.5209	293.1348	295.5278	314.5828	314.583
Ireland	132.633	132.6329	154.7649	194.3454	196.1411	210.4058	210.406
Italy	146.131	146.1312	168.9621	209.7498	212.2468	228.4203	228.420
Netherlands	150.851	150.8509	174.1155	215.6964	219.1797	234.7164	234.716
Poland	210.897	210.8966	257.7408	293.3694	295.7613	314.825	314.825
Portugal	175.037	175.0372	200.5394	247.9912	250.1148	266.9836	266.984
Slovak Republic	200.748	200.7477	246.0625	280.5244	282.8444	301.2817	301.282
Spain	144.704	144.7035	167.4034	207.9565	210.4386	225.5332	225.533
Sweden	151.357	151.3574	174.671	218.0293	219.9683	235.3819	235.382
United Kingdom	153.913	153.913	177.464	219.5445	223.2269	238.795	238.795
Average	163.928	163.928	192.759	232.998	235.598	251.999	251.999

Table 11: Comparative static effects in percent of incepting goods and service preferences simultaneously

			Net labor flow between sectors into (+)/out(-)		Goods trade		Services trade	
Country	GDP in %	EV in %	Goods in %	Serivces in %	Intra in %	Inter in %	Intra in %	Inter in %
Austria	0.000	0.192	0.000	0.000	-0.004	26.900	-1.441	207.329
Belgium-Luxembourg	2.528	2.719	0.034	-0.018	-31.071	12.938	-2.630	167.058
Czech Republic	-3.011	0.038	0.002	-0.002	-3.048	58.471	-3.371	256.059
Denmark	0.210	1.310	-0.005	0.003	-10.230	25.335	-4.516	205.875
Finland	-0.219	0.616	0.002	-0.002	-5.772	29.809	-2.191	210.168
France	0.135	0.374	-0.016	0.007	-5.523	24.096	-0.261	207.458
Hungary	-3.762	0.055	0.003	-0.003	-3.778	67.661	-4.267	269.618
Ireland	2.135	4.007	0.140	-0.092	-22.683	27.753	-17.466	153.251
Italy	0.040	0.229	-0.005	0.003	-2.539	26.067	-0.461	207.534
Netherlands	0.210	1.025	0.000	0.000	-10.602	25.983	-2.555	204.512
Poland	-3.771	0.010	0.001	-0.001	-3.775	67.300	-3.866	270.558
Portugal	-1.773	0.103	0.003	-0.002	-1.896	44.821	-2.517	234.840
Slovak Republic	-3.337	0.038	0.003	-0.002	-3.367	62.416	-3.632	262.145
Spain	0.121	0.227	-0.004	0.003	-1.465	25.342	-0.773	206.358
Sweden	-0.027	0.945	0.001	0.000	-7.874	28.009	-3.354	207.973
United Kingdom	-0.561	0.354	0.001	-0.001	-2.972	32.569	-2.126	215.772
Average	-0.692	0.765	0.010	-0.007	-7.287	36.592	-3.464	217.907

Table 12: Heterogeneity of comparative static effects in percent of incepting goods and service preferences simultaneously across countries on their bilateral trade flows

	Heterogeneity of international goods trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	8.495	8.495	14.3097	32.4899	36.1149	45.7616	45.762
Belgium-Luxembourg	-4.994	-4.9937	0.1556	17.0322	22.7724	27.9194	27.919
Czech Republic	33.328	33.3277	40.4734	64.238	72.2935	79.5166	79.517
Denmark	6.461	6.4613	12.1671	30.0063	37.5753	43.3428	43.343
Finland	10.358	10.3582	16.2728	34.7651	42.6109	48.5895	48.590
France	5.842	5.8419	11.5144	29.2498	32.7862	42.5086	42.509
Hungary	40.860	40.8596	49.0712	73.1564	81.6495	89.2648	89.265
Ireland	7.418	7.4183	13.9165	32.3218	38.812	44.6314	44.631
Italy	7.637	7.637	13.4058	31.442	35.0384	44.9258	44.926
Netherlands	6.947	6.9469	12.6787	31.7411	38.2027	43.9968	43.997
Poland	40.282	40.2815	48.7676	72.8039	81.2795	88.8794	88.879
Portugal	22.578	22.5781	29.1475	50.9962	58.402	65.043	65.043
Slovak Republic	36.436	36.4355	44.689	68.0662	76.3095	83.701	83.701
Spain	7.145	7.145	12.8873	30.8413	34.4211	44.2634	44.263
Sweden	8.766	8.7663	14.5956	32.8211	40.5538	46.4464	46.446
United Kingdom	12.767	12.7666	18.8103	37.7061	45.4521	51.8325	51.833
Average	15.645	15.645	22.054	41.855	48.392	55.664	55.664

