Economics Bulletin

Volume 36, Issue 1

A note on implementing gravity datasets with abundant zeros

Jordi Paniagua
Catholic University of Valencia

Abstract

This note presents a procedure to construct lighter FDI gravity datasets. The standard estimates using all potential dyads and many zeros are inefficient and present convergence issues. The standard balanced approach overlooks the fact that FDI is highly unbalanced and numerous country pairs rarely show investment activity. An empirical application reveals that our method improves the quality of statistical estimation. Standard datasets underestimate the effect of firm selection and heterogeneity and overestimate the negative effect of distance. Our method to construct gravity datasets reduces the number of zeros and yields unbiased estimates.

Citation: Jordi Paniagua, (2016) "A note on implementing gravity datasets with abundant zeros", *Economics Bulletin*, Volume 36, Issue 1, pages 268-280
Contact: Jordi Paniagua - jordi.paniagua@ucv.es.
Submitted: March 10, 2015. **Published:** February 21, 2016.

I. INTRODUCTION

Zeros have long baffled scholars. Romans simply ignored them (I, II, III…); ancient Greek philosophers stood perplex debating on *how nothing could be something* (Sedley, 1982). The discussion around the void is back on the plate of international economists. This study shows how to build a reduced bilateral dataset containing zeros, providing faster and -more importantly- unbiased estimators of the gravity equation. The contributions of this paper are two: firstly, our methodology alleviates convergence issues that stem from the non-existence of the maximum likelihood estimators. Additionally, the time needed to perform unbiased estimators of the gravity equation is lower. Secondly, we observe that the impact of distance on FDI is higher with abundant zeros. Results suggest that firm heterogeneity has an effect on the transaction costs of FDI.

Nobel laureate Jan Tinbergen (1962) is generally credited as the first to formalize the gravity equation for trade. Similarly to Newton's Universal Law of Gravitation, the gravity equation is a natural way to analyze the determinants of trade across borders. The extent of trade between country pairs is directly proportional to their economic mass (i.e., gross domestic product, GDP) and inversely proportional to distance, a proxy for transaction costs. Anderson (1979) provided the first theoretical foundation for the gravity equation. Since then, gravity models are widely used in empirical research and explain successfully a variety of bilateral economic interactions, such as trade, FDI, financial equities, migration, tourism, employment or commodity flows (Anderson, 2011; Bergstrand and Egger, 2011; Griffith, 2007; Paniagua and Sapena, 2014, 2015).

Tinbergen's work inspired fellow economists, such as Linnemann (1966) who realized that half of the world trade is zero. During 30 years, however, economists did as Romans do and ignored zeros, leading to biased estimators of the standard gravity equation. The appearance of zeros in a bilateral gravity dataset is generally attributed to firm heterogeneity (Anderson, 2011). Heterogeneous firms decide to export, invest abroad or serve their domestic market as a function of their productivity (Helpman, 2006; Helpman, Melitz, and Yeaple, 2004; Melitz, 2003). Hence, zeros signal which firms stay under a certain productivity threshold. For example, a zero-valued observation in an aggregate bilateral FDI dataset means that not a single firm from home country i surpassed the productivity threshold to invest in host country j. By obviating zeros, estimators incur in a self-selection bias problem, since the sample considers only the most productive firms. Some authors have recently addressed this issue, not without discrepancies on how to treat zeros appropriately (Davies and Kristjánsdóttir, 2010; Felbermayr and Kohler, 2006; Helpman, Melitz, and Rubinstein, 2008; Silva and Tenreyro, 2006).

Most of the raw data used to construct gravity datasets contains only positive observations. Economists are left to experiment with the way they fill in the blanks to consolidate their empirical databases. The most popular approach is to use “all potential country pairs” (Helpman, Melitz, and Rubinstein, 2008, p. 462). This balanced approach incurs in two issues. First, a country-selection bias since certain country pairs never trade or invest. Second, Poisson maximum likelihood algorithms may fail to converge with balanced datasets with many zeros.

This paper is motivated by an empirical observation: the world’s FDI is unbalanced. High performing countries attract most the bilateral FDI. Other countries, mostly less developed, are seldom the source for FDI outflows. This may be due to costly transaction costs as well as regulations that forbid international relationships. The 2014 World Investment Report (UNCTAD, 2014) reveals a clear unbalanced pattern in the distribution of FDI bilateral flows.

