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Article

An empirical analysis of the intra-industry trade flows with a spatial-gravity model for a cluster of EU-advanced economies and MEDA-transitional economies

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Abstract: This study uses spatial-gravity models to examine intra-industry trade flow based on technological intensity for a cluster of the main EU-advanced economies (Spain, France, Germany, Italy, and Greece) and MEDA-transitional economies (Morocco, Algeria, Tunisia, Libya, Egypt, Israel, Jordan, Lebanon, Syria, and Turkey) from 1990 to 2020. We have inserted into the models in an original way the variables of cultural affinity to grasp the effects of the liability of foreignness. We also consider the upheavals began with the "global economic crisis" (2007–2008), including the "sovereign debt crisis" for EU countries (2009–2011), and the "Arab Springs" for MEDA-transitional economies (2011–012). Results show the SAR-AR specification used to estimate our models is correct, and variables to catch the liability of foreignness make for more suitable regression. We have found significant trade flows with one order of lags, as a proxy for a persistence effect in trade flows, as well as other explanatory variables such as industry middle productivity, openness, stock market capitalization, and the exchange rate. While tariff barriers, remittance in- and outflows, and dummy variables that capture the effect of partnership agreements and the upheavals are less significant, nonetheless, these two effects have been found to be significant in the low-tech and service industries. We also found that improvements in the governance climate in EU-advanced economies have a negative effect on intra-industry trade flow, whereas improvements in the governance climate in MEDA-transitional economies have a positive effect, but only for high-tech production and services. We conclude that it is important for the European Union to have traced new guidelines to Euro-Mediterranean (Euro-Med) common action through cooperation in order to avoid the deterioration of political and economic relations between the countries in the Euro-Med region.

Keywords: trade; economic integration; Euro-Med cooperation; gravity model; EU; MEDA
JEL Classification: F14; F15; P33

1. Introduction

The Southern-Eastern Mediterranean counties (MEDA region) occupy an important role in the European Union's (EU) trade agenda for its geographical proximity and consolidated cultural and economic ties [1–9].

Since the mid-Nineties, the EU has started partnerships with the most MEDA-transitional economies following the "Barcellona Declaration" signed in 1995, by benefiting from the partial or full removal of customs duties on many industrial and agricultural products. As a result, MEDA-transitional economies are having several industries involved along the global value chains, such as: (i) agricultural and food; (ii) chemical, petrochemical, and mining; (iii) machinery and equipment; (iv) technology; and (v) service. However, the attractiveness of these countries remains

inferior due to some weaknesses in the governance climate and business environment [10,11].

In this paper, we intend to investigate with spatial-gravity models the intra-industry trade flow between a cluster of the main EU-advanced economies (Spain, France, Germany, Italy, and Greece)—the countries of Southern and Central Europe bordering the Mediterranean Sea, with significant interests in the basin and geographically neighboring to the MEDA ones—with the main MEDA-transitional economies by population, territorial extension, and economic size (Morocco, Algeria, Tunisia, Libya, Egypt, Israel, Jordan, Lebanon, Syria, and Turkey), by considering their cultural affinity and the effects of the following socio-economic and political imbalances: global recession, sovereign debt crisis, and "Arab Springs".

Therefore, our countries' cluster includes EU and MEDA economies that, while geographically neighboring and benefitting from the advantages of the free circulation of people, goods, and capital, can instead be really distant in terms of language, relationships, religion, behavior, and habits.

It is well known that the gravity equation is a "workhorse" in international trade studies [12–15], therefore, the following *research question* (*RQ*) has been posed.

What are the determinants of the intra-industry trade flow for a cluster of EU-advanced and MEDA-transitional economies, considering their attractiveness, the partnership agreements signed, the upheaval effects starting from the "global economic crisis" (2007–2008) followed by the "sovereign debt crisis" for EU-advanced economies (2009–2011), and the "Arab Springs" for MEDA-transitional economies (2011–2012)?

Our paper makes a novelty contribution to the literature on the determinants of cross-border international bilateral trade flows, connecting to recent empirical literature that has developed gravity equation and analyzed the various effects of multilateral push and pull determining variables [16–23].