	Heterogeneity of international services trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	163.282	163.2822	179.8701	215.4337	224.8474	262.7298	262.730
Belgium-Luxembourg	130.828	130.8284	145.3703	176.5504	184.0492	186.4917	186.492
Czech Republic	201.970	201.9699	242.2898	263.4333	272.5784	316.024	316.024
Denmark	161.582	161.5821	178.0649	214.8259	222.7495	260.388	260.388
Finland	165.427	165.4266	182.1501	217.9982	227.4924	265.6813	265.681
France	163.592	163.5917	180.1996	215.8004	224.3708	263.1569	263.157
Hungary	213.155	213.1549	254.4285	276.3137	285.7767	330.7711	330.771
Ireland	117.183	117.1833	130.8692	160.2072	167.2572	199.2177	199.218
Italy	163.616	163.616	180.231	215.8252	224.5632	263.1891	263.189
Netherlands	160.834	160.8339	177.2674	212.499	221.825	259.356	259.356
Poland	213.492	213.4924	255.3642	277.302	286.7889	331.9061	331.906
Portugal	185.127	185.1268	207.9037	243.1625	251.7965	292.8193	292.819
Slovak Republic	206.796	206.7964	247.7756	269.2454	278.5264	322.6786	322.679
Spain	162.621	162.6205	179.1711	214.636	223.1775	261.8214	261.821
Sweden	163.468	163.4681	180.0667	217.0926	225.0651	262.9839	262.984
United Kingdom	169.926	169.9256	186.9322	224.8719	233.0369	271.8808	271.881
Average	171.431	171.431	194.247	225.950	234.619	271.943	271.943

Appendix B: Results without unobserved trade costs

Table 13: Comparative static effects in percent of incepting goods preferences, $\phi = \varphi = 1$

Country	GDP in %	EV in %	Net labor flow between sectors into (+)/out(-) Goods in %	Serivces in %	Goods trade Intra in %	Inter in %	Services trade Intra in %	Inter in %
Austria	0.000	2.274	0.059	-0.055	-28.819	9.982	-4.518	-9.472
Belgium-Luxembourg	0.051	1.485	0.110	-0.296	-23.375	14.616	-27.567	-32.829
Czech Republic	-0.283	2.426	0.031	-0.048	-27.222	8.820	-4.415	-7.448
Denmark	-0.239	1.885	0.047	-0.053	-26.025	10.174	-4.615	-8.132
Finland	-0.634	1.877	0.015	-0.016	-24.503	9.468	-1.972	-2.592
France	-1.530	1.255	-0.032	0.011	-24.256	10.961	-1.386	4.647
Hungary	-0.475	2.229	0.012	-0.012	-27.658	8.245	-1.789	-2.971
Ireland	0.328	1.994	0.096	-0.903	-25.862	11.116	-90.041	-90.838
Italy	-2.001	0.897	-0.026	0.013	-16.558	14.835	-1.678	7.426
Netherlands	-0.693	1.757	0.017	-0.010	-26.337	10.428	-1.652	-1.710
Poland	-1.759	1.282	-0.032	0.020	-19.473	12.416	-1.240	6.879
Portugal	-0.642	1.599	0.027	-0.022	-23.513	10.897	-2.289	-3.192
Slovak Republic	0.240	1.831	0.087	-0.401	-27.807	11.038	-38.463	-43.339
Spain	-1.767	1.023	-0.014	0.009	-16.963	14.414	-1.547	5.693
Sweden	-0.938	1.692	-0.001	0.001	-23.972	9.971	-1.207	0.577
United Kingdom	-2.116	0.982	-0.046	0.022	-18.084	13.383	-1.606	9.024
Average	-0.779	1.656	0.022	-0.109	-23.777	11.298	-11.624	-10.517

Table 14: Heterogeneity of comparative static effects in percent of incepting goods preferences across countries on their bilateral trade flows, $\phi = \varphi = 1$