Developing countries capture 54% of world's inflows, while only 32% of the outflows, which are concentrated on developed countries (61%). Furthermore, FDI flows are concentrated on a few countries and firms (Mayer and Ottaviano, 2008). UNCTAD reports that 20 economies account for more than 80% of the world's FDI inflows and outflows.

II. THE METHOD

The aim of our method is to construct an efficient gravity dataset from raw bilateral data (i.e. without zeros). To do so, we analyze an array of positive investments between country pairs during over several years. The goal is to identify the country pairs that never interact and exclude them from the analysis. Let y_t be a vector of raw bilateral FDI observations during n+1 years:

$$y_t = \left[y_{t_0}, y_{t_1}, \dots, y_{t_n}\right], \quad (1)$$

where $y_{t_0}$is the investment between year t.

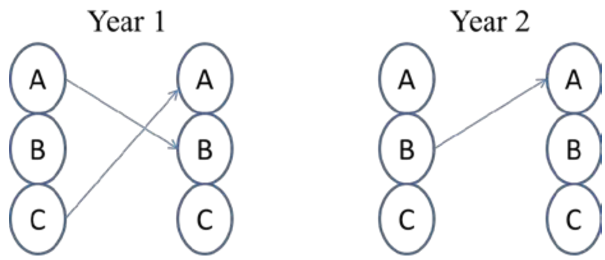
Some authors use the average of two-way bilateral trade datasets (see, for example, Glick & Rose, 2002 or Tomz, Goldstein, & Rivers, 2007). However, theories that underlie a gravity-like specification yield predictions on unidirectional bilateral flows rather than on two-way bilateral flows (Baldwin and Taglioni, 2006; Helpman, Melitz, and Rubinstein, 2008). Our method considers unidirectional data $(y_{ij} \neq y_{ji})$ and, therefore, our specification is more closely grounded in theory.

Some of these observations might be zero when no firm invests in a particular year. For simplicity, consider a three country setup home country i and host country j: $i, j = \{A, B, C\}$ and two years $t = \{1,2\}$. The resulting symmetric database panel is a 6x2 matrix:

$$y_{ijt} = \begin{bmatrix} y_{ABt} \\ y_{BAt} \\ y_{ACt} \\ y_{CAt} \\ y_{BCt} \\ y_{CBt} \end{bmatrix} = \begin{bmatrix} y_{AB1} & y_{AB2} \\ y_{BA1} & y_{BA2} \\ y_{AC1} & y_{AC2} \\ y_{CA1} & y_{CA2} \\ y_{BC1} & y_{CA2} \\ y_{CB1} & y_{CB2} \end{bmatrix}. \tag{2}$$

We explain the procedure with an example which can be easily applied in a N country case during *t+1* years with a dimension of $\frac{N!}{(N-2)!} \times (t+1)$. Consider now the setup illustrated in Figure 1. During year 1, country A invested in country B, and C in A. During year 2 only country B invested in A.

Figure 1: Example of bilateral investment flows



The resulting dataset includes 75% of null observations as follows:

$$y_{ijt} = \begin{bmatrix} y_{ABt} \\ y_{BAt} \\ y_{ACt} \\ y_{CAt} \\ y_{BCt} \\ y_{CBt} \end{bmatrix} = \begin{bmatrix} y_{AB1} & 0 \\ 0 & y_{BA2} \\ 0 & 0 \\ y_{CA1} & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}. \tag{3}$$

The estimation of (3) presents two issues. First, it can be time consuming for a large group of countries or years. Second, the estimators might not exist. We define $E(y_{ij}|x_{ij}) = exp(x'_{ij}\beta)$ and estimate the coefficients via maximum log-likelihood the usual Poisson estimator:

$$\sum [y_{ij} - exp(x'_{ij}\hat{\beta})]x_{ij} = 0. \tag{4}$$

Silva and Tenreyro (2010) show that the existence coefficient's estimates $(\hat{\beta})$, depend on the data configuration. In particular, estimators may not exist if there is perfect collinearity in a subsample of x_{ij} with the values of y_{ij}. Under these circumstances, the estimation algorithm does not converge. To overcome this caveat, the popular Poisson Pseudo Maximum Likelihood (PPML) algorithm eliminates all potentially problematic regressors to ensure convergence (Silva and Tenreyro, 2011). As theses authors recognize, this procedure may lead to biased estimators of the gravity equation(especially with many dummies). This issue is critical since standard specifications include country fixed effects (CFE) to control for multilateral resistance (Anderson and Van Wincoop, 2003; Baldwin and Taglioni, 2006). Omitting CFE biases gravity estimators (McCallum, 1995).

