How Similar Are International Economic Relations of EU Member States? Comparing Trade, Investment and Political Behavior*

Matteo Fiorini[a], Miklós Koren[b], Filippo Santi[a], and Gergő Závecz[b]

[a]European University Institute
[b]Central European University

December 2020

Abstract

This paper proposes a novel methodology to assess the similarity in trade and investment patterns across EU Member States (EUMS) with respect to the average EU performance. Contrary to alternative approaches, the similarity indicator presented here accounts for the sparse nature of trade and investment data. This study also investigates the linkages between similarity and measures of political effort exerted by EUMS to develop an idiosyncratic strategy for their trade and investment relationship with partner countries.

1 Introduction

Starting with the formation of a Custom Union (CU) in 1958 six European Countries established a regime of common commercial policy (CCP) where idiosyncratic trade policy strategies resulting from very different portfolios of trade relationships started to be aggregated in a unique trade policy stance with respect to the rest of the World. After 5 decades, in 2009, the institutions of a bigger European Union (EU) acquired exclusive responsibility for trade in goods and services, commercial aspects of intellectual property (IP), public procurement, and foreign direct investment (FDI), extending the breadth and depth of CCP. This exercise of integration and coordination requires a sophisticated assessment of the demands of EUMS which reflect their individual portfolios of economic exchanges with the rest of the World. In fact, differences in trade and investment patterns might generate incentives for idiosyncratic policy strategies creating tensions with the centripetal forces of CCP. This raises two important questions. First, how similar are the trade and investment profiles of EUMS? Second, what are the linkages between trade and investment similarity and the incentives to develop idiosyncratic commercial policy strategies with partner countries? The research presented in this report offers an answer.

*This project received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 770680 (RESPECT).

The main contribution of this paper consists of introducing a new statistical approach to quantify in a synthetic indicator the extent to which trade or investment profiles of individual EUMS differ from the EU average. Such quantitative assessment can be characterized over time in the period from 2001 to 2017 and with respect to any individual trade or investment partner. For instance, this methodology allows to quantify the similarity of Hungary's trade relationship with Russia in 2013 with respect to the EU average trade relationship with Russia in 2013. The constructed index is available at `https://github.com/ceumicrodata/economic-diplomacy/tree/v1.0/output/trade/`. Contrary to alternative methodologies, the indicator presented in this report takes into account the sparse nature of trade data.

Because some partner countries, notably small countries that are far away from the EU, receive few trade and investment transactions, a regular similarity index would suffer from a small-sample bias. A single large transaction could make this economic relation look very dissimilar to the rest of the EU. Our indicator explicitly accounts for randomness and computes the *statistical significance* that each country pair's trade and investment profile is dissimilar. We call the indicator the *Polya Index* as it is derived positing a Polya distribution for trade and investment flows.

The study of similarity in trade and investment patterns is of great policy relevance in a regime of common commercial policy. Our study adds a new instrument to the toolkit of EU Institutions to track idiosyncratic trade and investment patterns and their distribution across EUMS, trade partners and over time. Sharpening the quantitative assessment of EUMS differences in external commercial relationships enhances the capacity of EU Institutions to better fine tune its common commercial policy, accounting for heterogeneous incentives and objectives across EUMS. In other words, the similarity indicator presented in this report contributes to a higher coherence between CCP and EUMS incentives toward idiosyncratic trade and investment strategies.

Equipped with a measure of trade and investment similarity we propose a first application to study the empirical linkages between similarity and a portfolio of measures capturing political effort exerted by EUMS to develop an idiosyncratic strategy for external economic relationships.

Steps taken to implement this idiosyncratic strategy may be difficult to measure, as different governments may use different policy tools and instruments. We use media mentions of state visits, agreement signings, and similar events as a proxy for idiosyncratic political effort. This measure is admittedly broader than ideal, because inter-government cooperation can have many non-economic motives, as well. The fact that we find significant correlations with this noisy proxy suggests that at least some of the cooperative events mentioned in the media are due to the idiosyncratic economic incentives of EUMS.

With respect to trade similarity, the key finding is that country pairs whose trade structure is more similar to the EU average engage in fewer economic diplomacy negotiations and events. This is consistent with the idea that they have less of a need for idiosyncratic foreign policy. The only exception is the group of partner countries in the neighborhood of the EU: countries in the European Neighborhood Program as well as EU candidate countries. These countries are often mentioned by or visited by government actors from large, core EU countries, possibly as a way to exert the "soft power" of the EU.

Importantly, the negative relationship between industry similarity and economic diplomacy does not hold for cross-country investment projects. While this data is admittedly noisier than the trade data, the lack of a negative relationship is also consistent with the

fact that investment policy became part of the common commercial policy only after the Lisbon Treaty. Before 2009 there is less need to engage in softer forms of economic diplomacy to promote investment.