	Heterogeneity of international goods trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	4.434	4.434	7.18	9.3213	13.434	15.9025	15.903
Belgium-Luxembourg	8.579	8.5789	11.7749	14.1498	18.444	21.0215	21.022
Czech Republic	3.091	3.0909	6.1254	8.3803	12.4575	14.9047	14.905
Denmark	4.399	4.3991	7.4721	9.7556	13.8845	16.3629	16.363
Finland	3.903	3.9025	6.9609	7.5547	13.3429	15.8092	15.809
France	5.252	5.252	8.3501	8.9515	14.8149	17.3135	17.314
Hungary	2.542	2.5416	5.5678	7.8028	11.8583	14.2925	14.293
Ireland	5.251	5.2505	8.4832	10.6507	14.8133	17.3118	17.312
Italy	9.365	9.3648	12.5839	13.2089	16.2893	21.7631	21.763
Netherlands	4.598	4.5979	7.8105	9.9645	14.1013	16.5843	16.584
Poland	6.961	6.961	10.1093	10.7205	13.7333	19.2183	19.218
Portugal	5.259	5.2594	8.3575	8.9591	14.8228	17.3216	17.322
Slovak Republic	5.013	5.0128	8.2382	10.4007	14.5539	17.0468	17.047
Spain	8.955	8.9554	12.1624	12.785	15.854	21.4412	21.441
Sweden	4.396	4.3964	7.4692	8.0658	13.82	16.3597	16.360
United Kingdom	7.941	7.9413	11.1185	11.7353	14.7757	20.3109	20.311
Average	5.621	5.621	8.735	10.150	14.437	17.685	17.685

	Heterogeneity of international services trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	-17.517	-17.5172	-14.7882	-8.6209	-6.027	-1.788	-1.788
Belgium-Luxembourg	-38.708	-38.7084	-36.6805	-32.0977	-30.1702	-27.0202	-27.020
Czech Republic	-15.788	-15.7879	-13.0016	-6.705	-2.8711	0.2712	0.271
Denmark	-16.382	-16.3822	-13.6156	-7.3635	-3.6753	-0.4365	-0.437
Finland	-11.516	-11.516	-8.5884	-1.7017	2.0559	5.3576	5.358
France	-5.320	-5.3199	-1.2072	5.1816	9.2024	12.7353	12.735
Hungary	-11.828	-11.8278	-8.9105	-2.3178	1.6964	4.9864	4.986
Ireland	-91.636	-91.6358	-91.359	-90.7336	-90.4706	-90.0494	-90.049
Italy	-2.972	-2.9715	2.0649	7.7906	11.9111	15.5316	15.532
Netherlands	-10.747	-10.7468	-7.7937	-0.8472	2.9432	6.2736	6.274
Poland	-3.412	-3.4117	1.6018	7.3015	11.4033	15.0074	15.007
Portugal	-12.044	-12.0443	-9.1341	-2.5577	1.4467	4.7286	4.729
Slovak Republic	-48.273	-48.2732	-46.5618	-42.6942	-41.0675	-38.4091	-38.409
Spain	-4.439	-4.439	0.5212	6.1603	10.2185	13.7842	13.784
Sweden	-8.775	-8.7749	-5.7566	1.3434	5.2175	8.6215	8.622
United Kingdom	-0.294	-0.2944	3.5008	9.307	13.4855	17.157	17.157
Average	-18.728	-18.728	-15.607	-9.910	-6.544	-3.328	-3.328

Table 15: Comparative static effects in percent of incepting service preferences, $\phi = \varphi = 1$

			Net labor flow between sectors into (+)/out(-)		Goods trade		Services trade	
Country	GDP in %	EV in %	Goods in %	Serivces in %	Intra in %	Inter in %	Intra in %	Inter in %
Austria	0.000	4.421	0.113	-0.096	3.373	10.829	-32.699	155.668
Belgium-Luxembourg	0.378	3.638	0.680	-0.632	60.334	62.529	-70.649	1.659
Czech Republic	-0.017	2.544	0.191	-0.214	12.865	18.545	-34.707	121.139
Denmark	0.119	2.399	0.264	-0.206	20.718	24.510	-31.986	121.305
Finland	-0.075	2.061	0.129	-0.111	8.525	12.703	-23.127	149.958
France	0.649	1.972	-0.183	0.077	-15.666	-22.932	-5.718	192.295
Hungary	-0.099	3.295	0.072	-0.064	0.365	7.443	-25.606	165.072
Ireland	0.520	2.123	0.766	-0.979	68.532	69.158	-98.127	-94.191
Italy	0.681	1.152	-0.075	0.042	-4.677	-12.926	-4.424	181.352
Netherlands	0.253	3.040	-0.020	0.012	-5.748	-4.387	-16.885	181.093
Poland	0.032	1.676	-0.098	0.070	-10.115	-10.801	-6.216	199.172
Portugal	0.440	1.453	0.129	-0.087	10.379	8.583	-16.645	149.402
Slovak Republic	-0.137	4.691	0.657	-0.768	56.280	66.423	-82.867	-33.996
Spain	0.584	1.163	-0.032	0.021	-1.863	-8.112	-6.330	177.001
Sweden	-0.011	2.241	0.008	-0.006	-1.918	0.118	-15.189	179.059
United Kingdom	0.610	1.543	-0.138	0.077	-11.571	-18.352	-4.015	192.397
Average	0.245	2.463	0.154	-0.179	11.863	12.708	-29.699	127.399

