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Gravity Model Analysis: Robust Evidence from the Czech Republic and Corruption Matching

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Abstract:

This paper analyses Czech exports by applying the gravity model to a panel dataset consisting of 177 trade partners during 1995-2011. The model is based on a micro-founded specification derived for panel data estimations. We utilize the fixed effects (FE) and LSDV estimations and the Least Trimmed Squares (LTS). The FE and LSDV methods allow us to deal with multilateral resistance terms derived from micro-economic specification of gravity models. We demonstrate a theoretical bias in estimated coefficients, if the estimation does not take into account the resistance terms. The heterogeneity between partners is explored by the LTS through which we identify the most important outliers from the perspective of our gravity model. The results generally confirm that Czech trade is oriented towards European countries and determined primarily by key economic factors of domestic and foreign GDP. The institutional variables remain largely insignificant, except corruption due to the counterintuitive result that a higher corruption level in partner country should boost mutual trade. We interpret this finding as a result of “corruption matching”. The exclusion of outliers (LTS) significantly increases R-square and extends the number of significant determining factors (e.g. population or other institutional variables). The outliers, according to the LTS, are composed mainly of African, Asia and South or Central America states.

Keywords: Czech Republic, export, gravity model, fixed effects, LSDV, least trimmed squares

JEL: C13, C23, F10, F12, F14

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1. Introduction

The goal of this paper is to analyse Czech exports during the time period of 1995-2011 using the micro-founded gravity model approach. Our aim is to provide a thorough study, which utilizes the micro-founded gravity model derived for panel estimations based on Baldwin and Taglioni (2007). We use the traditional estimation techniques of the fixed effects (FE) and the least squares dummy variable regression (LSDV). We enrich the analysis by utilizing the Least Trimmed Squares (LTS). This method allows us to control for dataset heterogeneity. One of our goals is also to explore the theoretical bias in estimated coefficients stemming from the omission of multilateral terms.

We have not restricted ourselves to only standard economic and geographic factors, but we have also investigated the importance of various institutional determinants (e.g. state of corruption etc.) whose importance has been recognized previously. (e.g. Anderson (2004), Groot et al. (2004), and Seyoum (2011)).

The contribution of the paper is mainly empirical. To our knowledge this is the first study that solely focuses on Czech exports by utilizing standard micro-founded estimations and robustness techniques. We also investigate the differences in estimated coefficients between the so called naive and micro-founded estimations and demonstrate the bias in coefficients based on the omission of theoretical variables stemming from a micro-founded (structural) specification.

Using the previously mentioned methods and available data we examine several hypotheses:

H1: Czech exports are significantly oriented towards nearby countries (proximity or the existence of common borders are important determinants, which boost mutual trade).

This hypothesis is derived from the existence of a high export orientation towards EU countries and long-lasting trade relations between the Czech Republic and its neighbours.

H2: High quality institutions should promote mutual trade in general.

The trade of the Czech Republic is primarily oriented towards EU countries. Thus, we can expect that strong Czech trade integration within EU markets should define the institutional quality of Czech trading partners.

H3: Non-European countries are trade outliers from the model's perspective.

This hypothesis should confirm that those trade determinants being explored are defined primarily by European (especially EU) countries.

H4: There is a significant bias in the estimation that omits multilateral resistance terms.

The hypothesis is based on empirical investigations of bias magnitude by e.g. Baldwin and Taglioni (2007) or by Head and Mayer (2013).

The structure of the paper is as follows: chapter 2 summarizes the existing literature on gravity models in general, as well as, gravity studies concerning Czech trade. Chapter 3 provides a description of the dataset and methodology and also a supplementary review of the literature regarding our methodology. The estimation results are presented in Chapter 4 and our conclusions are stated in Chapter 5.

2. Literature review

a) Theory of gravity models

The gravity models of trade are inspired by the physical law of gravity, where the force that exists between two objects is proportional to the product of the masses of those objects and is inversely proportional to the square of their distance. The basic gravity equation of international trade subsequently defines mutual trade as proportional to the GDP of both countries and inversely proportional to the square of their mutual distance.

The fundamental introduction of the gravity model of international trade was presented by Tinbergen (1962). Since then, gravity models have been developed gradually. However, the real acceptance of gravity models by mainstream trade economists dates back to 1995 due to several works. Trefler (1995) criticized the Heckscher-Ohlin-Vanek theorem on the grounds that it overestimates trade flows and as a result that paper stimulated further efforts to find more appropriate trade models. Another seminal work (McCallum 1995) demonstrated the significant influence of borders on trade by analysing the dynamics of trade between provinces along the U.S. and Canada border.

Another stage in the development of gravity models concerns the search for the micro-foundations of such models. Studies by Anderson (1979), Anderson and Wincoop (2003) and Eaton and Kortum (2002), which derived the gravity equation from the CES demand equation were essential contributions. Some more recent noteworthy papers that focused on either applying or elaborating on the micro-foundations are Baldwin and Taglioni (2007), which investigated the proper gravity formula derivation and specification for panel data estimation; Head and Mayer (2011) derived the structural estimation based on new economic geography literature; Novy (2013a) measured trade costs; Novy (2013b) derived the gravity equation from the translog demand system.

The usual specification form of the gravity models of trade is log-linear. This specification suffers from the inability to estimate zero trade flows (because of the logarithms). Hence, the recent development focuses on the usage of the Poisson pseudo-maximum-likelihood which is able to include zero trade flows into the estimation (Santos Silva and Tenreyro 2006 or Santos Silva and Tenreyro 2011).

A summary of techniques related to gravity estimation is provided also in Head and Mayer (2013) and in Shepherd (2013).

b) Czech trade and its estimation

The literature that utilizes gravity models usually does not examine Czech trade separately, but includes CZ exports as part of multi-country datasets of bilateral trade flows. Gravity model literature regarding Czech trade can be divided into two distinct periods (of course this distinction is highly simplified).

The first studies examined the nature of Czech trade in the 90's before the country's accession to the EU. The underlying motivations for such analysis were to estimate potential trade between post-communist countries and western European countries, to examine EU accession criteria or the effects of trade disintegration due to fall of the "Eastern bloc" after 1989. For instance, Brühlhart and

Kelly (1999) examined the potential trade of Ireland with 5¹ Central and Eastern European countries (CEEC) showing that projected Czech exports to Ireland in 1994 were higher by 73% than the real exports in the same year for example. Jakab et al. (2001) estimated the difference between potential and actual trade of the Czech Republic, Hungary and Poland with 53 partners and observed a reorientation of Czech exports from eastern to western countries since 1993. Nilsson (2000) studied the fulfilment of the EU economic membership criteria for CEEC and observed no significant difference in high trade integration with the EU between candidate countries. He concluded that all candidate countries are competitive within the EU market. Fidrmuc and Fidrmuc (2003) investigated the effects of disintegration on CEEC caused by the fall of the iron curtain. They found a significant decline in mutual trade between CEEC with a visible path-dependency of mutual trade relations.

After the accession of the Czech Republic and other CEEC, we observed a shift in the focus of research topics. From that time, studies concentrated more on the effects of entering the EU and the subsequent liberalization of international trade.. For instance, Papazoglou et al. (2006) examined the effect of the CEEC accession to the EU in 2004. Using the gravity model, they estimated potential trade flows of CEEC with and without the accession. They concluded that the accession increased and redirected trade flows of CEEC towards EU members. Spies and Marques (2009) analysed the effect of the Free Trade Agreements between CEEC (who joined the EU in 2004) and EU members during the 90's. They observed increases in mutual trade between the Czech Republic and EU and FTA members, while imports from the rest of the world declined.

All of the studies noted above have considered the Czech Republic as a part of a bilateral trade flows panel dataset. If we focus on studies that solely estimate determinant factors underlying Czech exports (studies in which the explanatory variable consists of only CZ exports), we find only a very few empirical analyses directly analysing Czech exports. Mostly we find studies using Czech datasets where exports are included to answer different research questions. For example Polyák (2013) estimated the impact of the transition to the Euro currency on exports in the case of Slovakia, while the Czech Republic as a non-Eurozone member was regarded as a comparative country. The author concluded that the existence of the "Rose effect" is not strong; specifically, trade towards the EU members increased by about 5%. Hyžiková (2012) also investigated the "Rose effect" and focused on Germany and the Czech Republic while the effect of Euro in the case of the Czech Republic as a non-Eurozone member is reflected in the development of trade with its partners. According to her results, German exports into Eurozone countries increased by 18% in a cross-section specification and surprisingly decreased by 8% in a time-series specification. In the case of CZ, she observed an increase in exports to countries, if they adopted Euro. Another work utilizing gravity model on Czech dataset are master theses of Bobková (2012) and Wlazel (2014). Bobková used Czech and German data to make a comparison and determine the proper estimator; concluding that the Poisson pseudo maximum likelihood estimation is the proper one. Wlazel concentrated on the indirect trade of the Czech Republic. Janda et al. (2013) also used a gravity model approach on Czech data, but their goal was to analyse export promotion.

¹ Czech Republic, Estonia, Hungary, Poland and Slovenia.

3. Data and methodology of estimation

a) Theoretical model: structural gravity and estimation issues

In this subchapter, we shortly summarize the idea behind structural (micro-founded) gravity models and its implications for empirical estimations. The next subchapter will focus on our methodology and data.

The key difference between the structural and former gravity models is their derivation. The former approach was intuitively based on the experiences of other researchers. On the other hand, the structural gravity literature derives the model from specific micro-economic factors underlying the structure. Hence, the former approach is regarded as “naive” (Head and Mayer 2013).

In this article, we utilize the microeconomic derivation of Baldwin and Taglioni (2007). The model is derived from the CES demand function in the framework of general equilibrium. Their model is based on the work of Anderson and Wincoop (2003), however they extend their derivation to panel data application (the original derivation was valid only for cross-section analysis).

The key difference in the micro-founded and naive model is the presence of the multilateral resistance terms stemming from micro-founded derivation.