Better understanding the quantitative relationship between trade and investment similarity and the political resources allocated to develop idiosyncratic strategies of commercial policy toward partner countries has important policy implications. Those instances where the data reveal a robust negative correlation suggest that EU institutions might have to better account for heterogeneous trade and investment profiles in the design of CCP. The analysis that follows is limited in scope and will not go beyond the assessment of simple correlations between the variables of interest. The study of the causal effect of trade and investment similarity on idiosyncratic trade policy strategies is left for future research.

The remaining of the report is structured as follows. Section 2 presents the trade similarity index and its investment counterpart. Section 3 describes the data and Section 4 presents the results and offers discussion.

2 The Trade Similarity Index

To identify differential incentives of Member States to engage in economic relations with other countries, we compare the product composition of each Member State's export with that of the EU average. Because, quite naturally, larger countries will export more, we are only interested in the value share of each product in total export flows.

The exports of country i to country j in year t is hence characterized by a sequence of shares, $s_{ijt1}, s_{ijt2}, ..., s_{ijtP}$, where P is the overall number of products, with the shares summing to one, $\sum_{p=1}^{P} s_{ijtp} = 1$. These value shares completely characterize the trade structure of a pair of countries for our purposes. We also control for the overall volume of trade.

Comparing country i to the EU average (denoted by $*$) amounts to comparing two sets of shares, $\{s_{ijtp}\}$ and $\{s_{*jtp}\}$. Our goal is to ask if country i's trade shares are different from the EU average, and if so, to quantify the magnitude of the difference.

Industry similarity indexes between regions and countries have been proposed in other contexts by Finger and Kreinin (1979), Krugman (1991), and Fontagné et al (2018). In contrast to these, our proposed index of similarity is based on an economic choice model (Anderson et al. 1992).

2.1 Kullback-Leibler Divergence

Our preferred measure of difference between country-specific and EU trade shares is the Kullback-Leibler divergence (Kullback 1987, KLD henceforth), defined as

$$\mathrm{KLD}_{ijt} = \sum_{p=1}^{P} s_{ijtp} \ln(s_{ijtp}/s_{*jtp}). \tag{1}$$

This is a measure of distance between the two distributions, only taking the value zero if all the products have the same share, and positive otherwise. As mentioned above, a key benefit of this index is that it is based on utility maximizing decision model.

More specifically, take a consumer with logit preferences (a standard assumption in discrete choice models) whose ideal consumption shares are given by s_{ijt}. If this consumer instead consumes the products in shares s_{*jt}, her utility will be reduced by a magnitude proportional to the KLD between s and $s*$.

Comparing different indexes is outside the scope of this paper, as our main objective is to provide an *ordinal ranking* of countries: which are more and which are less similar to the EU average export flow?

2.2 The Polya Index

In practice, the KLD index will never be zero, as no two countries have exactly the same product composition of exports. In order to quantitatively judge what constitutes a significant gap between the trade composition of two countries, we test whether the KLD is significantly different from zero. This is important because the KLD index will be biased upwards in small samples.

To test for statistical significance and to mitigate small sample bias, we conduct the following procedure. Let x_{ijtp} denote the number of export shipments from country i to country j in product p in year t. Shipments are the basic units of observation in trade statistics, and a small number of shipments can lead to small-sample bias (Armenter and Koren 2014). The total number of shipments between a pair of countries $n_{ijt} = \sum_p x_{ijtp}$ is taken as given.

The *null hypothesis* is that all countries' shipments are distributed according to the same distribution. We chose the multivariate Polya distribution (Eggenberger and Pólya 1923) as the parametric distribution that best suites this application. The Polya distribution generalizes the multinomial distribution with an additional parameter. This way, countries are allowed to have different product shares, but only *at random*. The additional randomness, controlled by the *precision* parameter of the distribution, ensures that our estimated distribution can fit the data reasonably well.

More specifically, $\{x_{ijtp}\}$ is assumed to be distributed according to the Polya distribution with expected product shares $\{\pi_{jtp}\}$ and a precision T_{jt}. We estimate the expected shares and the precision parameter with maximul likelihood, separately for each partner country j and year t.

Under this null hypothesis, the KLD index has a distribution F_{ijt}:

$$\Pr(\text{KLD}_{ijt} \leq x | n_{ijt}) = F_{ijt}(x). \tag{2}$$

Computing this distribution in closed form is possible, but requires prohibitively many combinatorial steps. We would have to compute the probability of each possible allocation of shipments, for thousands of shipments. With a 100 product categories, even just 1,000 shipments could be distributed about 10^{39} different ways.