Table 16: Heterogeneity of comparative static effects in percent of incepting service preferences across countries on their bilateral trade flows, $\phi = \varphi = 1$

	Heterogeneity of international goods trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	3.518	3.5183	6.691	8.9644	16.0454	20.107	20.107
Belgium-Luxembourg	52.106	52.1059	55.4898	60.2237	70.7529	76.7292	76.729
Czech Republic	10.704	10.7041	14.2577	16.6923	24.2755	28.6251	28.625
Denmark	16.401	16.4013	18.9909	22.6978	30.6712	35.2447	35.245
Finland	5.319	5.3194	7.8373	11.0164	18.2307	22.3688	22.369
France	-27.388	-27.3877	-25.7723	-23.5125	-21.4371	-15.633	-15.633
Hungary	0.223	0.2234	3.4405	5.6447	12.51	16.4478	16.448
Ireland	58.407	58.4071	61.9311	66.8612	77.8265	84.0504	84.050
Italy	-17.958	-17.9581	-16.1329	-13.5796	-11.2347	-4.7136	-4.714
Netherlands	-10.523	-10.523	-8.5325	-5.683	0.4461	3.9617	3.962
Poland	-16.411	-16.4105	-14.5509	-11.9494	-6.1631	-2.8788	-2.879
Portugal	1.810	1.8099	4.0749	7.2435	14.0659	18.2912	18.291
Slovak Republic	55.288	55.2876	60.2723	63.6875	74.3246	80.426	80.426
Spain	-13.566	-13.5661	-11.6433	-8.9532	-6.4828	0.426	0.426
Sweden	-6.343	-6.3428	-4.2592	-1.2767	5.1389	8.8187	8.819
United Kingdom	-23.127	-23.127	-21.4168	-19.0243	-16.8272	-10.6826	-10.683
Average	5.529	5.529	8.167	11.191	17.634	22.599	22.599

	Heterogeneity of international services trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	116.914	116.9141	145.0158	154.488	169.3944	179.2628	179.263
Belgium-Luxembourg	-13.298	-13.2976	-2.0656	1.7208	7.6786	11.6226	11.623
Czech Republic	88.856	88.8559	109.9868	121.5696	134.5462	143.1401	143.140
Denmark	89.465	89.4651	110.5931	122.2829	135.3023	143.9261	143.926
Finland	114.005	114.0048	137.8677	150.9061	165.7799	175.5146	175.515
France	151.016	151.0164	179.0104	194.3062	211.7279	223.1704	223.170
Hungary	125.700	125.6997	154.9389	164.796	180.3037	190.5702	190.570
Ireland	-95.011	-95.0113	-94.4551	-94.151	-93.8044	-93.5776	-93.578
Italy	142.465	142.4653	169.5008	184.279	197.4147	210.8348	210.835
Netherlands	140.078	140.0777	166.8509	181.6629	198.1611	209.0843	209.084
Poland	156.449	156.4494	185.0482	200.671	218.4933	230.1615	230.162
Portugal	114.697	114.6966	138.6283	151.7106	163.3468	176.4055	176.406
Slovak Republic	-43.296	-43.2959	-36.7938	-34.3499	-30.5059	-27.9589	-27.959
Spain	138.634	138.6342	165.2528	179.7928	192.7239	207.2337	207.234
Sweden	138.741	138.7412	165.3684	180.0983	196.5007	207.3582	207.358
United Kingdom	151.396	151.3964	179.4328	194.7495	208.3748	223.6559	223.656
Average	94.801	94.801	117.136	128.408	140.965	150.650	150.650

Table 17: Comparative static effects in percent of incepting goods and service preferences simultaneously, $\phi = \varphi = 1$