The derived micro-founded cross-section theoretical model can be written as follows (we follow Baldwin and Taglioni (2007) and Shepherd (2013)):

$$\log X_{ij} = \log Y_i + \log Y_j + (1 - \delta) \log D_{ij} + \log G$$

$$\log G = -\log \Omega_i - (1 - \delta) \log P_j$$

$$\Omega_i = \sum_{n=1}^N \left(\tau_{in}^{1-\delta} \frac{E_n}{P_n^{1-\delta}} \right)$$

$$P_j = \left(\sum_{n=1}^N n_n (p_{nj})^{1-\delta} \right)^{1/(1-\delta)}$$

Where X_{ij} represents bilateral exports from country i to country j when the total number of countries is N . Y_i, Y_j and D_{ij} are consequent country exports and mutual distance. τ_{ij} reflects all trade costs or trade barriers between countries i and j , E_n represents the total expenditure in the import country on the category of goods that is imported and δ is the elasticity of substitution among all good categories. P_j is the ideal CES price index of the nation j , p_{ij} is the landed price (the price of the imported good in the importing country) and n_n represents the number of exported good categories from country n .

The naive approach ignores the term G , which includes the multilateral resistance terms Ω_i and P_j . The term includes all remaining trade costs between exporting country and its partner except mutual distance. The first term is called outward multilateral resistance expressing the dependence of exports on trade costs between exporting country and all its potential partners. The second term, inward multilateral resistance, reflects the dependence of imports on trade costs between importing country and all potential suppliers.

The micro-founded derivation includes two additional important variables in the theoretical model, which together vary in time, exporter and importer dimensions. However, their estimation raises many difficulties because the variables are unobservable. So far we can observe three main directions regarding how to estimate the theoretical model.

The first can be called the "pragmatic" solution (Baldwin and Taglioni 2007). It consists of the inclusion of time and country dummies, which should capture the variation in time and country-pair dimensions. The model is hence estimated as FE. The weakness of this approach is that during the transformation in FE all constant terms across partner countries (such as mutual distance) disappear.

The second approach approximates the multilateral terms via a combination of observable variables (Anderson and Wincoop 2003). However the natural weakness here is that the term is approximated, which might be more or less arbitrarily derived.

The third approach is the approximation of the multilateral term according to the Taylor-series expansion of the first order (Baier and Bergstrand 2009). The weakness of this method is that the Taylor expansion is precise only within a small proximity from the point around which the approximation is made.

We have chosen to follow the pragmatic solution. The reason is that we fear that the second approach suffers from large degrees of potential randomness or impreciseness because we approximate unobservable factors. We have also decided not to follow the third approach because we are concerned with the potential inaccuracy of the first order Taylor expansion. The econometric methods we use are FE and LSDV estimation.

b) Data and econometric specification

Our log-linear econometric specification of the theoretical model is as follows:

$$\begin{aligned} \log(X_{ijt}) = & \beta_0 + \beta_1 \log(Y_{jt}) + \beta_2 \log(Y_{it}) + \beta_3 \log(D_{ij}) + \beta_4 \log(L_{jt}) + \beta_5 R_{jt} + \beta_6 GEF_{jt} \\ & + \beta_7 BUS_{jt} + \beta_8 TRA_{jt} + \beta_9 FIS_{jt} + \beta_{10} GOV_{jt} + \beta_{11} MON_{jt} + \beta_{12} INV_{jt} + \beta_{13} FIN_{jt} \\ & + \beta_{14} PRO_{jt} + \beta_{15} COR_{jt} + \beta_{16} BORD_{ijt} + \sum_{w=1}^8 \rho_w PTA_{wijt} + \sum_{v=2}^3 \delta_v C_{vijt} \\ & + \sum_{e=1}^T \mu_e TD_e + \sum_{n=1}^N \gamma_n CD_n + \varepsilon_{ijt} \end{aligned}$$

We utilize a one-way error component model for disturbances (time-series specification):

$$\varepsilon_{ijt} = \mu_{ij} + u_{ijt}$$

The μ_{ij} is an unobserved country-specific effect unvarying in time and u_{ijt} reflects the remaining disturbance.

The pragmatic solution is reflected in time dummies ($\sum_{e=1}^T \mu_e TD_e$) and country dummies ($\sum_{n=1}^N \gamma_n CD_n$), where N is the total number of partner countries (177) and T is the total number of years (17).

Except for the dummies of multilateral resistance terms, we divided 18 possible influential factors into several groups: A) core economic (GDPs, distance and population), B) monetary (Euro dummies Cs, MON), C) trade barriers (R, PTA dummies, BORD) and D) institutional factors (proxies for corruption, fiscal burden, etc.). Their sources and names can be found in Table 1 and their descriptive statistics in Table 2. We provide a correlation matrix in Table 13 **Chyba! Nenalezen zdroj odkazů.** in the Appendix. The dataset covers 177 trading partners of the Czech Republic (see Table 11 in the Appendix) within the period 1995-2011.

Table 1: List of explanatory variables (except mult.res. dummies).

Indicator	Variable group	Variable	Unit	Source
X_{ijt}		Czech exports (the dependent variable)	mil. EUR	Eurostat
Y_{it}	A	GDP PPS (Czech Republic)	mil. EUR	Eurostat
Y_{jt}	A	GDP PPS (Partner)	mil. EUR	IMF and Eurostat
D_{ij}	A	Distance	km (adjusted)	CEPII
L_{jt}	A	Population (partners)	mil. Inhabitants	IMF
R_t	C	Recession dummy	dummy (0,1)	Own estimation
GEF_{jt}	D	Government Effectiveness	per cent (0-100)	World Bank
BUS_{jt}	D	Business freedom	per cent (0-100)	Heritage Foundation
TRA_{jt}	D	Trade freedom	per cent (0-100)	Heritage Foundation
FIS_{jt}	D	Fiscal freedom	per cent (0-100)	Heritage Foundation
GOV_{jt}	D	Government spending	per cent (0-100)	Heritage Foundation
MON_{jt}	B	Monetary freedom	per cent (0-100)	Heritage Foundation
INV_{jt}	D	Investment freedom	per cent (0-100)	Heritage Foundation
FIN_{jt}	D	Financial freedom	per cent (0-100)	Heritage Foundation
PRO_{jt}	D	Property rights	per cent (0-100)	Heritage Foundation
COR_{jt}	D	Freedom from Corruption	per cent (0-100)	Heritage Foundation
$BORD_{ijt}$	C	Common border	dummy (0,1)	Own estimation
PTA_{1-9ijt}	C	Preferential Trade Agreement intensity dummies	dummy (0,1)	WTO, UNCTAD & own estimate
C_{1-3ijt}	B	Euro dummies (degree of exchange rate flexibility)	dummy (0,1)	Own estimation

The subscripts are following: i = Czech Republic, $j=1,2,...177$ denotes partner countries and $t=1995,...2011$.

The variables in the logarithm can be interpreted as elasticities. By applying the following formula (Wooldridge 2003, p. 188) we can calculate the “semi-elasticity” of non-log variables expressing percentages (institutional factors):

$$\% \Delta y = 100 \cdot [\exp(\hat{\beta} \cdot \Delta x) - 1]$$

where $\% \Delta y$ denotes the percentage change in the dependent variable (Czech exports) and Δx stands for unit change in explanatory variables (institutional factors). The calculated elasticities are provided in Table 4 and their interpretation is derived from what is the % change in variable y (Czech exports) when we change the explanatory variable by 1 unit (e.g. when business freedom index increases by 1 unit).

Table 2: Descriptive statistics of explanatory variables.

Variable	Mean	Median	Std. Dev.	Number of observations	Expected sign of the coefficient
X_{ijt}	310.290	6.360	1725.040	3009.000	
Y_{jt}	244649.000	25456.000	874666.000	3009.000	+
Y_{it}	165815.000	161806.000	34218.600	3009.000	+
D_{ij}	5735.720	5302.300	3748.750	3009.000	-
L_{jt}	35.507	7.594	130.594	3009.000	+/-
R_{jt}	0.235	0.000	0.424	3009.000	-
GEF_{jt}	50.691	49.268	28.515	2481.000	+
BUS_{jt}	64.198	67.200	15.785	2481.000	+
TRA_{jt}	66.675	69.200	16.248	2481.000	+
FIS_{jt}	70.298	72.790	16.002	2481.000	+
GOV_{jt}	66.198	72.457	23.668	2481.000	+
MON_{jt}	71.976	75.830	16.130	2481.000	+
INV_{jt}	52.900	50.000	19.995	2481.000	+
FIN_{jt}	51.052	50.000	19.996	2481.000	+
PRO_{jt}	49.249	50.000	24.057	2481.000	+
COR_{jt}	40.799	33.000	23.874	2481.000	+
$BORD_{ijt}$	0.023	0.000	0.149	3009.000	+
C_{1ijt}	0.856	1.000	0.351	3009.000	+/-
C_{2ijt}	0.061	0.000	0.240	3009.000	+/-
C_{3ijt}	0.055	0.000	0.227	3009.000	+
PTA_{1ijt}	0.113	0.000	0.316	3009.000	+/-
PTA_{2ijt}	0.019	0.000	0.136	3009.000	+/-
PTA_{3ijt}	0.016	0.000	0.125	3009.000	+/-
PTA_{4ijt}	0.035	0.000	0.184	3009.000	+/-
PTA_{5ijt}	0.044	0.000	0.206	3009.000	+/-
PTA_{6ijt}	0.062	0.000	0.241	3009.000	+/-
PTA_{7ijt}	0.152	0.000	0.359	3009.000	+/-
PTA_{8ijt}	0.446	0.000	0.497	3009.000	+/-
PTA_{9ijt}	0.051	0.000	0.220	3009.000	+/-

The Y_{jt} denotes the GDP of partner country, which can be regarded as a proxy for export demand. On the other hand, Y_{it} as a GDP of exporter (CZ) reflects the supply side of the relationship or the economic power of the exporting country. Both variables are expressed in mil. EUR (nominal purchasing power standards). We expect positive effects of both coefficients and the value should be around unity. (Head and Mayer (2013) estimated the average value of β_1 as 0.98 and of β_2 as 0.84 using 2508 estimates compiled from 159 papers). Distance is measured by D_{ij} and it reflects trade costs. We expect a negative effect on bilateral trade and the expected value of coefficient should be around 1 as is common in other studies (see e.g. Chaney (2013) or Disdier and (Head 2008)). The dummies C_{1ijt} , C_{2ijt} and C_{3ijt} (in the paper together called as Euro dummies) represent relationships of partner countries' exchange rate to the Euro. The dummy C_{1ijt} equals 1, if a partner is a non-member of the Eurozone with floating rates to Euro (otherwise the value is 0), the C_{2ijt} equals 1, if it is a country with an exchange rate fixed to the Euro and the C_{3ijt} equals 1, if it is a member of the Eurozone. For the purpose of the estimation the variable C_{1ijt} is excluded from the regression to serve

as a reference value. Because the Czech Republic is a member of the EU and its trade is oriented to the EU market, we can expect a positive role of European currency in a partner country (positive sign of C_{3ijt}). The role of population size L_{jt} (measured in millions) as a proxy for market size is not so straightforward because on the one hand large markets can stimulate foreign imports and on the other hand such markets can be more self-sufficient.