Instead, we approximate $F()$ with its empirical distribution function. We simulate the distribution with 10,000 Monte Carlo draws and define $\hat{F}_{ijt}(x)$ as the fraction of draws in which the simulated KLD index is smaller or equal to x.

We then define the *Polya Index* as the tail probability of the empirical distribution, evaluated at the actual KLD,

$$\text{Polya}_{ijt} \equiv 1 - \hat{F}_{ijt}(\text{KLD}_{ijt}). \tag{3}$$

The Polya Index captures the probability that we would observe the measured KLD index or higher, conditional on all countries' trade structures being the same in expectation. Formally, it is the statistical size of a one-sided test of the null hypothesis that all countries have a KLD of zero (with their shares generated from the Polya distribution).

The Polya Index is an index of similarity. When the product distribution of the country is statistically indistinguishable from the rest of the countries, Polya_{ijt} is very close to one. By contrast, low levels of the Polya Index mean that we can reject the null hypothesis of similarity. It is important to note, however, that a large Polya Index does not necessarily mean a full alignment of the country's trade structure with that of the EU. It can also arise when we have too few transactions to statistically differentiate the two trade structures. A low Polya Index, on the other hand, surely indicates significant differences.

With the due differences, the Polya Index can also be applied to bilateral investments, although the sparsity of investment transactions might make harder for statistically significant differences to emerge in investment portfolios (compared to trade). Hence, we expect the Polya Index for investment to be larger than its trade counterpart.

3 Data and Methods

3.1 Trade, Investments, and additional controls

Export data come from COMEXT (Eurostat 2019). We use the chapter-level product distribution of bilateral exports between EUMS and their Extra-EU partners, measured between 2001 and 2017 (although most analysis uses the years 2015-17 due to unavailability of other political measures discussed below). Because we do not have access to shipment-level data, we approximate the number of shipments by dividing the value of exports by EUR 12,000, following estimates in Hornok and Koren (2015a,b).

Investment data come from the fDIMarket database (Financial Times, 2019). We aggregate single Greenfield FDI transactions at origin-destination-sector level over the period 2003-2018, focusing on the flows that occurred between EUMS and the rest of the world. Also in this case, we divide the value of larger-than-average investments by the average investment value (computed on strictly positive transactions only). In other words, we are assuming that a factor-n larger investment is comparable to n average size FDI. This assumption is required to reduce data sparsity.

Although the main focus is to explore how trade and investment structure against extra-EU partner countries affect EUMS policy efforts toward idiosyncratic economic strategy, some specifications also include intra-EU trade/investments flows.

We use the GeoDist dataset (Mayer and Zignago 2011) to include geographic distance as well as historical and cultural ties. We also include current GDP (expressed in US dollars and taken in log form), which we take from the World Bank - World Development Indicators and the National Accounts database of the OECD (World Bank 2020).

3.2 Political Variables

To study the behavior of Member States, we turn to media mentions of state visits and similar events. For what concern our main variable of interest, we extract information

on the number of events about economic or diplomatic cooperation between two state actors for the period 2015-17 from the Global Database of Events, Language and Tone (The GDELT Project 2020).

In particular, we limit our attention to positive, cooperative events (as coded by GDELT) in which government agencies or decision makers from EUMS are considered as the "initiating actors". There are two groups of cooperative events: one classified as "intent" (intent to cooperate) and one classified as "visits." In this latter category we include state visits, formal negotiations, signing of agreements, and material cooperation. With reference to any member state, we tally all such events happening in, or being related to, any potential partner country.

As an example, let us focus on a single member state, say France. Then, the French foreign minister visiting Turkey could be one event, which would add up to the France-Turkey bilateral record. The French president arguing for further cooperation with Russia would instead accrue to the France-Russia bilateral record.

Given this approach, we construct two measures of government collaboration between any EUMS i and a given partner j in year t, denoted by INTENT_{ijt} and VISIT_{ijt}. The procedure followed to extract and manipulate information from GDELT is described in Koren et al (2020).

In some of the models presented on Figures 4 to 7 we also control for two additional time-varying and symmetric political variables. The first, *Agreement* is the log of the vote similarity index of two countries in a given year, and comes from the United Nations General Assembly Voting Data (Voeten, Strezhnev and Bailey 2009).

The *Difference in democracy* comes from the Quality of Government Basic Dataset (Teorell et al 2020), and captures the (log) absolute difference in the imputed Freedom House Level of Democracy scores between any two countries.