We propose another procedure to construct the dependent variable array y_{ijt}, which alleviates convergence issues and reduces the probability of obtaining unbiased estimators. We eliminate the rows with no bilateral track record of FDI. In our example, y_{ACt}, y_{BCt} and y_{CBt} show no economic relationship. Thus, our resulting matrix is a much simpler 3x2 matrix with less zeros (50%):

$$y_{ijt} = \begin{bmatrix} y_{ABt} \\ y_{BAt} \\ y_{ACt} \\ y_{CAt} \\ y_{BCt} \\ y_{CBt} \end{bmatrix} = \begin{bmatrix} y_{AB1} & 0 \\ 0 & y_{BA2} \\ 0 & 0 \\ y_{CA1} & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \rightarrow y^*_{ijt} = \begin{bmatrix} y_{ABt} \\ y_{BAt} \\ y_{CAt} \end{bmatrix} = \begin{bmatrix} y_{AB1} & 0 \\ 0 & y_{BA2} \\ y_{CA1} & 0 \end{bmatrix}. \tag{5}$$

The matrix y^*_{ijt} portrays accurately the economic relationship between country pairs. Its dimension is smaller and contains less country zeros than the balanced dataset. Our method reduces the number of zeros in the dependent variable. Therefore, it reduces the chances of collinearity with dummy regressors with many zeros and it also reduces computing time. Consequently, our method presents an advantage when the empirical specification contains numerous country fixed effects.

III. EMPIRICAL APPLICATION

The standard non-linear gravity equation is as follows:

$$\begin{aligned} y_{ij} = exp(&\beta_1\, ln(D_{ij}) + \beta_2 border_{ij} + \beta_3 colony_{ij} + \beta_4 language_{ij} \\ &+ \beta_5 religion_{ij} + \beta_6 BIT_{ij} + \beta_7 FTA_{ij} \\ &+ \beta_8 currency_{ij} + \lambda_j + \lambda_j) + \varepsilon_{ij} \end{aligned} \quad (6)$$

where y_{ij} is the aggregate greenfield investment between home country i and host j at constant 2000 USD; D is the distance in kilometers between country capitals; *colony* is set to 1 if the two countries have ever had a colonial link; *language* takes positive value if both countries share the same official language; *religion* is a composite index which measures the religious affinity between country pairs with values from zero to one; *BIT* (Bilateral Investment Treaty) is a dummy that is equal to one if the country pair has a bilateral investment treaty in force; *FTA* (Free Trade Agreement) is a dummy that indicates if both countries have a free trade agreement in force; *currency* is set to 1 if countries share a common currency or have a fixed exchange rate; λ represents country fixed effects that control third-country effects (or multilateral resistance); lastly ε_{ij} represent an stochastic error term.

FDI bilateral data have been taken from FDIMarkets (2013); distance, border, colony, language from CEPII (2011), BIT from UNCTAD (2013), common currency and FTA from Head, Mayer, and Ries (2010) updated with UNCTAD (2013) data. Religion is a composite index calculated with data from CIA World Factbook (2011) according to the following formula for each country pair: %Christiani*%Christianj + %Muslimi*%Muslimj + %Buddhisti*%Buddhistj + %Hindui*%Hinduj + %Jewishi*%Jewishj.

We use positive bilateral greenfield investment data from 160 countries. We construct two cross-section datasets for 2005. The inspection period to eliminate dyads spans from 2005 to 2010. This dataset is heavily unbalanced, meaning that not all countries invested in the remaining 159. From these 160 countries, 40 were investment hosts and never invested abroad.

The first dataset contains all possible country-pair combinations between 160 countries (25,280). The dataset reports 1065 aggregate unidirectional country-pair investments, thus 95% of the observations are zero. After applying the methodology, the datasets shaves down to 4358 dyads with a track record during the available period. This second dataset contains 77% zeros.