The presence of an economic crisis is measured by the dummy R_{jt} , where 1 depicts the presence of a crisis. We assume that all countries during the period (2008-2011) were hit by the global financial crisis and hence $R_{jt}=1$ is assumed for that period. We expect a negative effect of the crisis on Czech exports. The PTA dummies PTA_{ijt} are proxies for mutual trade barriers when every PTA dummy represents a sort of mutual agreements. The meaning of all dummies is provided in Table 12 in the Appendix.

The institutional factors are taken from the Heritage Foundation, the World Bank and the United Nations. They exhibit values between 0 and 100, where the highest value 100 reflects “absolute freedom” in terms of the ideal efficiency of state governance. Some observations for several states are missing in the case of institutional factors. The missing values have not been modified and we work with an unbalanced panel. We expect a positive effect of institutional variables on Czech exports². The last dummy in our dataset indicates common borders (wherein, BORD=1).

Before moving on to the estimation of our gravity model, we test the data for collinearity using the Variance Inflation Factor analysis (O’Brien 2007). These tests do not suggest any problem with multicollinearity.

Then, we conduct the panel data estimation. First, we want to estimate parameters in a static regression model. We need to distinguish between the random and fixed effect model. We used the Hausman test, which does reject the random effect model. Finally, we examine any contamination of data by using the robustness technique of estimation. It can be difficult to estimate our models by using the OLS estimator, which combines all observations into one model in an attempt at obtaining unambiguous estimates. Therefore, we use the simple Least Trimmed Square estimator (LTS). This estimator allows the exclusion of whole polluting countries or pair of polluting years from the data set. In this estimator we are looking for a certain parameter for which the sum of z smallest squared residuals is minimal:

$$b^{LTS} = \arg \min \sum_{i=1}^z r_{(i)}^2(b),$$

Where

$$r^2_{(1)} \leq r^2_{(2)} \leq \dots \leq r^2_{(k)} \leq \dots \leq r^2_{(NT)}$$

and $\frac{n}{2} \leq z \leq n$. Finally, we built an OLS estimator based on these z observations. We also define a parameter h , which represents the percentage of excluded observations with values between 0 and 1. We apply this estimator to the static form of the time series model and we exclude the most

² More detailed information on the Heritage Foundation’s variables can be found at: <http://www.heritage.org/index/about>. The description of the Government effectiveness constructed by the World Bank (GEF): <http://info.worldbank.org/governance/wgi/index.aspx#home>. The information about education index (EDU) composed by the UN: <http://hdr.undp.org/en/statistics/hdi>.

problematic observations from the data set and re-estimate the model using the fixed effects again. We decided to set h equal to 0.7 (30% of observations excluded), 0.8 (20% of observations excluded) and 0.9 (10% of observations excluded), run LTS and re-estimate models again without the excluded rows.

4. Empirical results

First, we start with the analysis of a static model, which we estimate using the fixed effects approach. At the end we run the Least Trimmed Squares estimation to provide a robust estimation of the model (time-series specification) and hence provide a control test for heterogeneity of the dataset.

a) Fixed effects

In Table 3 we present the comparison of three estimations. The LSDV and FE (within) estimation based on the microfounded specification and the FE (within) estimation of non-microfounded gravity model. Insignificant results were excluded from Table 3. The results of the complete model (within, FE) can be found in the Table 5 (h=1).

Table 3: Comparison of estimations

	LSDV			FE (Within)			Naive (FE Within)		
const	-9.6507	(5.0249)	***	-9.6507	(5.0249)	***	-19.038	(2.2695)	***
Ln (Y _{it})	1.5033	(0.1602)	***	1.5033	(0.1602)	***	1.4496	(0.2342)	***
Ln (Y _{it})	1.4627	(0.342)	***	1.4627	(0.342)	***	0.5626	(0.3403)	*
Ln (D _{ij})	-2.7798	(0.4155)	***						
Ln (L _{jt})							-0.424	(0.4706)	
R _{jt}							0.2596	(0.0538)	***
FIN _{jt}	0.0041	(0.0016)	***	0.0041	(0.0016)	***	0.004	(0.0026)	
COR _{jt}	-0.0057	(0.0021)	***	-0.0057	(0.0021)	***	-0.0064	(0.0036)	*
BORD _{ijt}	-2.8465	(0.9312)	***						
C _{2ijt}	-0.1681	(0.0761)	***	-0.1681	(0.0761)	***			
C _{3ijt}	0.2709	(0.0886)	***	0.2709	(0.0886)	***			
PTA _{1ijt}	0.1276	(0.0627)	***	0.1276	(0.0627)	***			
PTA _{2ijt}	0.2768	(0.0956)	***	0.2768	(0.0956)	***			
PTA _{3ijt}	0.6626	(0.1589)	***	0.6626	(0.1589)	***			
PTA _{7ijt}	-0.1188	(0.0747)	***	-0.1188	(0.0747)	***			
PTA _{8ijt}	0.1655	(0.0939)	***	0.1655	(0.0939)	***			
No.obs.	2480			2480			2480		
R ² /within R ²	0.943			0.400			0.384		

Notes: * significant at 10%, ** significant at 5%; *** significant at 1%. Hausman test rejects random effects. VIF test does not report problems with collinearity. Robust standard errors reported.

When we compare the results of “naive” and micro-founded gravity estimation, we can observe several relevant differences. The most important departure concerns the role of trade barriers and euro dummies because all these variables are insignificant in the naive specification. Then the institutional variables (except corruption) also do not play any important role in the naive model compared to the micro-founded estimation. The domestic supply approximated by domestic GDP has much lower significance and coefficient value. On the other hand in the naive specification the presence of recession is significant with a positive sign (non-intuitive).

Hence, the comparison shows that the theory based specification reveals a much richer set of determining factors than an ad hoc derived specification (H4 supported). Therefore, the outcomes of gravity estimations are enormously sensitive to the omission of variables as presented in the micro-founded specification.

We start by examining the fixed effects estimations. The overall R-squared (within) is around 40%. If we summarize the results then the most influential factors are core economic-geographical variables (distance, common border, domestic supply and foreign demand) and few institutional determinants (financial freedom and corruption). A noteworthy discovery in the category of institutional variables is that the presence of corruption within a partner country stimulates Czech exports. Besides the economic and institutional factors, the relationships of a partner’s exchange rate to the Euro and

several mutual trade agreements (trade barriers) are also among the significant and influential factors.

Now, we examine the results in more detail. The economic variables are the core of the most important determinants of Czech exports. Both the domestic supply (GDP of exporting country) and foreign demand (partner GDP) exhibit elasticities around 1.5 which is far larger than was expected. The distance elasticity and common border is significant with negative coefficient. The results for these two variables are partly counterintuitive. The distance coefficient is much larger in absolute value than it is common (2.8). The negative coefficient of the common border variable means that the borders should decrease the level of mutual trade. The larger value of distance and the negative value of common border variable may be caused by the LSDV. Parameters can take over the value of other parameters constant over time.

Table 4: Elasticities of institutional variables

Dep. Variable: Log(X _{ij})	LSDV (FE and time dummies)		Naive estimation	
	Semi-elasticity (1 unit change in expl. variable)	Semi-elasticity (10 unit change in expl. variable)	Semi-elasticity (1 unit change in expl. variable)	Semi-elasticity (10 unit change in expl. variable)
FIN	0.411***	4.185***		
COR	-0.568***	-5.541***	-0.638*	-6.200*

On the other hand, the population variable and recession dummy are insignificant.

In the category of monetary factors, the euro dummies are significant. The dummy C_{2ijt} representing the fixed exchange rate to Euro is negative, but on the other side the C_{3ijt} dummy (membership of the Eurozone) has positive coefficient. The dummy C_{1ijt} (floating rate to Euro) was left out. We can hence interpret the results in a way that Czech companies export more to Eurozone members and less into countries with fixed exchange rate to Euro compared to countries with floating exchange rate to Euro. The results confirm pro-European orientation of Czech exports. However, in case of non-Eurozone countries, exporters very likely regard the floating rate to the Euro more beneficial than the fixed exchange rate.

In case of trade barriers dummies we left out the PTA_{9ijt} representing trade without any special institutional relevance. The most interesting result is that the EU membership dummy (PTA_{1ijt}) does not have the largest coefficient. The reason for this may be that other variables, such as Eurozone dummy (C_{3ijt}) or distance could catch part of the effect of PTA_{1ijt} on exports. In other words, there may be an influential correlation between PTA_{1ijt} and these variables (see correlation coefficients in the Table 13).