3.3 Estimating Equation

Our main question is whether these events of economic diplomacy are correlated with our proposed index of trade (investment) similarity. We use a gravity model (Head and Mayer 2014) to relate the intensity of economic diplomacy to the sizes and geographic distance of countries. Because the dependent variable is a count variable with frequent zeros, we use a Poisson regression to estimate its correlation with our variables of interest,

$$\text{VISITS}_{ijt} \sim \text{Poisson}\left[\exp\left(\beta_1 y_{it} + \beta_2 y_{jt} + \beta_3 d_{ij} + \gamma \text{Polya}_{ijt}\right)\right], \tag{4}$$

with y_{it}, d_{ij} and $\text{Polya}_{ijt} \in [0,1]$ denoting respectively the log of nominal GDP of country i in year t, the log of the distance (in km) between country i and j, and the Polya Index of trade similarity between the two countries in year t.

Given this parametrization, the expected value of the number of visits is

$$\text{E}(\text{VISITS}_{ijt}|y_{it}, y_{jt}, d_{ij}, \text{Polya}_{ijt}) = \exp\left(\beta_1 y_{it} + \beta_2 y_{jt} + \beta_3 d_{ij} + \gamma \text{Polya}_{ijt}\right), \tag{5}$$

so that the β and γ coefficients can be interpreted as elasticities or semi-elasticites. The structure of the gravity equation suggests that β_1 and β_2 will be very close to one, while β_3 will be close to minus one. The key parameter of interest is γ, which captures the

correlation between trade similarity and visits, *conditional on* other determinants of economic diplomacy.

In some specifications, we include *exporter* × *time* and *importer* × *time* fixed effects to account for patterns of omitted heterogeneity across countries.

4 Results and Discussion

Figure 1 plots the histogram of the Polya Index across countries pairs. The distribution is bimodal. Most country pairs have a Polya Index at or very close to zero, indicating significant differences from the trade pattern of the overall EU. But there are also many country pairs with a Polya Index close to one, which is primarily due to a small number of transactions. When two countries trade little, we cannot significantly reject that their trade pattern is identical to the EU average.

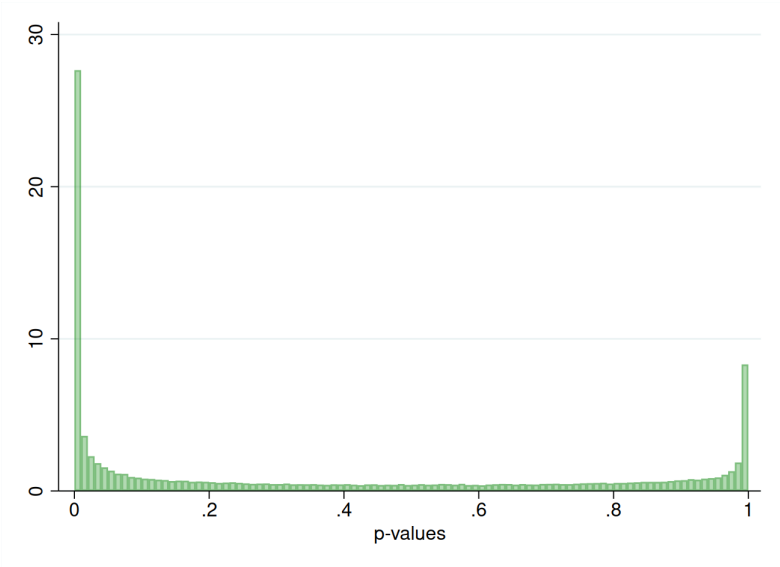

Figure 1: **The histogram of Polya Index.** The histogram records the distribution of Polya Index of the country pairs between 2001 and 2017.

To study the persistence of the Polya Index over time, we plot the average index before and after 2010 for each country pair (cfr. Figure 2). If trade similarity and dissimilarity are due to structural economic reasons, we expect the index to be similar over time. In this case, the early and late index would be close, and a country pair would be lying somewhere close to the 45-degree line on the scatter plot. While the relationship between early and late Polya Index is not very tight, it still shows some strong persistence: most country pairs with a low index before 2010 tend to have a low index also after 2010.

Table 1 shows how the Polya Index is correlated with standard gravity variables of country size and distance. The first column shows that large exporters tend to be more similar to the EU average. This is partly a mechanical relationship, because larger exporters represent a larger weight in the average trade of the EU. We also find that trade with more distance countries is associated with lower similarity. In column 2, we also control for the overall trade volume between country pairs. This does not change the aforementioned correlations.