Answering to research question, we are contributing to the academic and scientific debate by exploring these effects. To the best of our knowledge, at the current state-of-art of research there are no studies considering the MEDA countries' cluster in relation to the main EU economies using a spatial-gravity model for the analysis of the determining-factors of their trade flows and measuring in an original way the distances (physical) and the differences (cultural) across countries. In fact, very few studies analyzed the trade potential between EU-advanced economies and MEDA-transitional economies, also highlighting the countries' trade potential with reference to the Euro-Med agreements [24,25].

In other words, the use of the gravity equation entails the possibility of considering in the modelling the attractiveness between countries, together with other macroeconomic variables useful for explaining the intra-industry trade flow of goods and services. By utilizing a model for the spatial analysis of panel data, we are also able to insert and estimate the effects of a measure of the cultural affinity between countries as a proxy of the specific liability of foreignness [26–31]. This seems to us to be an advancement for research that has international trade as its object and refers specifically to EU- advanced and MEDA-transitional economies.

Global value chains include the production and cross-border distribution of goods and services by integrating various processes, from the acquisition of raw

materials to the delivery of finished products to consumers. In other words, global supply, production, and labor chains involve various stages of the production process: from product conception, to design and marketing, to after-sales services.

These global networks have significant impacts on most of the production systems of the countries involved. In other words, this global connection has contributed to the creation of complex, diversified, fragmented, and dynamic production and organizational systems [32]. Therefore, a globalized economy characterized by internationalized firms has allowed the removal of trade barriers, the diffusion of technology and innovation, the free movement of goods, capital, and people, ultimately fostering global economic development.

Although global value chains can be to lead by big multinational corporations, they can also incorporate small and medium-sized enterprises, which increasingly follow the large ones towards foreign markets. According to the World Bank [33], the growth of global value chains in Europe has occurred mainly in the machinery, consumer electronics, and transportation industries, while many countries in North Africa and the Middle East (MENA) are mainly involved in the supply of raw materials and intermediate goods processed in other global sites. As a result, our study focuses on intra-industry trade flows across different countries, rather than inter-industry trade flows, in light of this renewed interest for the global manifestations deriving from supply, production, and labor chains.

In particular, intra-industrial trade flows can arise for two reasons. The first concerns the demand side, because consumers demand differentiated products. The second concerns the supply side, because firms import and export intermediate products necessary for their production process. We must add that only the second type of trade flows is closely linked to global value chains, therefore in considering intra-industrial trade flows, we must specify that this link could be weak. However, our study specifically refers to “North-South” trade relations, therefore low-income economies may need consumer products to replace differentiated products. As a result, the demand-side motivation would fall, or in any case it would not be such as to invalidate the implications of our study about the intra-industrial trade flows in relation to global value chains.

Table 1. The status of agreements for the Euro-Med cooperation.

Country	Status	Date signed	Entry in force
Morocco	Signed	February 1996	March 2000
Algeria	Signed	April 2002	September 2005
Tunisia	Signed	July 1995	March 1998
Libya	Not-signed	Negotiations started in 2008	-
Egypt	Signed	June 2001	June 2004
Israel	Signed	November 1995	June 2000
Jordan	Signed	November 1997	May 2002
Lebanon	Signed	June 2002	April 2006
Syria	Not-signed	Negotiations started in 2008	-
Turkey	Signed	March 1995	December 1995

For instance, the cooperation between the EU and its Southern-Eastern neighboring partners is managed and established under the framework of the Euro-Med Association Agreements-EMAA (Customs Union Agreement-CUA, for Turkey), and many aspects concern trade. As shown in **Table 1**, nearly all countries have concluded association agreements with the EU, except for Libya and Syria.

The EU has opened its markets to MEDA long before the "Barcelona Declaration", gradually reducing tariffs for many industrialized products. This liberalization process has consisted of a gradual levying of tariffs and trade barriers for manufacturing products and then of a gradual liberalization for agricultural products and services. However, the Euro-Med agreements began even earlier, with Malta and Cyprus as signatory countries in the early Seventies. Starting from 1995, all other countries have begun their admission process. Libya acquired the status of observer and Syria had the treaty in the stage of ratification before the escalation of violence and war. The application of agreements had a new acceleration in the early Two-thousand, but the positions of the EU and MEDA countries have crystallized due to the recurring crises.