The highest coefficient from trade barriers dummies exhibits the PTA_{3ijt} (Agreement on Customs Union) followed by the PTA_{2ijt} (European Economic Area member). However these coefficients may be violated by the low number of observations exhibiting a value of 1 in these two cases (57 observations in case of PTA_{2ijt} and 48 in case of PTA_{3ijt}). The PTA_{7ijt} (GSP and EBA - everything but arms) is the only significant trade barrier dummy with a negative coefficient when the reference is PTA_{9ijt} (the dummy is left out).

The group of institutional variables illustrates important and surprising results. In general, the institutional factors are mostly insignificant. There are just two relevant factors: the measure of the banking efficiency and security (FIN) and the level of corruption. The semi-elasticity of FIN is positive: showing that a 1 unit increase of FIN (improvement in the banking efficiency and security) variable boosts exports by 0.4 percent. Hence, the result is in line with our expectations. However the result for the corruption variable is counterintuitive. The semi-elasticity is negative – the 1 unit increase in the variable (improvement in the fight against corruption) would decrease the exports by 0.57%. As a result, exports may be stimulated.

When we look at the literature focusing on the role of institutions on FDI and exports the result may have some logic. Several empirical studies have found a dual role of corruption. Corruption can in specific cases stimulate exports and vice versa in other scenarios.

In the literature analysing FDI e.g. Egger and Winner (2005) revealed stimulating short and long term impact of corruption on FDI. Cuervo-Cazurra (2006) found that the state of the corruption in FDI target country attracts FDI from countries with very similar institutional quality. In other words, investors from corrupting countries would invest more within other corrupted countries and vice versa in regards to countries that exhibit low levels of corruption. We can call this phenomenon “corruption matching”. The relationship is further investigated by Brada, Drabek and Perez (2012) who conclude that the “middle” corrupt countries would be more engaged in FDI than in low or highly corrupt countries. The reason is that the firms in less corrupt countries would gain skills (advanced technology, corporate effectiveness etc.) preferred mainly in also less corrupt states and vice versa. The intermediate corrupted countries would partially teach the firms both of these skills. A different interpretation of highly corrupted countries with high FDI inflows is presented by Cuervo-Cazurra (2008) that claims that the reason for high FDI in corrupted countries (a possible positive role of corruption in FDI attraction) can be explained by suitable type of corruption in those (transition) countries. The so called arbitrary corruption (disorganized criminality) found in transition countries does not deter foreign investments as the existence of pervasive corruption does.

The literature investigating the effects of corruption on international trade (exports/imports) also mentions the dual role of corruption. Horsewood and Voicu (2012) find positive effects of corruption reduction in trade flows. On the other hand, de Jong and Bogmans (2011) conclude that generally corruption should be considered as harmful to international trade; however there is a significant difference between the exporting and importing economy because of bribes paid to the customs bureaucracy that can actually boost import levels. Corruption can thus compensate for demonstrated low levels of institutional quality in importing countries. The role of customs is explored also by the micro-founded gravity model of Dutt and Traca (2010). Bribes to customs system that are derived from the extortion of exporters should be regarded as taxes (increase in costs); however, bribes can enhance trade, if tariffs are high. Goel and Korhonen (2011) focused on disaggregated exports and showed that various sectors have different sensitivities to corruption. Thede and Gustafson (2012) classified corruption according to five characteristics (volume, prevalence, custom location, function and predictability) that show evidence of their different impact channels on trade. However, according to their results, the total trade effect of corruption is negative.

Hence, the results may show that the Czech Republic could be partly engaged in “corruption matching”. The main exports are oriented towards the EU, hence this pattern should not hold there.

However the corruption matching can appear in regards to exports outside the EU, especially in trade with former members of the “east Soviet block”. Hence, our second hypothesis (H2) about pro-trade effects of good quality institutions is falsified.

b) LTS

Since there is a certain possibility of heterogeneity of the dataset, we applied a least trimmed square estimator to our data and we monitored those countries or years that had been deleted by the algorithm. Afterwards, we estimated the reduced data by applying the fixed effects once more. The results of estimates of three possible variants ($h=0.9$, 0.8 and 0.7) are given in Table 5. The complete summary of our LTS results are in the Appendix (Table 14). **Chyba! Nenalezen zdroj odkazů.**

Table 5: LTS Results

	h=1.0 (baseline estimation)		h=0.9		h=0.8		h=0.7	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Ln (Y_{jt})	1.4115 ***	(0.1645)	1.1773 ***	(0.1126)	1.1887 ***	(0.1072)	1.139 ***	(0.1037)
Ln (Y_{it})	1.829	(2.6536)	2.4993	(1.936)	2.3016	(1.7802)	1.7054	(1.5023)
Ln (D_{ij})								
Ln (L_{jt})	0.379	(0.3201)	-0.4586 *	(0.2558)	-0.6473 **	(0.2517)	-0.7369 ***	(0.235)
R_{jt}	0.276 ***	(0.1064)	0.2322 ***	(0.0784)	-0.5447	(1.0184)	0.2245 ***	(0.0633)
GEF_{jt}	0.0028	(0.0032)	0.0031	(0.0024)	0.0008	(0.0022)	0.0045 **	(0.002)
BUS_{jt}	-0.0034	(0.0025)	0.0004	(0.0018)	0.0003	(0.0016)	0.0016	(0.0015)
TRA_{jt}	0.0028	(0.0023)	0.0026	(0.0017)	0.0005	(0.0015)	0.0012	(0.0014)
FIS_{jt}	-0.0041	(0.0026)	-0.0047 **	(0.0019)	-0.0079 ***	(0.0018)	-0.008 ***	(0.0016)
GOV_{jt}	0.0006	(0.002)	0.0014	(0.0015)	0.002	(0.0014)	0.0017	(0.0014)
MON_{jt}	0.0017	(0.002)	0.0002	(0.0015)	-0.0009	(0.0014)	-0.0051 ***	(0.0014)
INV_{jt}	-0.0007	(0.0018)	0.0001	(0.0013)	-0.0001	(0.0012)	0.0002	(0.0011)
FIN_{jt}	0.0039 **	(0.0017)	0.0062 ***	(0.0014)	0.0062 ***	(0.0013)	0.0048 ***	(0.0012)
PRO_{jt}	0.0016	(0.0023)	-0.0003	(0.0018)	-0.0004	(0.0016)	0.001	(0.0015)
COR_{jt}	-0.0056 **	(0.0022)	-0.0054 ***	(0.0017)	-0.0041 ***	(0.0016)	-0.006 ***	(0.0015)
$BORD_{ijt}$								
C_{2ijt}	-0.1886 **	(0.085)	-0.1909 ***	(0.0673)	-0.2121 ***	(0.0633)	-0.233 ***	(0.0634)
C_{3ijt}	0.3088 ***	(0.1013)	0.1715 **	(0.0806)	0.0787	(0.0749)	-0.0494	(0.0744)
PTA_{1ijt}	0.3281 *	(0.1957)	0.2743	(0.1705)	0.4305 ***	(0.1596)	0.7105 ***	(0.1936)
PTA_{2ijt}	0.5142 **	(0.228)	0.4458 **	(0.1906)	0.5243 ***	(0.1752)	0.7285 ***	(0.1962)
PTA_{3ijt}	0.5724 ***	(0.2172)	0.8507 ***	(0.2107)				
PTA_{4ijt}	0.2504	(0.1758)	0.2767 *	(0.1577)	0.4634 ***	(0.1471)	0.7294 ***	(0.1767)
PTA_{5ijt}	-0.1366	(0.1323)	0.0275	(0.1272)	0.1419	(0.1237)	0.1909	(0.1649)
PTA_{6ijt}	-0.1024	(0.1165)	0.0184	(0.0972)	0.1529	(0.0951)	0.4201 ***	(0.1329)
PTA_{7ijt}	-0.2041 **	(0.0914)	-0.1945 ***	(0.0729)	-0.2864 ***	(0.0769)	-0.348 ***	(0.0754)
PTA_{8ijt}	0.0979	(0.1269)	0.2734 ***	(0.0963)	0.1772 *	(0.0966)	0.2441 **	(0.1009)
No. of obs.	2480		2480		2480		2480	
R^2	0.410		0.591		0.672		0.737	

Notes: * significant at 10%, ** significant at 5%; *** significant at 1%. Hausman test rejects random effects. VIF test does not report problems with collinearity. Robust standard errors reported.

The exclusion of outliers using the LTS estimator strikingly increases the R-square from 41 to more than 70. It also changes the results in several ways compared to the baseline estimation. The key economic variable, foreign GDP, does not exhibit any significant change contrary to domestic GDP. However, we observe that when we exclude 30% of outliers, the significance and impact of institutional variables, recession dummy and population increase.

Starting with population, the coefficient becomes significant with a positive sign. The likely interpretation of the coefficient is that the larger the domestic market approximated by the number of inhabitants, the more self-sustainable is the destination market and thus, the lower export value it needs.

The positive coefficient of the recession dummy is unintuitive. The results may be caused by our assumption that all countries were facing recession during the period 2008 – 2011. This assumption may not reflect the heterogeneity of the crisis impact on other. On the other hand the unintuitive (in this case positive) sign of significant estimated parameter can sometimes be caused by the omission of some important variable within the econometric model.

If we focus on the institutional variables, we see that a higher homogeneity of the dataset has revealed a much richer picture of institutional determinants. The corruption and financial freedom has remained significant with similar coefficients. However, three other institutional variables have become significant.

The fiscal freedom indicator (FIS) is a proxy for the tax burden imposed by the government. The negative coefficient means that the higher the tax burden is in the destination country, the higher should be the exports into that country. This result seems to be contradictory to liberal views of mutual trade. However, the explanation can be that Czech exports are mainly oriented towards EU members where the tax burden measured by the tax revenue (% of GDP) is the highest on average (see Table 6).

Table 6: The average tax revenue (in % of GDP, 2011)

Europe	19.4
S. and C. America	17.6
Africa	17.4
Oceania, Australia	16.2
Asia	13.8
N. America	10.7

Source: World Bank - World Development Indicators, 2011.