Figure 3 shows the histogram of visit and intent counts, which are our dependent vari-

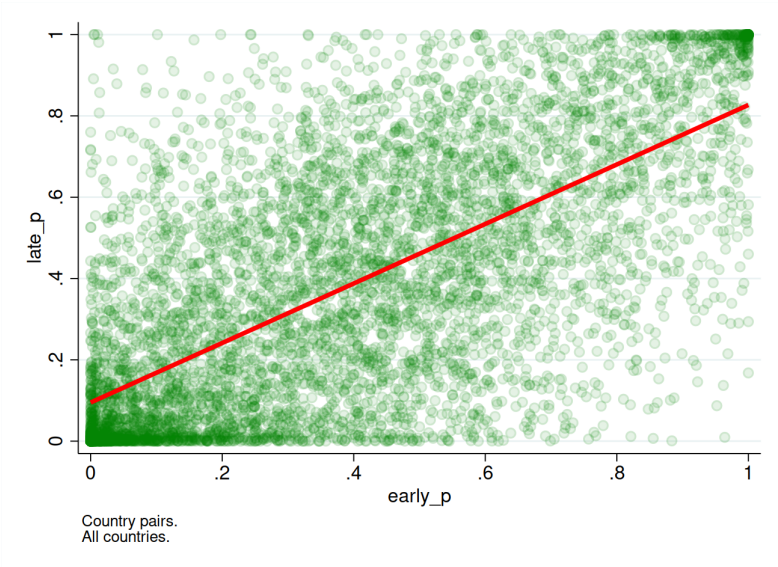

Figure 2: **The Polya Index is relatively persistent over time.** Circles represent country pairs. The horizontal axis records the average Polya Index of the country pair between 2001 and 2009, the vertical axis records the average between 2010 and 2017. The index is constructed as explained in main text. The solid line shows a linear fit.

ables. The distribution is very skewed (in fact, we truncated the histogram at 300), with some country pairs engaging in many events, but the vast majority only in very few.

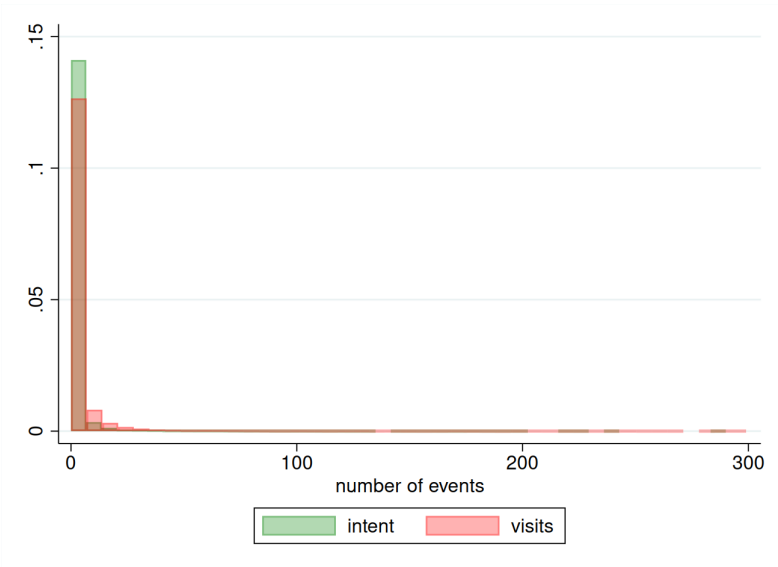

Figure 3: **The histogram of GDELT intent and visits.** The histogram records the distribution of the two dependent variables. Intent means intention to cooperate. Visit is a sum of visits and negotiations, signed agreements and material cooperation. Both intent and visits are cut at 300 events a year for a directed dyad.

To serve as a baseline, we first estimate a gravity equation of economic diplomacy, using only standard measures of size and distance. Table 2 shows the results. Both intent and visits are obeying the gravity equation: larger, closer countries have more intergovernmental events. Indeed the β coefficients are very close to plus and minus one, as

Table 1: Larger, closer countries have more similar trade patterns

	Model 1 without trade flow	Model 2 with trade flow
Distance (log)	-0.071***	-0.087***
	(0.013)	(0.018)
Exporter nominal GDP (log)	0.126***	0.139***
	(0.013)	(0.018)
Importer nominal GDP (log)	0.006	0.019
	(0.007)	(0.015)
Trade flow (log)		-0.013
		(0.011)
Number of observations	5855	5855
R^2	0.226	0.228

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Linear model is used for estimation.

Standard errors: Clustered standard errors are in parantheses.

Sample: all countries.

expected.

Finally, we include the Polya Index, together with the two additional political controls described in Section 3. For ease of presentation, we only report the point estimate of the coefficient γ (capturing the partial correlation between the Polya Index and our proxy for idiosyncratic economic policy effort), for different specifications together with its 90-percent confidence interval, in various specifications. Figure 4 below summarizes the result for INTENT_{ijt} — our measure capturing EUMS governments' intent to visits partner countries authorities.