Table 1 reports the regression results. The first two columns contain the results without zeros, column 3 shows the results with the traditional (balanced) approach and column 4 reports the results with the method described in this paper. As expected, the gravity equation performs well in explaining two thirds of the variation of bilateral trade flows in levels. The Ordinary Least Squares (OLS) benchmark in column 1 show counter intuitive results. The coefficients of border, religion and institutional agreements are not significant. The OLS equation sub-estimates the effect of distance, which is normally higher than -0.278. Furthermore, the obtained R^2 shows that the log-linear relationship might not be a proper fit for the data.

Column 2 reports the results of the PPML non-linear estimator of equation (6) excluding zeros. This specification resolves some of the issues of the previous OLS estimation: distance's elasticity is higher and religion has a positive significant effect to the 1% level. The results in the next columns (3-6) contain zeros.

Table 1: Results

	(1) OLS	(2) PPML	(3) PPML	(4) PPML	(5) HMR	(6) HMR
log(distance)	-0.278***	-0.350***	-0.554***	-0.440***	-0.382***	-0.302***
	(0.08)	(0.06)	(0.08)	(0.07)	(0.10)	(0.07)
Border	-0.117	-0.447***	-0.303*	-0.304*	-0.217	-0.0647
	(0.19)	(0.15)	(0.17)	(0.15)	(0.16)	(0.18)
Colony	0.477***	0.437***	0.566***	0.565***	0.475***	0.413***
	(0.15)	(0.13)	(0.14)	(0.13)	(0.14)	(0.14)
Common language	0.383**	0.632***	0.809***	0.719***	0.504***	0.436***
	(0.16)	(0.15)	(0.15)	(0.13)	(0.15)	(0.14)
Common religion	-0.00001	0.737***	0.704*	0.666***	0.300	-0.037
	(0.30)	(0.28)	(0.30)	(0.24)	(0.28)	(0.32)
Free trade agreement	0.213	-0.191	-0.063	-0.041	0.115	0.051
	(0.17)	(0.12)	(0.15)	(0.13)	(0.17)	(0.24)
Investment treaty	-0.043	-0.162	0.116	-0.039	-0.003	-0.062
	(0.13)	(0.10)	(0.13)	(0.10)	(0.12)	(0.12)
Common currency	-0.038	0.115	-0.451	0.115	-0.153	0.0516
	(0.11)	(0.09)	(0.23)	(0.08)	(0.24)	(0.17)
$\hat{\bar{\eta}}^*_{ij}$					0.073	1.252***
					(0.55)	(0.23)
$\widehat{\overline{w}}_{ij}(\delta)$					0.004***	0.009***
					(0.00)	(0.001)
Zeros	0%	0%	96%	77%	96%	77%
Observations	1065	1065	25,280	3458	1065	1065
Obs. dropped			14039	940		
R^2	0.42	0.67	0.67	0.68		
Fixed effects	Country	Country	Country	Country	Country	Country
Year	2005	2005	2005	2005	2005	2005

*Notes: * Significant on the 10% level;** Significant on the 5% level; *** Significant on the 1% level. Robust standard errors are in parentheses. Second stage of HMR (Helpman et. al 2008) is reported.*

The signs and magnitudes of the coefficients reported in column 3 (PPML with zeros) are in line with the theoretical expectations. Colony, language and religion are positive and significant. Distance and border are negative and significant to the 1% and 10% level respectively. However, to achieve convergence PPML drops more than 55% of the observations with a balanced dataset. Some controls for third country effects are eliminated and results should be interpreted with caution. The standard symmetrical method in column 4 seems to overestimate the gravity coefficients, which a common result without multilateral resistance terms (e.g., McCallum, 1995).

The gravity estimates with our method are reported in column 4. To converge, PPML drops only 27% of the observations. Our specification is, therefore, closer to the theory foundations of the gravity equation since it controls better for multilateral resistance (via CFE) and firm heterogeneity (zeros). However, our results suggest that the main bias stems from excluding zeros altogether, rather than from the loss of CFE terms.

The last two columns report the second step of the gravity estimation proposed by Helpman et al. (2008) (HMR henceforth) to estimate bilateral flows with zeros. Although HMR imposes to strict conditions on the error term (Silva and Tenreyro, 2015), its is HMR is particularly relevant in our context since it controls for both selection and heterogeneity.