The sign of government effectiveness (GEF) coefficient is intuitive: the better the state governance is, the higher the exports are. However, the measure of price stability (MON) in partner countries signals that the ability of the central banks to cope with unstable inflation is lower when the exports are higher. This unintuitive result may be caused by the long-lasting financial crisis in the Eurozone which has also affected price stability.

The dummy variables also exhibit several relevant changes. The coefficient of C_{2ijt} dummy increased but, the effect remained the same; although the stimulating effects of the Eurozone membership dummy C_{3ijt} disappeared.

The focus on PTA dummies reveals also a much detailed picture after the exclusion of the outliers. In general, the mutual trade agreements have various effects with uneven magnitude (PTA_{9ijt} as a reference dummy is trade without any institutional relief). The EU and EEA memberships and associations agreements (PTA_{1ijt}, PTA_{2ijt} and PTA_{4ijt}) have the most significant positive impact on mutual trade; followed by the neighbourhood and partnership policies (PTA_{6ijt}) and GSP (Generalized System of Preferences) a MFN (most favoured nation principle, PTA_{8ijt}). On the other side, mutual agreements (PTA_{7ijt}) consisting of GSP and EBA (Everything but arms) have worse effects than a situation without any institutional relief.

The analysis of excluded outliers reveals that the LTS estimator dropped according to the less relevant trading partners, except a few important partners (Slovakia and Russia). If we focus solely on continents, then those with the highest number of excluded observations comes from Africa; followed by Asia and Central and South America (Table 7). The LTS estimator dropped “only” 111 observations from Europe. Despite this fact, the share of European excluded observations on Czech exports is the largest (about 12 percent). The continent with the second highest share is Asia with only 1.3 percent.

Table 7: Excluded exports by continents

	Excluded exports as % of total Czech exports			Number of excluded observations		
	h=0.9	h=0.8	h=0.7	h=0.9	h=0.8	h=0.7
Africa	0.04%	0.16%	0.30%	122	202	291
N. America	0.01%	0.03%	0.47%	1	2	4
S. and C. America	0.03%	0.05%	0.11%	42	69	127
Asia	0.31%	1.02%	1.25%	64	152	197
Europe	0.26%	5.47%	11.75%	14	58	111
Oceania, Australia	0.00%	0.00%	0.01%	4	12	17
Total	0.66%	6.73%	13.88%	247	495	747

Note: The total exports refer to the total exports of our dataset consisting of 177 trading partners during the period 1995-2011.

These figures stress the relevance of the European continent for the Czech exports (H3 supported). The structure of Czech exports in 2013 is depicted in Table 8. The share of Czech trade within the European continent is about 90% of the total Czech exports. The other important trading partners (in terms of continents) are Asia with more than a 5% share and America, which maintains a share of more than 3%.

Table 8: Structure of Czech exports in year 2013

Export by continents		
Continent	Exports in mil. of EUR	Exports as a % of total exports
Africa	1258	1.03%
America	3 901	3.20%
Asia	6 376	5.23%
Europe	109 715	90.00%

Not-specified	92	0.08%
Oceania and polar areas	567	0.47%
The 10 most important export partners		
Country	Exports in mil. of EUR	Exports as a % of total exports
Germany	38 146	31.29%
Slovakia	10 848	8.90%
Poland	7 266	5.96%
France	6 021	4.94%
United Kingdom	5 881	4.82%
Austria	5 538	4.54%
Russia	4 475	3.67%
Italy	4 397	3.61%
Netherland	3 409	2.80%
Hungary	3 159	2.59%

Source: Czech statistical office.

Note: The percentages are based on computations of exports to 217 countries or areas denoted by ISO-2 codes. Hence the baseline of the world's export total is partly different than total exports in our dataset which consists of 177 countries.

If we focus on individual countries, we see that the most important destinations for Czech exports are its neighbours; especially Germany with a 31% share (H1 supported). 9 out of 10 of the highest export destinations are located in the European continent and are also European Union members; the exception is Russia, which is classified as Asian country despite the fact that part of its geographical area lies within continental Europe.

The exclusion of the less relevant trading partners by the LTS estimator can be seen by comparing Table 8 with Table 9. In the table depicting the most important outliers, we find only two countries from Table 8. The reason why the LTS regarded Slovakia as an outlier can be the strong historical interconnection between the Czech Republic and Slovakia, which may be stronger than the economic determinants of trade as measured by the gravity model.

Table 9: The most important outliers

Country	Number of excluded years			Excluded exports (% of CZ exports)		
	h=0.9	h=0.8	h=0.7	h=0.9	h=0.8	h=0.7
SLOVAKIA	0	5	15	0.00%	2.84%	8.26%
RUSSIA	0	11	17	0.00%	1.96%	2.30%
CROATIA	10	16	16	0.22%	0.47%	0.47%
UTD ARAB Emir.	5	15	16	0.14%	0.46%	0.46%
US	0	0	2	0.00%	0.00%	0.43%
HONG KONG	1	17	17	0.03%	0.26%	0.26%
SOUTH Africa	0	3	7	0.00%	0.09%	0.17%
SINGAPORE	10	14	15	0.10%	0.15%	0.15%
BOSNIA	3	5	14	0.02%	0.03%	0.14%

ESTONIA	0	10	10	0.00%	0.11%	0.11%
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Note: The percentage shares denote the export shares of excluded years for each value of h where the total exports are defined by exports to 177 countries in our dataset. Sorted according for $h=0.7$.

If we return back to the estimated coefficient by the LTS estimator, we see that the sign of the corruption coefficient is even more interesting. We have found that a higher level of corruption of a partner should boost trade. This finding remained even though the LTS excluded countries mainly from less developed continents than Europe where we would expect higher corruption level (see Table 10). It may mean that the Czech exporters still prefer countries where the corruption is higher even inside the European continent because the continent is composed of core EU countries with low corruption level, but also former Soviet Union members or Balkan states where the corruption level is higher. However we still have to remember that the list of the main trading partners (Table 8) consists of developed countries such as Germany, France and the UK which maintain good state governance. Hence, the preference towards corrupted countries is limited by this fact.

Table 10: Average corruption levels per observation

Africa	N. Americca	S. and C. America	Asia	Europe	Oceania, Australia
28.7	82.9	35.5	37.6	57.2	65.6

Note: The corruption level is measured by the Freedom from Corruption index (the Heritage Foundation) used in the dataset. The average is computed from the dataset over the whole period 1995-2011. The value vary between 0 and 100 where 100 represents the corruption free country and vice versa.

In general, the results may reveal the existence of two potential subgroups of trading partners, which may follow different patterns of decision making. The first and most important subgroup consists of European countries, especially Czech neighbours and other EU members, where we can hardly say that corruption would boost exports because most EU members are supposed to have already established a high quality institutional infrastructure compared to the rest of the world. The second subgroup consists of those countries in which corruption may play a more important role because of the potential of decreasing transaction costs.

5. Conclusion

We have investigated Czech export decisions using the micro-founded gravity model. We have proceeded in our estimation by using two steps.

First, we estimated the fixed effect model and showed that the micro-founded specification delivers significantly different results than non micro-founded model (H4 supported). The results of the panel estimation are that, generally, Czech exports are significantly oriented to nearby and large countries on the European continent. This finding supports our expectations (H1 and H3).

Trade is primarily affected by key economic determinants as domestic and foreign GDP (domestic supply and foreign demand). The impact of various institutional factors is mainly insignificant except banking efficiency and corruption remains partly a puzzle of analysis because higher corruption should increase Czech exports according to the results (thus, H4 falsified). We interpret this result as

being derived from the presence of corruption matching. The panel estimation also reveals that mutual trade agreements may have various negative and positive effects (PTA dummies) when the most influential factor is a Customs Union agreement. The Euro plays a significant and positive role in boosting mutual trade.

This picture partly changes when we apply the LTS estimator to deal with the heterogeneity of the dataset. The R-squared increased rapidly. Foreign GDP remained significant, however the domestic supply did not. On the other side, the partners' population appeared to be a relevant factor with negative impact on Czech exports. The recession dummy became significant with a positive coefficient, which represents a puzzle for us. The institutional determinants are demonstrated to be highly sensitive to the heterogeneity of the dataset. After the LTS application many other institutional factors became significant; while the most interesting finding is that corruption still remained significant with the same effect. Hence, possible corruption matching appears to be one of the most robust factors. Also, the LTS confirms the various effects of mutual trade agreements uncovered by the fixed effects estimation.

The LTS excluded mainly irrelevant trading partners from Africa, Asia or Central or South America as outliers. This comparison reveals that the heterogeneity of the dataset exists as a primary matter. The estimations reveal a much richer picture of trade determinants when we account for this heterogeneity. The LTS not only confirms the well-known fact that Czech exports are highly oriented towards European countries and especially members of the EU, but they also point out the possibility of two subgroups of trading partners that obey different decision patterns. The first subgroup could consist of western European countries with high standard of public service and public governance. The second subgroup with a less developed institutional framework will likely use corruption as a magnet or stimulating determinant of mutual trade (probably due to the lower transaction costs needed to make up for the missing institutional structures and functions). However this hypothesis demands deeper investigation and is a motivation and goal for further research.