The top left panel displays the coefficient of regression on the entire sample of countries. Green dots and lines represent our estimates without political controls, red dots and lines with political controls. For comparison, we post the trade and investment coefficients on the same graph. Note, however, that the investment similarity index is computed on a different sample of countries due to data availability.[1]

Overall, trade similarity is negatively correlated with idiosyncratic economic policy, as captured by events mentioned by the media. This is consistent with our hypotheses that countries that are structurally more different from the EU average also have higher incentives to engage in idiosyncratic policy efforts. By contrast the correlation with investment similarity is positive, although as we will see, this correlation is not significant in any of the relevant subgroups.

The other panels show the same coefficient estimated separately in different subgroups

[1] In particular, trade data include the following countries that are not present in FDI data: Buthan, Comoros, Dominica, Saint Kitts and Nevis, Tonga, Tuvalu, and Vanuatu. Conversely, FDI data also include the following countries and autonomous territories: Bosnia and Herzegovina, Hong Kong, Liechtenstein, Montenegro, Serbia, Slovenia, Syria, Taiwan, Andorra, Macau, Monaco, East Timur, Venezuela, Democratic Rep. of Congo, Bermuda, North Korea, Somalia, South Sudan, Greenland, Guadeloupe, Martinique, New Caledonia, Palestine Occupied Territories, Solomon Island, Lesotho, Sao Tome and Principe, Reunion.

Table 2: The gravity equation holds for measures of economic diplomacy

	Model 1 intent	Model 2 visits
Distance (log)	-0.857***	-0.627***
	(0.125)	(0.116)
Exporter nominal GDP (log)	1.073***	0.850***
	(0.132)	(0.143)
Importer nominal GDP (log)	0.900***	0.705***
	(0.101)	(0.113)
Trade flow (log)	-0.193**	-0.115
	(0.082)	(0.083)
Number of observations	5855	5855
Pseudo R^2	0.479	0.447

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Poisson pseudo-likelihood regression is used for estimation.

Standard errors: Clustered standard errors are in parantheses.

Sample: all countries.

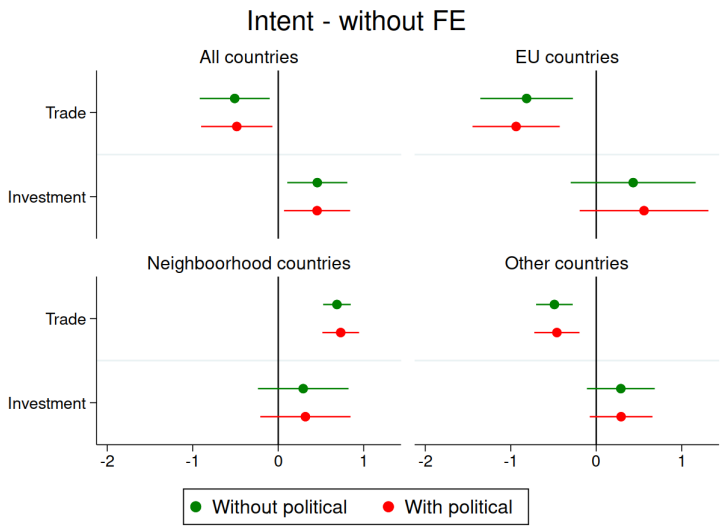

Figure 4: **Trade similarity and intent to cooperate are negatively correlated for most countries.** The vertical axis records the effect of trade and investment Polya indices on intent. Points represent point estimates, lines represent confidence intervals (90). Samples are named in the subtitles. Different colors represent different model specifications without fixed effects.

of destination countries. Going clockwise, the top right panel reports the coefficients related to internal EU trade/investments, again reinforcing a strong negative correlation between similarity and idiosyncratic policy. The bottom right panel shows estimates from other third countries that are neither members, nor in the formal neigbhorhood and accession programs of the EU. Here the correlation is again strongly and significantly

negative. Finally, the bottom left panel shows trade with EU neighborhood countries. Here the correlation is strongly positive, suggesting that most government-to-government initiatives are initiated by core EU countries whose trade patterns are much aligned with the average. More peripheral EUMS with a low Polya Index tend to engage in less diplomacy with neighbouring countries (conditional on size and distance). Notice how the coefficient on investment similarity is not significantly associated with idiosyncratic policy in any of the three cases.

Figure 5 reports the result from the same set of regressions, with the number of visits VISIT_{ijt} as outcome variable. The patterns across the different subgroups are very similar the result we obtained for the Intent-to-visit case. The only difference involves the investment similarity, which is significantly *positively* correlated with state visits to neighbouring non-EU partners. We believe this to be a finding that warrants further study in the future.