			Net labor flow between sectors into (+)/out(-)		Goods trade		Services trade	
Country	GDP in %	EV in %	Goods in %	Serivces in %	Intra in %	Inter in %	Intra in %	Inter in %
Austria	0.000	6.858	0.135	-0.111	-28.667	17.428	-33.584	140.668
Belgium-Luxembourg	0.474	5.643	0.750	-0.646	12.383	74.828	-71.470	-6.716
Czech Republic	-0.297	5.119	0.203	-0.222	-19.804	26.573	-35.472	112.188
Denmark	-0.121	4.480	0.283	-0.215	-14.188	33.283	-32.754	111.741
Finland	-0.735	4.026	0.133	-0.114	-19.255	22.514	-23.861	146.231
France	-0.684	3.122	-0.188	0.080	-33.896	-13.338	-6.963	199.382
Hungary	-0.580	5.534	0.077	-0.067	-27.398	15.578	-26.287	158.723
Ireland	0.869	4.587	0.840	-0.980	14.554	79.115	-98.201	-94.808
Italy	-1.193	1.994	-0.082	0.046	-19.238	1.029	-6.121	196.639
Netherlands	-0.402	4.789	-0.015	0.009	-30.621	4.088	-17.675	176.877
Poland	-1.637	2.815	-0.105	0.076	-25.397	2.179	-7.663	212.828
Portugal	-0.243	3.163	0.137	-0.092	-17.716	18.566	-17.492	145.572
Slovak Republic	0.138	6.952	0.723	-0.778	6.595	76.666	-83.442	-40.371
Spain	-1.125	2.158	-0.037	0.024	-17.913	5.801	-7.855	189.300
Sweden	-0.939	3.919	0.007	-0.005	-25.137	10.228	-16.042	179.643
United Kingdom	-1.347	2.378	-0.147	0.084	-24.760	-5.076	-5.764	210.192
Average	-0.489	4.221	0.170	-0.182	-16.904	23.091	-30.665	127.380

Table 18: Heterogeneity of comparative static effects in percent of incepting goods and service preferences simultaneously across countries on their bilateral trade flows, $\phi = \varphi = 1$

	Heterogeneity of international goods trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	3.546	3.700	3.546	9.523	13.726	27.721	34.755
Belgium-Luxembourg	54.661	54.664	54.661	62.316	69.868	90.771	101.277
Czech Republic	11.878	11.917	11.878	18.336	22.878	37.999	45.599
Denmark	17.920	17.372	17.920	23.756	29.513	45.451	53.461
Finland	8.543	-22.062	8.543	13.915	19.215	33.885	41.258
France	-22.491	1.556	-22.491	-18.655	-15.768	-8.364	0.870
Hungary	2.108	-9.232	2.108	8.002	12.148	25.948	32.884
Ireland	58.406	-7.902	58.406	66.448	73.981	95.390	106.151
Italy	-9.342	-8.847	-9.342	-4.855	-1.478	7.182	17.057
Netherlands	-7.719	5.032	-7.719	-3.151	0.287	13.827	20.096
Poland	-8.884	57.130	-8.884	-4.374	-0.980	11.127	18.579
Portugal	5.381	-5.179	5.381	10.597	14.522	29.985	37.143
Slovak Republic	56.719	-2.592	56.719	64.711	71.033	92.079	102.658
Spain	-5.262	7.934	-5.262	-0.573	2.956	12.006	23.293
Sweden	-2.163	-14.584	-2.163	2.680	6.325	20.680	27.326
United Kingdom	-14.873	57.943	-14.873	-10.660	-7.488	0.643	10.785
Average	9.277	9.178	9.277	14.876	19.421	33.521	42.075

	Heterogeneity of international services trade changes in % by country						
Country	Minimum	2.50%	25%	50%	75%	97.50%	Maximum
Austria	118.186	118.186	133.225	138.938	147.314	168.396	168.396
Belgium-Luxembourg	-15.405	-15.405	-9.719	-7.315	-3.552	4.668	4.668
Czech Republic	92.355	92.355	105.284	111.879	119.310	138.001	138.001
Denmark	92.478	92.478	105.415	110.888	117.987	138.156	138.156
Finland	123.449	123.449	138.467	144.820	154.758	176.477	176.477
France	171.770	171.770	190.036	197.760	209.852	236.261	236.261
Hungary	133.621	133.621	151.184	157.335	166.356	189.057	189.057
Ireland	-95.252	-95.252	-94.933	-94.798	-94.623	-94.290	-94.290
Italy	169.593	169.593	187.714	195.379	206.077	233.558	233.558
Netherlands	150.650	150.650	168.112	176.094	185.771	210.127	210.127
Poland	183.070	183.070	204.347	211.807	222.735	250.248	250.248
Portugal	124.062	124.062	139.133	145.491	153.764	177.236	177.236
Slovak Republic	-46.236	-46.236	-42.195	-40.779	-38.702	-33.477	-33.477
Spain	163.034	163.034	180.708	188.191	197.888	225.447	225.447
Sweden	153.308	153.308	170.330	179.020	188.797	213.420	213.420
United Kingdom	181.184	181.184	200.082	209.724	220.581	247.905	247.905
Average	106.242	106.242	120.449	126.527	134.644	155.074	155.074