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Appendix

Table 11: List of partner countries

Code	Partner countries	Code	Partner countries	Code	Partner countries	Code	Partner countries
AFG	Afghanistan	SLV	El Salvador	LBR	Liberia	SAU	Saudi Arab
ALB	Albania	GNQ	Eq. Guinea	LBY	Libya	SEN	Senegal
DZA	Algeria	ERI	Eritrea	LIE	Liechtenstein	XSE	Serbia
AND	Andorra	EST	Estonia	LTU	Lithuania	SYC	Seychelles
AGO	Angola	ETH	Ethiopia	LUX	Luxembourg	SLE	Sierra Leone
ATG	Antigua & B.	FRO	Faroe Isl	MAC	Macau	SGP	Singapore
ARG	Argentina	FJI	Fiji	MKD	Macedonia	SVK	Slovakia
ARM	Armenia	FIN	Finland	MDG	Madagascar	SVN	Slovenia
AUS	Australia	PYF	Fr. Polynesia	MWI	Malawi	ZAF	South Africa
AUT	Austria	FRA	France	MYS	Malaysia	ESP	Spain
AZE	Azerbaijan	GAB	Gabon	MDV	Maldives	LKA	Sri Lanka
BHS	Bahamas	GEO	Georgia	MLI	Mali	VCT	St Vincent
BHR	Bahrain	DEU	Germany	MLT	Malta	SDN	Sudan
BGD	Bangladesh	GHA	Ghana	MHL	Marshall Isl	SWZ	Swaziland
BRB	Barbados	GRC	Greece	MRT	Mauritania	SWE	Sweden
BLR	Belarus	GRL	Greenland	MUS	Mauritius	CHE	Switzerland
BEL	Belgium	GRD	Grenada	MEX	Mexico	SYR	Syria
BLZ	Belize	GTM	Guatemala	MDA	Moldova	TWN	Taiwan
BEN	Benin	GIN	Guinea	MNG	Mongolia	TJK	Tajikistan
BMU	Bermuda	GUY	Guyana	MAR	Morocco	TZA	Tanzania
BOL	Bolivia	HTI	Haiti	MOZ	Mozambique	THA	Thailand
BIH	Bosnia	HND	Honduras	PRK	N. Korea	TGO	Togo
BWA	Botswana	HKG	Hong Kong	NAM	Namibia	TTO	Trinidad &T.
BRA	Brazil	HUN	Hungary	NPL	Nepal	TUN	Tunisia
BRN	Brunei	TCO	Chad	NLD	Netherlands	TUR	Turkey
BGR	Bulgaria	CHL	Chile	NZL	New Zealand	TKM	Turkmenistan
BFA	Burkina Faso	CHN	China	NIC	Nicaragua	UGA	Uganda
MMR	Burma	ISL	Iceland	NER	Niger	UKR	Ukraine
BDI	Burundi	IND	India	NGA	Nigeria	URY	Uruguay
KHM	Cambodia	IDN	Indonesia	ANT	NL Antilles	USA	USA
CMR	Cameroon	IRN	Iran	NOR	Norway	ARE	Utd Arab Emir
CAN	Canada	IRQ	Iraq	OMN	Oman	GBR	Utd Kingdom
CYM	Cayman Isl	IRL	Ireland	PAK	Pakistan	UZB	Uzbekistan
COL	Colombia	ISR	Israel	PAN	Panama	VEN	Venezuela
COG	Congo	ITA	Italy	PNG	Papua NG	VNM	Viet Nam
COD	Congo DR	JAM	Jamaica	PRY	Paraguay	VII	Virgin Isl US
CRI	Costa Rica	JPN	Japan	PER	Peru	YEM	Yemen
CIV	Côte d'Ivoire	JOR	Jordan	PHL	Philippines	ZMB	Zambia
HRV	Croatia	KAZ	Kazakhstan	POL	Poland	ZWE	Zimbabwe
CAF	Ctl African Rep.	KEN	Kenya	PRT	Portugal		
CUB	Cuba	KWT	Kuwait	QAT	Qatar		
CYP	Cyprus	KGZ	Kyrgyzstan	ROM	Romania		
DNK	Denmark	LAO	Laos	RUS	Russia		
DOM	Dominican Rep	LVA	Latvia	RWA	Rwanda		
ECU	Ecuador	LBN	Lebanon	KOR	S. Korea		
EGY	Egypt	LSO	Lesotho	SMR	San Marino		

Table 12: Trade barriers dummy

PTA dummies	Meaning of the dummy if the value is 1. If the agreement is not present then the value is 0.
PTA _{1ijt}	EU member
PTA _{2ijt}	European Economic Area member
PTA _{3ijt}	Agreement on Customs Union
PTA _{4ijt}	Association Agreement
PTA _{5ijt}	Free Trade Area agreement
PTA _{6ijt}	Neighbourhood and partnership policies
PTA _{7ijt}	GSP+ and EBA (Everything but arms)
PTA _{8ijt}	GSP a MFN.
PTA _{9ijt}	The trade is without any special institutional reliefs.

Table 13: Cross-correlation matrix

X _{ijt}	1.00																																																			
Y _{jt}	0.24	1.00																																																		
Y _{it}	0.10	0.07	1.00																																																	
D _{ij}	-0.20	0.01	0.00	1.00																																																
L _{jt}	0.04	0.53	0.02	0.01	1.00																																															
R _{jt}	0.08	0.05	0.67	0.00	0.01	1.00																																														
GEF _{jt}	0.23	0.25	0.00	-0.06	0.02	0.00	1.00																																													
BUS _{jt}	0.16	0.17	-0.01	-0.01	-0.08	0.03	0.73	1.00																																												
TRA _{jt}	0.18	0.12	0.36	-0.08	-0.18	0.29	0.52	0.45	1.00																																											
FIS _{jt}	-0.13	-0.07	0.26	0.20	0.00	0.18	-0.09	0.07	0.22	1.00																																										
GOV _{jt}	-0.23	-0.06	0.03	0.35	0.12	0.01	-0.41	-0.17	-0.19	0.49	1.00																																									
MON _{jt}	0.11	0.12	0.21	0.03	0.00	0.04	0.49	0.40	0.36	0.18	0.02	1.00																																								
INV _{jt}	0.20	0.09	-0.09	-0.01	-0.09	-0.05	0.63	0.62	0.41	0.01	-0.14	0.40	1.00																																							
FIN _{jt}	0.12	0.11	0.02	0.05	-0.11	-0.01	0.63	0.61	0.48	0.09	-0.15	0.46	0.72	1.00																																						
PRO _{jt}	0.21	0.20	-0.16	-0.03	-0.05	-0.11	0.83	0.75	0.43	-0.12	-0.33	0.41	0.68	0.66	1.00																																					
COR _{jt}	0.22	0.21	0.01	-0.06	-0.06	0.01	0.85	0.69	0.50	-0.12	-0.42	0.46	0.57	0.60	0.84	1.00																																				
BORD _{ijt}	0.62	0.08	0.00	-0.22	0.00	0.00	0.19	0.08	0.13	-0.13	-0.24	0.07	0.14	0.10	0.17	0.15	1.00																																			
C _{2ijt}	0.06	0.00	-0.07	-0.26	-0.04	-0.05	0.25	0.13	0.18	-0.19	-0.32	0.11	0.18	0.18	0.19	0.20	0.10	1.00																																		
C _{3ijt}	0.36	0.07	0.19	-0.25	-0.03	0.13	0.31	0.23	0.25	-0.19	-0.29	0.16	0.27	0.21	0.29	0.30	0.19	-0.06	1.00																																	
PTA _{1ijt}	0.39	0.10	0.09	-0.37	-0.04	0.07	0.50	0.34	0.36	-0.33	-0.51	0.25	0.39	0.36	0.44	0.47	0.30	0.48	0.54	1.00																																
PTA _{2ijt}	-0.01	-0.03	0.02	-0.16	-0.04	0.03	0.19	0.12	0.12	-0.07	-0.13	0.07	0.06	0.04	0.20	0.24	-0.02	0.10	-0.03	-0.05	1.00																															
PTA _{3ijt}	-0.01	-0.01	0.00	-0.15	-0.01	-0.01	0.02	0.01	0.06	-0.02	0.00	-0.11	0.03	0.02	0.03	-0.02	-0.02	0.08	0.18	-0.05	-0.02	1.00																														
PTA _{4ijt}	0.02	-0.04	-0.09	-0.19	-0.04	-0.09	0.16	0.08	0.08	-0.03	-0.13	0.00	0.12	0.12	0.10	0.06	0.12	0.02	-0.05	-0.07	-0.03	-0.02	1.00																													
PTA _{5ijt}	-0.02	-0.04	0.11	-0.19	-0.04	0.07	0.03	0.00	0.02	0.05	-0.10	0.07	0.04	0.02	-0.08	-0.03	-0.01	0.03	-0.05	-0.08	-0.03	-0.03	-0.04	1.00																												
PTA _{6ijt}	-0.03	0.00	-0.01	-0.19	-0.03	0.03	-0.07	0.04	0.00	0.03	-0.01	-0.08	-0.01	-0.07	-0.05	-0.07	0.00	-0.05	-0.06	-0.09	-0.04	-0.03	-0.05	-0.06	1.00																											
PTA _{7ijt}	-0.07	-0.10	0.25	0.04	-0.05	0.17	-0.36	-0.30	-0.08	0.10	0.22	0.03	-0.20	-0.18	-0.32	-0.28	-0.06	-0.09	-0.10	-0.15	-0.06	-0.05	-0.08	-0.09	-0.11	1.00																										
PTA _{8ijt}	-0.14	-0.07	-0.20	0.33	0.12	-0.11	-0.24	-0.20	-0.34	0.12	0.25	-0.21	-0.31	-0.30	-0.20	-0.26	-0.14	-0.22	-0.19	-0.32	-0.12	-0.11	-0.17	-0.19	-0.23	-0.38	1																									
	X _{ijt}	Y _{jt}	Y _{it}	D _{ij}	L _{jt}	R _{jt}	GEF _{jt}	BUS _{jt}	TRA _{jt}	FIS _{jt}	GOV _{jt}	MON _{jt}	INV _{jt}	FIN _{jt}	PRO _{jt}	COR _{jt}	BORD _{ijt}	C _{2ijt}	C _{3ijt}	PTA _{1ijt}	PTA _{2ijt}	PTA _{3ijt}	PTA _{4ijt}	PTA _{5ijt}	PTA _{6ijt}	PTA _{7ijt}	PTA _{8ijt}																									