However, recently, the EU has fixed some new priorities in the Euro-Med Agenda [6]. The trade ministers of member countries and those of partner countries have requested to strengthen the trade ties across them and investments, since this is a crucial element for the socio-economic recovery in the region.

The paper has been organized as follows: (i) materials and methods; (ii) results and discussion; (iii) conclusions.

2. Materials and methods

2.1. Connections with the literature

Empirical research on international trade flows in the Euro-Med region has often produced findings that are divergent or contradictory [34–39], and we know the economic integration process that started in 1995 has been less effective than expected [40–43].

However, with the intensification of trade along the global value chains, characterized by increasingly complex and unbundling trade flows, as well as by higher cross-border investments and more mobility of knowledge-workers, transaction costs have reduced, also due to technological advances in communications [44,45]. In other words, developing countries that have better inserted themselves in the global value chains have had the important opportunity to improve their attractiveness by entering international markets [46]. The sophisticated interconnection of the manufacturing systems of the different economies at a global level has led the interdependence of the countries to increase remarkably [47].

The international fragmentation of production along the global value chains—which regards both trade in product/semi-finished product and foreign direct investment flows—impacts on within-country incomes through several ways: (i) the offshoring of low-value added tasks towards underdeveloped countries could entail a higher (or lower) remuneration of high-skilled workers in developed (or developing and emerging) countries, thus increasing income inequalities in advanced economies while reducing it in less developed ones [48,49]; (ii) this same offshoring of low-

value added tasks from capital-abundant economies to labor abundant ones entails a higher capital-output ratio in the former and reduction wages in developed countries, exactly to the extent that capital acts as a substitute for labor [50], nonetheless, to the extent that undeveloped countries are marked by a lower level of education and knowledge capital than developed ones, the value chain tasks offshored by the latter may result in high-skilled and capital-intensive activities for developing and emerging economies, finally increasing wage inequalities in both developed and underdeveloped countries [51–53]; (iii) the production along the global value chains is always more skill-based and capital-intensive than traditional trade [54], due to the higher level of capabilities required to perform given tasks with strong complementarities with other geographically fragmented value-adding activities [55], and also due to the more skill- and capital-intensive production techniques used by firms operating in global value chains than domestic firms [56]; (iv) trade and capital liberalization fosters the most mobile production factor, thus capital; (v) finally, the fragmentated nature of international production can be a threat for workers, weakening the bargaining power, reducing wages, and increasing inequalities in both developed and underdeveloped countries [57–59]. In conclusion, the fragmented production along the global value chains has prompted a hyper-specialization of world economies and trade towards specified value chain activities and tasks over others [60–68].

Trade integration of manufacturing systems along the global value chains has allowed the reduction of trade-related costs and facilitated investments and spillovers between overseas and local firms, ultimately improving the business environment [33]. However, several considerations have also emerged in the economic debate about the possibility that higher openness brings effective benefits to the real economy [69–74].

In other words, the globalization of markets can be both an opportunity and a threat for firms and for economic systems overall [75,76].

The inability to effectively govern this process is a cause for concern. In fact, the last thirty years of accelerated globalization are at the root of recent global economic and socio-political imbalances, whose global diffusion has been rapid [55,77–80]. Therefore, it is possible that the impact of these shocks on global trade has been amplified across global value chains. This has contributed to feeding the debate about the likely back-reshoring strategies of firms. However, recent crises such as the global pandemic and the Eastern European war can also have the effect of improving the resilience of systems, if these ones learn to adapt to new global competition, where the decision to remain global or national is important for decision-makers [81–87].

The countries' regulatory and cultural heterogeneity is also associated with an increase in the transaction costs of internationalized firms. The literature on the topic is evolving, but it can suffer from methodological issues [88–90].

We consider the governance climate and cultural affinity between countries both as proxies for the formal and informal rules and the liability of foreignness, respectively. In fact, the capture of non-observable aspects that can affect intra-industry trade flow, such as non-tariff barriers, has a damping effect and changes quantity and price.