HMR consists of a two-stage procedure; the first stage is a probit estimation:

$$Prob(T_{ij} = 1/observed\ variables) = \Phi(\lambda_i, \lambda_j, Z_{ij}, X_{ij}, \eta_{ij}) \quad (7)$$

where T_{ij} takes a value of 1 when country i invests in country j and zero if the value is zero[1]; $\Phi(.)$ is the cumulative normal standard distribution function; and λ_i, λ_j are the fixed effects of host and investor. Control variables X_{ij} are the variables that affect both the probability and volume of investment and Z_{ij} are the variables that have an effect on the probability of positive FDI but no effect over its volume. X_{ij} captures the distance as well as other dyadic variables. The error term, which is correlated with the error term of gravity equation is noted as η_{ij}.

The second HMR step runs a log-likelihood maximization estimation and includes variables control that for non-random firm selection (zeros) and firm heterogeneity:

$$ln(y_{ij}) = Z_{ij} + X_{ij} + \theta\hat{\bar{\eta}}^*_{ij} + \hat{\bar{w}}_{ij}(\delta) + \lambda_i + \lambda_j + u_{ij} \quad (8)$$

where $\hat{\bar{\eta}}^*_{ij} = \phi(\hat{z}_{ij})/\Phi(\hat{z}_{ij})$ is the inverse Mills ratio and $\hat{z}^*_{ij} = \Phi^{-1}(\hat{\rho}_{ij})$. $\hat{\rho}_{ij}$ are the probabilities obtained in the first probit step of equation (7), and $\phi(.)$ is the standard normal density function[2]. $\hat{\bar{w}}_{ij}(\delta)$ is defined as:

$$\hat{\bar{w}}_{ij}(\delta) = ln\left\{exp\left[\delta\left(\hat{z}^*_{ij} + \hat{\bar{\eta}}^*_{ij}\right)\right] - 1\right\}, \quad (9)$$

where δ is a non-linear parameter which affects both firm selection and firm heterogeneity.

The importance of constructing the dataset with zeros is witnessed by the estimated coefficients of the correction terms $\hat{\bar{w}}_{ij}(\delta)$ and $\hat{\bar{\eta}}^*_{ij}$, which are positive

---

[1] Here the different options to fill in zeros in the data will affect T_{ij}.

[2] Following HMR, some dyads are such that their probability of investment indistinguishable from 1. The inverse Mills ratio would be undefined for predicted probabilities close to 1, therefore all probabilities > 0.9999999 are converted to equal 0.9999999.

and significant with our procedure. Moreover, the estimate of the correction term $\widehat{\overline{w}}_{ij}(\delta)$ doubles in magnitude with our method (column 6). This result suggests that balanced datasets underestimate the effect of firm selection and heterogeneity. We do not appreciate any significant differences in the rest of the variables estimates. Border and religion are not significant, since they are variables that increase the probability of trade but not its volume.

Overall, our results suggest that distance elasticity increases (i.e., more negative) in the number of zeros in the dataset. This effect should be partially attributed to the elimination of some CFE terms in PPML. However, this is not the case for HMR or OLS. Including all countries increases excessively the number of zeros, which point towards less productive firms. Our results are compatible with a setup where foreign investors face higher transactions costs with increasing competition from exporters and domestic firms. This provides additional evidence to support the idea that distance reflects more than transport costs (Choi and Choi, 2014).

IV. CONCLUSIONS

The main issue addressed by this paper is the implementation of gravity bilateral datasets containing many zeros. With the standard symmetrical approach, the PPML algorithm drops many fixed effects to ensure convergence and, therefore introduces a bias in gravity estimates. Our method to construct gravity datasets reduces the number of zeros and thus PPML drops less fixed effects, yielding unbiased estimates.

Furthermore, we observe that the standard balanced dataset underestimates the effect of firm heterogeneity and selection. Our results also indicate a starker effect of distance with more zeros. Future studies that look deeper in the application of this method to trade datasets are certainly encouraged.

REFERENCES

Anderson, J. E. (1979) ‘A theoretical foundation for the gravity equation’, *American economic review*, *69*(1), 106–16.

Anderson, J. E. (2011) ‘The Gravity Model’, *Annual Review of Economics*, *3*, 133–60.

Anderson, J. E. and Van Wincoop, E. (2003) ‘Gravity with gravitas: a solution to the border puzzle’, *The American Economic Review*, *93*(1), 170–92.

Baldwin, R. and Taglioni, D. (2006) *Gravity for dummies and dummies for gravity equations*. NBER Working Paper No. 12516.