Table 14: LTS results (complete)

	h=1		h=0.95		h=0.90		h=0.85		h=0.80		h=0.75		h=0.7	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Ln (Y _{it})	1.4115 ***	(0.1645)	1.1269 ***	(0.1215)	1.1773 ***	(0.1126)	1.2335 ***	(0.1071)	1.1887 ***	(0.1072)	1.1089 ***	(0.1054)	1.139 ***	(0.1037)
Ln (Y _{it})	1.829	(2.6536)	2.9891	(2.1188)	2.4993	(1.936)	1.9225	(1.8419)	2.3016	(1.7802)	1.2749	(1.6363)	1.7054	(1.5023)
Ln (D _{ij})														
Ln (L _{it})	0.379	(0.3201)	-0.2073	(0.2818)	-0.4586 *	(0.2558)	-0.5969 **	(0.2576)	-0.6473 **	(0.2517)	-0.7604 ***	(0.2419)	-0.7369 ***	(0.235)
R _{it}	0.276 ***	(0.1064)	0.3009 ***	(0.0874)	0.2322 ***	(0.0784)	0.1991 **	(0.0775)	-0.5447	(1.0184)	0.1937	(0.9375)	0.2245 ***	(0.0633)
GEF _{it}	0.0028	(0.0032)	0.0051 *	(0.0026)	0.0031	(0.0024)	0.0012	(0.0023)	0.0008	(0.0022)	0.0021	(0.0021)	0.0045 **	(0.002)
BUS _{it}	-0.0034	(0.0025)	0.0017	(0.0019)	0.0004	(0.0018)	0.0007	(0.0017)	0.0003	(0.0016)	0.0002	(0.0016)	0.0016	(0.0015)
TRA _{it}	0.0028	(0.0023)	0.004 **	(0.0019)	0.0026	(0.0017)	0.0008	(0.0016)	0.0005	(0.0015)	-0.0002	(0.0014)	0.0012	(0.0014)
FIS _{it}	-0.0041	(0.0026)	-0.0044 **	(0.0021)	-0.0047 **	(0.0019)	-0.007 ***	(0.0018)	-0.0079 ***	(0.0018)	-0.0082 ***	(0.0017)	-0.008 ***	(0.0016)
GOV _{it}	0.0006	(0.002)	0.0006	(0.0015)	0.0014	(0.0015)	0.0014	(0.0015)	0.002	(0.0014)	0.0019	(0.0015)	0.0017	(0.0014)
MON _{it}	0.0017	(0.002)	-0.0002	(0.0017)	0.0002	(0.0015)	-0.0009	(0.0014)	-0.0009	(0.0014)	-0.0016	(0.0013)	-0.0051 ***	(0.0014)
INV _{it}	-0.0007	(0.0018)	-0.0001	(0.0014)	0.0001	(0.0013)	-0.0003	(0.0013)	-0.0001	(0.0012)	0.0002	(0.0011)	0.0002	(0.0011)
FIN _{it}	0.0039 **	(0.0017)	0.0049 ***	(0.0015)	0.0062 ***	(0.0014)	0.0068 ***	(0.0013)	0.0062 ***	(0.0013)	0.0056 ***	(0.0013)	0.0048 ***	(0.0012)
PRO _{it}	0.0016	(0.0023)	0.0005	(0.002)	-0.0003	(0.0018)	-0.0011	(0.0017)	-0.0004	(0.0016)	0.0014	(0.0015)	0.001	(0.0015)
COR _{it}	-0.0056 **	(0.0022)	-0.0067 ***	(0.0018)	-0.0054 ***	(0.0017)	-0.0048 ***	(0.0016)	-0.0041 ***	(0.0016)	-0.0061 ***	(0.0016)	-0.006 ***	(0.0015)
BORD _{ijt}														
C _{2ijt}	-0.1886 **	(0.085)	-0.1777 **	(0.0709)	-0.1909 ***	(0.0673)	-0.1786 ***	(0.0608)	-0.2121 ***	(0.0633)	-0.223 ***	(0.0605)	-0.233 ***	(0.0634)
C _{3ijt}	0.3088 ***	(0.1013)	0.2243 ***	(0.0853)	0.1715 **	(0.0806)	0.1556 **	(0.0726)	0.0787	(0.0749)	0.0087	(0.0731)	-0.0494	(0.0744)
PTA _{1ijt}	0.3281 *	(0.1957)	0.2839	(0.1798)	0.2743	(0.1705)	0.4475 ***	(0.1605)	0.4305 ***	(0.1596)	0.5589 ***	(0.1719)	0.7105 ***	(0.1936)
PTA _{2ijt}	0.5142 **	(0.228)	0.4411 **	(0.2007)	0.4458 **	(0.1906)	0.5643 ***	(0.179)	0.5243 ***	(0.1752)	0.6043 ***	(0.1829)	0.7285 ***	(0.1962)
PTA _{3ijt}	0.5724 ***	(0.2172)	0.8145 ***	(0.221)	0.8507 ***	(0.2107)	1.0207 ***	(0.2079)						
PTA _{4ijt}	0.2504	(0.1758)	0.2388	(0.1653)	0.2767 *	(0.1577)	0.4414 ***	(0.1475)	0.4634 ***	(0.1471)	0.6137 ***	(0.1586)	0.7294 ***	(0.1767)
PTA _{5ijt}	-0.1366	(0.1323)	-0.0255	(0.1334)	0.0275	(0.1272)	0.1338	(0.1241)	0.1419	(0.1237)	0.1476	(0.1407)	0.1909	(0.1649)
PTA _{6ijt}	-0.1024	(0.1165)	-0.046	(0.105)	0.0184	(0.0972)	0.1323	(0.0951)	0.1529	(0.0951)	0.2747 **	(0.1096)	0.4201 ***	(0.1329)
PTA _{7ijt}	-0.2041 **	(0.0914)	-0.2532 ***	(0.0795)	-0.1945 ***	(0.0729)	-0.2109 ***	(0.0749)	-0.2864 ***	(0.0769)	-0.3136 ***	(0.0719)	-0.348 ***	(0.0754)
PTA _{8ijt}	0.0979	(0.1269)	0.2031 *	(0.1043)	0.2734 ***	(0.0963)	0.2595 ***	(0.0949)	0.1772 *	(0.0966)	0.2117 **	(0.0968)	0.2441 **	(0.1009)

Table 15: Excluded outliers (LTS estimation)

Country	ISO2	Number of excluded years			excluded exports (% of CZ exports)		
		h=0.9	h=0.8	h=0.7	h=0.9	h=0.8	h=0.7
ANDORRA	AD	0	0	0	0.00%	0.00%	0.00%
UTD ARAB Emir.	AE	5	15	16	0.14%	0.46%	0.46%
AFGHANISTAN	AF	0	0	0	0.00%	0.00%	0.00%
ANTIGUA & B.	AG	0	0	0	0.00%	0.00%	0.00%
ALBANIA	AL	0	0	3	0.00%	0.00%	0.00%
ARMENIA	AM	0	2	3	0.00%	0.00%	0.00%
NL. ANTILLES	AN	0	0	0	0.00%	0.00%	0.00%
ANGOLA	AO	4	5	9	0.00%	0.00%	0.01%
ARGENTINA	AR	0	0	1	0.00%	0.00%	0.02%
AUSTRIA	AT	0	0	0	0.00%	0.00%	0.00%
AUSTRALIA	AU	0	0	0	0.00%	0.00%	0.00%
AZERBAIJAN	AZ	0	1	1	0.00%	0.00%	0.00%
BOSNIA	BA	3	5	14	0.02%	0.03%	0.14%
BARBADOS	BB	5	7	8	0.00%	0.00%	0.00%
BANGLADESH	BD	0	1	7	0.00%	0.00%	0.01%
BELGIUM	BE	0	0	0	0.00%	0.00%	0.00%
BURKINA Faso	BF	0	3	4	0.00%	0.00%	0.00%
BULGARIA	BG	0	0	0	0.00%	0.00%	0.00%
BAHRAIN	BH	0	1	2	0.00%	0.00%	0.00%
BURUNDI	BI	0	0	2	0.00%	0.00%	0.00%
BENIN	BJ	0	0	2	0.00%	0.00%	0.00%
BERMUDA	BM	0	0	0	0.00%	0.00%	0.00%
BRUNEI	BN	0	0	0	0.00%	0.00%	0.00%
BOLIVIA	BO	0	0	2	0.00%	0.00%	0.00%
BRAZIL	BR	0	0	4	0.00%	0.00%	0.01%
BAHAMAS	BS	0	0	0	0.00%	0.00%	0.00%
BOTSWANA	BW	13	13	13	0.00%	0.00%	0.00%
BELARUS	BY	0	1	1	0.00%	0.01%	0.01%
BELIZE	BZ	1	6	8	0.00%	0.00%	0.00%
CANADA	CA	1	2	2	0.01%	0.03%	0.03%
CONGO, DR	CD	1	1	2	0.00%	0.00%	0.00%
CTL AFRICAN R.	CF	0	1	3	0.00%	0.00%	0.00%
CONGO	CG	1	1	1	0.00%	0.00%	0.00%
COTE D'IVOIRE	CI	0	0	1	0.00%	0.00%	0.00%
CHILE	CL	0	0	3	0.00%	0.00%	0.01%
CAMEROON	CM	9	17	17	0.00%	0.00%	0.00%
CHINA PR	CN	0	0	0	0.00%	0.00%	0.00%
COLOMBIA	CO	0	0	1	0.00%	0.00%	0.00%
COSTA RICA	CR	0	0	1	0.00%	0.00%	0.00%
CUBA	CU	0	1	6	0.00%	0.00%	0.01%