The quality of trade policies and a favorable governance climate can accelerate the process of development in the MEDA-transitional economies, as well as the cluster formation of firms to attract foreign investments [91]. Effective governance is important both for growth in the long-term and for the resilience of a country's systems.

The Covid-19 pandemic and the conflict onset in Eastern Europe and Near Middle East are the other significant upheavals impacting on global economic perspectives [65,92,93]. As a result, we do not consider the current period in the analysis, and we limit ourselves to considering just shocks starting from the "global economic crisis" in 2007 up to the "Arab Springs".

Other important variables for the analysis are the middle-productivity of firms by industry, exchange rates, recorded remittances of migrant workers, stock market capitalization, openness, and tariff barriers. For instance, these and other macroeconomic variables can be considered by the business decision-makers when they must decide the offshoring of the manufacturing process [94,95]. In **Table 2**, we show descriptive statistics and proxies for the variables used.

Table 2. Descriptive statistics of variables, panel data, 1990–2020, log-values.

Variables	Statistics			Proxy and main sources
	μ	σ_w	σ_b	
Trade Flow Primary	12.920	0.854	1.421	Total trade flow from EU-country accounting (Export + Import) USD-thousands (UNCTAD-UN)
Trade Flow Labor intensive	11.520	0.690	1.909	
Trade Flow Low-tech	10.879	0.895	1.626	
Trade Flow Medium-tech	12.114	0.814	1.992	
Trade Flow High-tech	12.008	0.672	1.592	
Trade Flow Services (*)	12.972	0.390	1.339	
Population-MEDA	9.664	0.188	1.012	Number of people as a proxy of market potential Unit-thousands (UNCTAD-UN)
Population-EU	10.660	0.043	0.722	
Per-capita GDP-MEDA	9.157	0.378	0.565	Per-capita GDP at PPP as a proxy of economic development USD (WDI-WB)
Per-capita GDP-EU	10.280	0.281	0.159	
Openness-MEDA	4.218	0.216	0.272	Openness degree by country as a proxy of international integration Trade of goods and services as percentage of GDP (WDI-WB)
Openness-EU	3.989	0.203	0.101	
Tariff Barriers-MEDA Primary	2.803	0.715	0.467	Tariff barriers by industry as a proxy of resistances to trade in percentage (reconstruction on WDI-WB)
Tariff Barriers-EU Primary	1.913	0.239	0.000	
Tariff Barriers-MEDA Manufacturing	2.326	0.720	0.599	
Tariff Barriers-EU Manufacturing	0.803	0.370	0.000	

Table 2. (*Continued*).

Variables	Statistics			Proxy and main sources
	μ	σ_w	σ_b	
Middle Productivity-MEDA Primary	4.271	0.892	1.353	Middle productivity by industry for exported dollars as a proxy of the value added along global value chains (Value added for worker by industry x Export share of *ij*-country) USD (elaboration on WDI-WB, UNCTAD-UN)
Middle Productivity-EU Primary	8.658	0.558	0.422	
Middle Productivity-MEDA Labor intensive	3.193	0.590	2.104	
Middle Productivity-EU Labor intensive	8.398	0.464	0.745	
Middle Productivity-MEDA Low-tech	1.959	0.725	1.529	
Middle Productivity-EU Low-tech	8.064	0.649	0.496	
Middle Productivity-MEDA Medium-tech	2.693	0.724	2.068	
Middle Productivity-EU Medium-tech	9.331	0.501	0.936	
Middle Productivity-MEDA High-tech	3.450	0.755	1.605	
Middle Productivity-EU High-tech	9.084	0.454	0.691	
Middle Productivity-MEDA Services (*)	6.132	0.573	1.593	
Middle Productivity-EU Services (*)	7.415	0.425	1.023	
Remittance Inflow-MEDA	0.613	0.307	0.415	Share as a proxy for potential of target market (in)/labor market (out) in percentage on world (elaboration on WDI-WB)
Remittance Outflow-EU	1.121	0.267	0.700	
Stock Market Capitalization-MEDA	2.500	0.623	1.452	Market capitalization of listed companies as a proxy of the financial depth in percentage of GDP (WDI-WB)
Stock Market Capitalization-EU	3.694	0.541	0.334	
Governance Climate-MEDA	3.636	0.211	0.328	Composite index of governance dimensions by Kaufmann et al. [96] in percentage (elaboration on WGI-WB)
Governance Climate-EU	4.240	0.048	0.099	
Exchange Rate LCU-USD	0.429	0.560	0.465	Exchange rate as a proxy of monetary influences on the trade USD (UNCTAD-UN)
Exchange Rate EUR-USD	0.752	0.083	0.000	
Euro-Med Agreements Effect	0.494	0.430	0.269	Dummy variable: “0” for “pre-agreements”; “1” for “post agreements”
Socio-economic and Political Turmoil Effect	0.387	0.495	0.000	Dummy variable: “0” for “pre-crises”; “1” for “post crises”