Bergstrand, J. H. and Egger, P. (2011) ‘Gravity Equations and Economic Frictions in the World Economy’, in D. Bernhofen, R. Falvey, D. Greenaway and U. Kreickemeier (eds.), *Palgrave Handbook of International Trade*. New York: Palgrave Macmillan.

CEPII (2011) Centre d’études prospectives et d’informations internationales . Obtained through the Internet: http://www.cepii.fr

Choi, C.-Y. and Choi, H. (2014) ‘Does distance reflect more than transport costs?’, *Economics Letters*, *125*(1), 82–6.

CIA World Factbook (2011) Central Intelligence Agency . Obtained through the Internet: www.cia.gov/library/publications/the-world-factbook/

Davies, R. B. and Kristjánsdóttir, H. (2010) ‘Fixed Costs, Foreign Direct Investment, and Gravity with Zeros’, *Review of International Economics*, *18*(1), 47–62.

FDIMarkets (2013) FDI Markets - The Financial Times Ltd . Obtained through the Internet: http://www.fdimarkets.com

Felbermayr, G. J. and Kohler, W. (2006) ‘Exploring the intensive and extensive margins of world trade’, *Review of World Economics*, *142*(4), 642–74.

Glick, R. and Rose, A. K. (2002) ‘Does a currency union affect trade? The time-series evidence’, *European Economic Review*, *46*(6), 1125–51.

Griffith, D. A. (2007) ‘Spatial structure and spatial interaction: 25 years later’, *The Review of Regional Studies*, *37*(1), 28–38.

Head, K., Mayer, T. and Ries, J. (2010) ‘The erosion of colonial trade linkages after independence’, *Journal of International Economics*, *81*(1), 1–14.

Helpman, E. (2006) ‘Trade, FDI, and the Organization of Firms’, *Journal of Economic Literature*, *44*(3), 589–630.

Helpman, E., Melitz, M. and Rubinstein, Y. (2008) ‘Estimating Trade Flows: Trading Partners and Trading Volumes’, *Quarterly Journal of Economics*, *123*(2), 441–87.

Helpman, E., Melitz, M. and Yeaple, S. R. (2004) ‘Export versus FDI with heterogeneous firms’, *American Economic Review*, *94*(1), 300–16.

Linnemann, H. (1966) *An econometric study of international trade flows.* Amsterdam: North-Holland Pub. Co.

Mayer, T. and Ottaviano, G. (2008) 'The happy few: the internationalisation of European firms', *Intereconomics*, *43*, 135–48.

McCallum, J. (1995) 'National borders matter: Canada-US regional trade patterns', *The American Economic Review*, *85*(3), 615–23.

Melitz, M. (2003) 'The impact of trade on intra-industry reallocations and aggregate industry productivity', *Econometrica*, *71*(6), 1695–725.

Paniagua, J. and Sapena, J. (2014) 'Is FDI doing good? A golden rule for FDI ethics', *Journal of Business Research*, *67*(5), 807–12.

Paniagua, J. and Sapena, J. (2015) 'Do credit constraints reduce foreign jobs? A note on foreign direct employment', *Applied Economics Letters*, *22*(3), 195–8.

Sedley, D. (1982) 'Two conceptions of vacuum', *Phronesis*, *27*(2), 175–93.

Silva, J. M. C. S. and Tenreyro, S. (2006) 'The log of gravity', *The Review of Economics and Statistics*, *88*(4), 641–58.

Silva, J. M. C. S. and Tenreyro, S. (2010) 'On the Existence of the Maximum Likelihood Estimates in Poisson Regression', *Economics Letters*, *10*(2), 310–2.

Silva, J. M. C. S. and Tenreyro, S. (2011) 'poisson: Some convergence issues', *Stata Journal*, *11*(2), 207–12.

Silva, J. M. C. S. and Tenreyro, S. (2015) 'Trading partners and trading volumes: Implementing the Helpman-Melitz-Rubinstein model empirically', *Oxford bulletin of economics and statistics*, *77*(1), 93–105.

Tinbergen, J. (1962) *Shaping the World Economy: Suggestions for an International Economic Policy.* New York: The Twentieth Century Fund.

Tomz, M., Goldstein, J. L. and Rivers, D. (2007) 'Do we really know that the WTO increases trade? Comment', *The American Economic Review*, 2005–18.

UNCTAD (2013) United Nations Conference on Trade and Development . Obtained through the Internet: www.unctad.org

UNCTAD (2014) 'World Investment Report', . Retrieved from www.unctad.org