CYPRUS	CY	0	0	1	0.00%	0.00%	0.01%
GERMANY	DE	0	0	0	0.00%	0.00%	0.00%
DENMARK	DK	0	0	0	0.00%	0.00%	0.00%
DOMINICAN REP.	DO	0	3	7	0.00%	0.00%	0.01%
ALGERIA	DZ	0	7	11	0.00%	0.01%	0.04%
ECUADOR	EC	0	0	1	0.00%	0.00%	0.00%
ESTONIA	EE	0	10	10	0.00%	0.11%	0.11%
EGYPT	EG	0	0	1	0.00%	0.00%	0.00%
ERITREA	ER	3	3	3	0.00%	0.00%	0.00%
SPAIN	ES	0	0	2	0.00%	0.00%	0.03%
ETHIOPIA	ET	0	0	3	0.00%	0.00%	0.00%
FINLAND	FI	0	0	0	0.00%	0.00%	0.00%
FIJI	FJ	0	5	7	0.00%	0.00%	0.00%
FAROE ISL.	FO	0	0	0	0.00%	0.00%	0.00%
FRANCE	FR	0	0	1	0.00%	0.00%	0.05%
GABON	GA	5	12	13	0.00%	0.00%	0.00%
UTD KINGDOM	GB	0	0	0	0.00%	0.00%	0.00%
GRENADA	GD	0	0	0	0.00%	0.00%	0.00%
GEORGIA	GE	3	5	5	0.01%	0.02%	0.02%
GHANA	GH	0	0	0	0.00%	0.00%	0.00%
GREENLAND	GL	0	0	0	0.00%	0.00%	0.00%
GUINEA	GN	1	6	7	0.00%	0.00%	0.00%
EQ. GUINEA	GQ	2	2	6	0.00%	0.00%	0.00%
GREECE	GR	0	0	1	0.00%	0.00%	0.01%
GUATEMALA	GT	0	0	1	0.00%	0.00%	0.00%
GUYANA	GY	3	7	9	0.00%	0.00%	0.00%
HONG KONG	HK	1	17	17	0.03%	0.26%	0.26%
HONDURAS	HN	0	0	1	0.00%	0.00%	0.00%
CROATIA	HR	10	16	16	0.22%	0.47%	0.47%
HAITI	HT	0	2	5	0.00%	0.00%	0.00%
HUNGARY	HU	0	0	1	0.00%	0.00%	0.04%
SWITZERLAND	CH	0	0	0	0.00%	0.00%	0.00%
INDONESIA	ID	0	1	1	0.00%	0.00%	0.00%
IRELAND	IE	0	0	1	0.00%	0.00%	0.00%
ISRAEL	IL	0	0	3	0.00%	0.00%	0.01%
INDIA	IN	0	0	0	0.00%	0.00%	0.00%
IRAQ	IQ	7	7	7	0.00%	0.00%	0.00%
IRAN	IR	0	3	4	0.00%	0.01%	0.01%
ICELAND	IS	0	0	1	0.00%	0.00%	0.00%
ITALY	IT	0	0	1	0.00%	0.00%	0.07%
JAMAICA	JM	11	12	16	0.00%	0.00%	0.00%
JORDAN	JO	0	2	5	0.00%	0.01%	0.01%
JAPAN	JP	0	0	2	0.00%	0.00%	0.09%
KENYA	KE	1	1	1	0.01%	0.01%	0.01%
KYRGYZSTAN	KG	0	0	0	0.00%	0.00%	0.00%
CAMBODIA	KH	5	7	9	0.00%	0.00%	0.00%

N. KOREA	KP	5	12	12	0.00%	0.00%	0.00%
S. KOREA	KR	0	0	0	0.00%	0.00%	0.00%
KUWAIT	KW	0	0	0	0.00%	0.00%	0.00%
CAYMAN ISL.	KY	0	0	0	0.00%	0.00%	0.00%
KAZAKHSTAN	KZ	0	6	10	0.00%	0.03%	0.07%
LAOS	LA	5	5	7	0.00%	0.00%	0.00%
LEBANON	LB	0	8	8	0.00%	0.03%	0.03%
LIECHTENST.	LI	0	0	0	0.00%	0.00%	0.00%
SRI LANKA	LK	1	1	2	0.00%	0.00%	0.00%
LIBERIA	LR	0	1	1	0.00%	0.00%	0.00%
LESOTHO	LS	7	10	13	0.00%	0.00%	0.00%
LITHUANIA	LT	0	0	1	0.00%	0.00%	0.01%
LUXEMB.	LU	0	0	0	0.00%	0.00%	0.00%
LATVIA	LV	0	0	0	0.00%	0.00%	0.00%
LIBYA	LY	0	2	4	0.00%	0.01%	0.02%
MOROCCO	MA	0	0	4	0.00%	0.00%	0.00%
MOLDOVA	MD	0	0	1	0.00%	0.00%	0.00%
Madagascar	MG	1	6	8	0.00%	0.00%	0.00%
MARSHALL ISL.	MH	0	0	0	0.00%	0.00%	0.00%
MACEDONIA	MK	0	0	0	0.00%	0.00%	0.00%
MALI	ML	8	8	10	0.02%	0.02%	0.02%
MYANMAR	MM	0	0	0	0.00%	0.00%	0.00%
MONGOLIA	MN	8	15	16	0.01%	0.01%	0.01%
MACAO	MO	2	3	3	0.00%	0.00%	0.00%
MAURITANIA	MR	3	5	8	0.01%	0.01%	0.01%
MALTA	MT	0	5	12	0.00%	0.00%	0.01%
MAURITIUS	MU	0	1	6	0.00%	0.00%	0.00%
MALDIVES	MV	0	0	1	0.00%	0.00%	0.00%
MALAWI	MW	10	12	15	0.00%	0.00%	0.00%
MEXICO	MX	0	0	1	0.00%	0.00%	0.00%
MALAYSIA	MY	0	0	1	0.00%	0.00%	0.01%
MOZAMBIQUE	MZ	8	12	14	0.00%	0.00%	0.00%
NAMIBIA	NA	6	10	12	0.00%	0.00%	0.00%
NIGER	NE	3	7	8	0.00%	0.00%	0.00%
NIGERIA	NG	0	0	1	0.00%	0.00%	0.00%
NICARAGUA	NI	6	9	14	0.00%	0.00%	0.00%
NETHERL.	NL	0	0	0	0.00%	0.00%	0.00%
NORWAY	NO	0	0	0	0.00%	0.00%	0.00%
NEPAL	NP	0	0	0	0.00%	0.00%	0.00%
N. ZEALAND	NZ	0	0	2	0.00%	0.00%	0.01%
OMAN	OM	7	8	8	0.00%	0.00%	0.00%
PANAMA	PA	1	2	4	0.01%	0.01%	0.01%
PERU	PE	0	0	0	0.00%	0.00%	0.00%
FR. Polynesia	PF	0	0	0	0.00%	0.00%	0.00%
PAPUA NG	PG	4	7	8	0.00%	0.00%	0.00%
PHILIPPINES	PH	1	2	2	0.01%	0.01%	0.01%

PAKISTAN	PK	0	0	0	0.00%	0.00%	0.00%
POLAND	PL	0	0	1	0.00%	0.00%	0.08%
PORTUGAL	PT	0	2	3	0.00%	0.00%	0.01%
PARAGUAY	PY	2	4	6	0.00%	0.00%	0.00%
QATAR	QA	1	1	2	0.00%	0.00%	0.00%
ROMANIA	RO	0	1	2	0.00%	0.00%	0.01%
RUSSIA	RU	0	11	17	0.00%	1.96%	2.30%
RWANDA	RW	5	9	12	0.00%	0.00%	0.00%
SAUDI ARAB.	SA	0	0	1	0.00%	0.00%	0.01%
SEYCHELLES	SC	1	2	3	0.00%	0.00%	0.00%
SUDAN	SD	0	0	1	0.00%	0.00%	0.00%
SWEDEN	SE	0	0	1	0.00%	0.00%	0.01%
SINGAPORE	SG	10	14	15	0.10%	0.15%	0.15%
SLOVENIA	SI	0	0	1	0.00%	0.00%	0.02%
SLOVAKIA	SK	0	5	15	0.00%	2.84%	8.26%
SIERRA Leone	SL	5	6	7	0.00%	0.00%	0.00%
SAN MARINO	SM	0	0	0	0.00%	0.00%	0.00%
SENEGAL	SN	3	3	7	0.00%	0.00%	0.01%
EL SALVADOR	SV	8	11	13	0.03%	0.03%	0.03%
SYRIA	SY	0	0	0	0.00%	0.00%	0.00%
SWAZILAND	SZ	10	13	14	0.00%	0.00%	0.00%
CHAD	TD	4	8	10	0.00%	0.00%	0.00%
TOGO	TG	7	8	11	0.00%	0.00%	0.00%
THAILAND	TH	0	0	1	0.00%	0.00%	0.00%
TAJIKISTAN	TJ	0	0	1	0.00%	0.00%	0.00%
Turkmenistan	TM	2	5	7	0.00%	0.01%	0.01%
TUNISIA	TN	0	0	0	0.00%	0.00%	0.00%
TURKEY	TR	0	1	1	0.00%	0.01%	0.01%
TRINIDAD & T.	TT	2	2	6	0.00%	0.00%	0.00%
TAIWAN	TW	0	0	4	0.00%	0.00%	0.03%
TANZANIA	TZ	0	0	2	0.00%	0.00%	0.00%
UKRAINE	UA	1	2	3	0.02%	0.04%	0.06%
UGANDA	UG	0	0	2	0.00%	0.00%	0.00%
US	US	0	0	2	0.00%	0.00%	0.43%
URUGUAY	UY	0	0	4	0.00%	0.00%	0.00%
UZBEKISTAN	UZ	1	5	6	0.00%	0.01%	0.02%
ST VINCENT	VC	3	3	3	0.00%	0.00%	0.00%
VENEZUELA	VE	0	0	2	0.00%	0.00%	0.00%
VIRGIN ISL.	VI	0	0	0	0.00%	0.00%	0.00%
VIET-NAM	VN	0	0	1	0.00%	0.00%	0.00%
SERBIA	XS	0	0	2	0.00%	0.00%	0.06%
YEMEN	YE	0	4	5	0.00%	0.01%	0.01%
SOUTH Africa	ZA	0	3	7	0.00%	0.09%	0.17%
ZAMBIA	ZM	0	0	5	0.00%	0.00%	0.00%
ZIMBABWE	ZW	1	4	7	0.00%	0.00%	0.00%

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