Note: (*) time-series 2005–2020.

2.2. Gravity equation

The analysis of international trade flow that uses the gravity equation adapts the law of universal gravitation discovered by Newton in 1687 for economic applications. In other words, the trade between economies can be represented on the basis of a positive force, such as a variable representative of their mass as the population, and a variable that acts as a force of resistance as the distance. The gravity equation has a strong theoretical foundation in models for studying cross-country trade flows [15,97–101]. However, the attractiveness index is often a source of confusion among researchers due to the difficulties in its formulation [102–104].

We have innovated by building an attractiveness index $A_{ij,t}$ way to be included in the models to analyze intra-industrial trade flows, as follows Equation (1):

$$A_{ij,t} = \frac{POP_i\, POP_j}{\left(GDPper_i - GDPper_j\right)^2}\ [G] \tag{1}$$

Since the model with the gravity equation has its roots in physics, the trade flow depends both on the potential market of countries—population, and their distance—which we have here considered in terms of income. We have omitted the original gravitational constant [G]. Although we can think it is the fixed value given by the cultural distance between countries to remain in line with the law of universal gravitation by Newton. As it is a multiplicative constant that remains fixed in the years, its effect on the result would only be the value transposition.

The attractiveness index thus formulated allows us to consider international trade between countries as directly proportional to their mass—push factor—and inversely proportional to their development-gap measured by per-capita GDP—pull factor. In other words, we assume that countries with similar incomes can trade more with each other by also having similar manufacturing systems and consumer needs.

Often, gravity equation models consider space instead, by using a physical distance variable and other variables affecting the trade flow. In these models, additional effects are spillovers from the neighboring economies [105,106]. For instance, effects deriving from the presence of migrants in the labor markets or effects of the middle productivity of the industry can be added to models [107–109].

Empirical studies on international trade also consider the attractiveness of neighboring countries—the third country effect [110]. In fact, trade between countries also depends on the trading costs in neighboring countries. In our study, if pairs of countries that are contiguous to culturally more similar and competitive countries see their trade flow decrease, it is likely that it will move towards the more culturally similar countries. The use of these and other explanatory variables is therefore not unusual in empirical studies on international trade [111].

Therefore, we think there are some criticalities in the use of physical distance, since it is a weak proxy to catch resistance effect in the gravity equation as has been shown [112,113]. In other words, the geographical distance can be affected by a certain degree of mismeasurement, at instance, in the selection of the barycentric value—which may not reflect the true distance between the main economic centers on which focus on the most trade [114]. Furthermore, we think with globalization, geographical distance has acquired an increasingly marginal role in the perception of

investors and managers, due to the emergence of greater interdependence between economies, not only of an economic type, but also social, cultural, political, technological, and now even in wellbeing, although, it is undeniable in trade the existence of transaction costs [55,82,115–117].

For these reasons, we prefer development as a measure of the distance between countries, which we have precisely obtained as the difference between the per-capita GDP at PPP [118]. The international studies use purchasing power parity-PPP as it is better suited to the comparative analysis of countries. The PPP form measures the economic income of the people independently of the domestic currencies. It is the cost of a given set of goods for each country divided by the cost of the same set of goods for the United States.