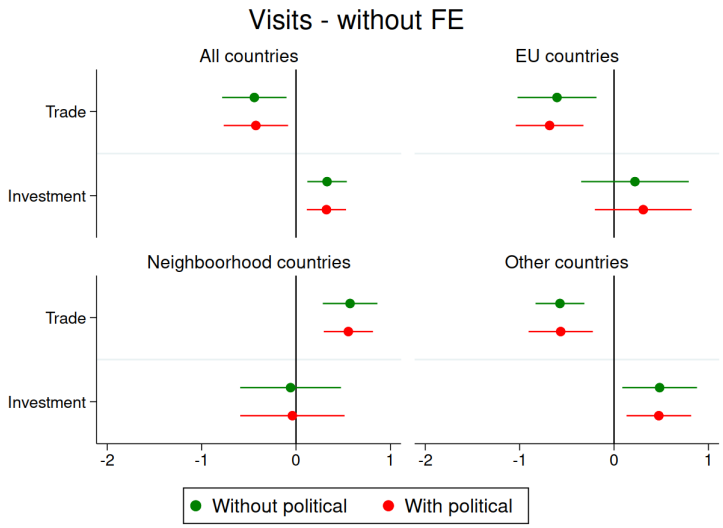

Figure 5: **Trade similarity and state visits are negatively correlated for most countries.** The vertical axis records the effect of trade and investment Polya indices on visits. Points represent point estimates, lines represent confidence intervals (90). Samples are named in the subtitles. Different colors represent different model specifications without fixed effects.

For the sake of completeness, Figures 6 and 7 also report the estimates of the γ coefficient from regressions controlling for exporter-year and importer-year fixed effects. Because these fixed effects take up many degrees of freedom, these estimates are much noisier. The overall pattern of coefficients is nonetheless similar.

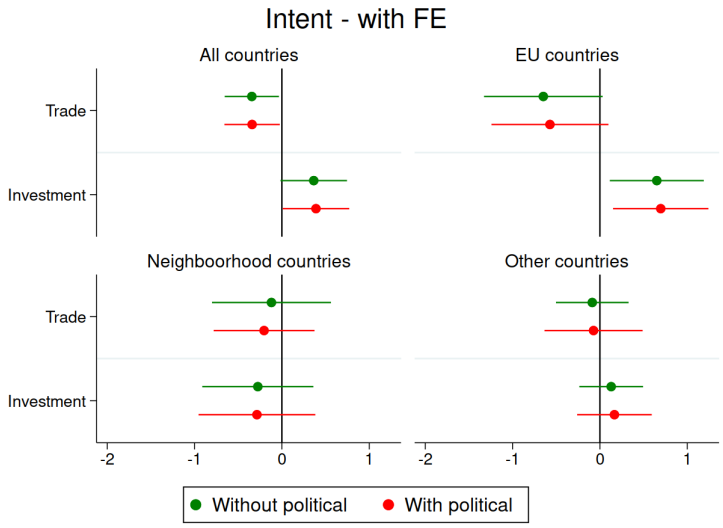

Figure 6: **With additional controls, there are no significant correlations between trade similarity and intent to cooperate.** The vertical axis records the effect of trade and investment Polya indices on intent. Points represent point estimates, lines represent confidence intervals (90). Samples are named in the subtitles. Different colors represent different model specifications with fixed effects.

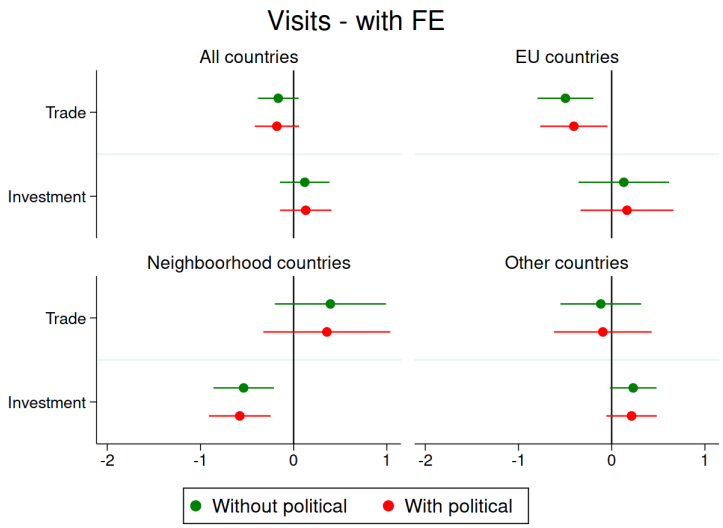

Figure 7: **Trade similarity and state visits are negatively correlated for most countries (even after fixed effects).** The vertical axis records the effect of trade and investment Polya indices on visits. Points represent point estimates, lines represent confidence intervals (90). Samples are named in the subtitles. Different colors represent different model specifications with fixed effects.

5 Conclusions

This paper presented a novel approach to measure the similarity in trade and investment structures between EU Member States and the EU average. It contributes to the literature on similarity indexes by statistically accounting for the sparse nature of trade and investment data. We applied this methodology to construct a panel dataset of trade and investment similarity indexes covering all EUMS and their trading partners over the period from 2001 to 2017. Complementing this data with new measures of political effort exerted by EUMS in bilateral relationships with partner countries, our analysis has shown a robust negative correlation between trade similarity and the incentives to develop idiosyncratic commercial policy strategies.

The empirical resources and the analysis presented in this paper have a strong policy relevance. Indeed, the EU regime of common commercial policy requires a complex synthesis of idiosyncratic external policy motives originating from different trade and investment structures. A careful empirical assessment of the differences and similarities in EUMS international economic relationships is a necessary condition for a successful centralized decision making process. The work presented in this paper is an attempt to serve this purpose.

References

[1] Anderson, Simon P., Andre de Palma, and Jacques-Francois Thisse. 1992. Discrete Choice Theory of Product Differentiation. MIT Press.

[2] Armenter, Roc, and Miklós Koren. 2014. "A Balls-and-Bins Model of Trade." The American Economic Review 104 (7): 2127–51.

[3] Eggenberger, F. and G. Pólya. "Über die Statistik Verketteter Vorgänge." Zeitschrift für Angewandte Mathematik und Mechanik, 3:279-289, 1923.

[4] Eurostat. 2019. "COMEXT: International Trade in Goods." [dataset] http://epp.eurostat.ec.europa.eu/newxtweb/mainxtnet.do.

[5] Dahlberg, Stefan, Sören Holmberg, Bo Rothstein, Natalia Alvarado Pachon and Sofia Axelsson. 2020. "The Quality of Government Basic Dataset, version Jan20. University of Gothenburg: The Quality of Government Institute." [dataset] http://www.qog.pol.gu.se doi:10.18157/qogbasjan20

[6] Finger, J. M., and M. E. Kreinin. 1979. "A Measure of 'Export Similarity' and Its Possible Uses." The Economic Journal 89 (356): 905–12.

[7] Fontagné, Lionel, Angelo Secchi, and Chiara Tomasi. 2018. "Exporters' Product Vectors across Markets." European Economic Review 110 (November): 150–80.

[8] The GDELT Project. 2020. "Global Database of Events, Language and Tone (GDELT) 2.0." [dataset] https://www.gdeltproject.org/data.html.

[9] Head, Keith, and Thierry Mayer. 2014. "Gravity Equations: Workhorse, Toolkit, and Cookbook." In Handbook of International Economics, edited by Gita Gopinath, Elhanan Helpman, and Kenneth Rogoff, 4:131–95. Elsevier.

[10] Hornok, Cecília, and Miklós Koren. 2015a. "Per-Shipment Costs and the Lumpiness of International Trade." The Review of Economics and Statistics 97 (2): 525–30.

[11] Hornok, Cecília, and Miklós Koren. 2015b. "Administrative Barriers to Trade." Journal of International Economics 96, Supplement 1 (0): S110–22.

[12] Koren, Miklós, Fiorini, Matteo and Santi, Filippo. 2020. "European Gov2Gov Cooperation Data." [dataset] https://github.com/ceumicrodata/gov2gov-cooperation

[13] Koren, Miklós, Matteo Fiorini, Filippo Santi and Gergő Závecz. 2020. "The Pólya Index of Trade Similarity" [dataset] https://github.com/ceumicrodata/economic-diplomacy/tree/v1.0/output/trade/

[14] Krugman, Paul. 1991. Geography and Trade. Cambridge: MIT Press.

[15] Kullback, Solomon. 1987. "Letters to the Editor: The Kullback-Leibler Distance." The American Statistician 41 (4): 338–41.

[16] Mayer, T. and Zignago, S. 2011. Notes on CEPII's distances measures: the GeoDist Database [dataset] CEPII Working Paper 2011-25.

[17] Voeten, Erik, Strezhnev, Anton and Bailey, Michael. 2009. "United Nations General Assembly Voting Data." [dataset] https://doi.org/10.7910/DVN/LEJUQZ, Harvard Dataverse, V27, UNF:6:d0mGNR+Qja/nNTgUCC5xAA== [fileUNF]

[18] World Bank. "GDP (current US dollars). World Development Indicators, The World Bank Group, 2020." [dataset] http://api.worldbank.org/v2/en/indicator/NY.GDP.MKTP.CD?downloadformat=excel