In our gravity equation there is not a G-constant as in the original. On the contrary, considering it would mean having a "gravitational inconstant", since it would consider a set of time-varying factors with respect to the original gravity equation. As a result, by modifying the gravity equation as above, we can avoid many errors in the estimation process. However, ignoring how to treat the G-constant in gravity equation can be a source of bias in the empirical literature on the gravity equation.

2.3. Spatial model

For econometric specifications, we adopt spatial models on panel data, keeping in mind the heterogeneity characterizing our cluster of advanced and transitional economies, by implementing fixed-effects models considering the fixed effect for the pairs of countries [119–121].

We estimate this model with the fixed-effects estimator rather than the GMM one, which can present several problems during the estimation process. The fixed-effects model allows us to control for unobserved heterogeneity by differencing group-specific fixed effects [122]. This type of models avoids to us from incurring into potential mis-specifications due to the nuisance issue of selecting valid instruments in the GMM framework. The fixed-effects estimator allows the unobserved time-invariant individual heterogeneity to be correlated with the time-varying regressors [123]. This allows to get unbiased coefficient estimates, even if there are unobserved confounding effects that ca be related with the regressors [124], provided that time-invariant variables must not have time-varying effects, which, otherwise, would interfere in the process of coefficient estimation, leading to misinterpretations of the results [125].

In fact, the fixed-effects estimator performs well in panel data with sufficiently large *T*, because time-demeaning captures within-group variations effectively. On the other hand, inappropriately applying GMM estimators to a panel dataset with too large *T* can produce inconsistent estimates.

However, fixed-effects estimator does not explicitly handle lagged dependent variables, but this may not be an issue when the panel dataset is not too short.

Furthermore, the correlation between the variables is not a problem in our dataset **(Figure A1** in the Appendix). The fixed-effects estimator consent to us of avoiding the issue of selecting the order of lags needed for adequate dynamic

adjustment. Finally, fixed-effect estimator does not require assumptions about the serial correlation of the error terms.

Culture is a multifaceted concept that is not easily reducible. It is relatively stable over time, defining society and the economy through consolidated beliefs and habits [126]. In other words, it is what unites a group of people in each place and time, and it can modify only slowly in the years and for generational passing [127].

Therefore, culture can be considered as the dominant orientation into the individual minds, directing people's attitudes, inclinations, predispositions, preferences, judgments, expectations, ways of thinking, and finally, behaviors.

We have calculated the cultural affinity by applying the non-compensatory procedure of Mazziotta and Pareto [128] to the differences between the Hofstede indices of each country. Therefore, cultural affinity is a measure of cultural distance (dissimilarity) of country systems.

With this procedure, the standard deviation is used as a correction term to account for the heterogeneity of the indices that comprise the aggregate indicator. This procedure is simple and easy to implement, and it considers the heterogeneity of the indices that compose it.

The effects of culture underlying a population have received more attention in the economic literature in the last decade, and have been considered in different ways in international business studies [129–143]. However, the liability of foreignness paradox suggests that a lower perceived psychic distance from business decision-makers may represent a difficulty when affinity prevents management from learning about socio-cultural differences [144]. Therefore, this distance reflects the differences existing in the countries' institutional and business environment.

The empirical evidence supporting the point of view that culture relevantly impacts on economic outcomes and trade flows [145–149]. More precisely, it is the social capital, rooted in the results of historical experiences that each population has experienced, determines the cultural profile of each country, and may have a role in explaining the attitude applied to economic issues [150]. Based on recent studies, we know that it is important to include for each country the interdependence between the traits that define the culture [151,152]. These studies provide evidence about the need for a multi-dimensional interpretation of the culture concept. In our study, we have thus considered more cultural traits to define cultural affinity by obtaining an explanatory benefit [153,154]. The cultural affinity can be considered as an expression of similarity (dissimilarity) among people belonging to different countries and its idea can be traced in numerous studies [155–157]. However, Shenkar [158,159] has criticized the concept of the cultural distance, since if it is approached without considering the methodological and computation issues, the results can be misleading. The composite indices that do not adequately address heterogeneity can suffer from a compensatory effect between the indicators that compose them. Some of them may have a higher (or lower) impact on the final measurement, while others may have no-impact.

Several studies implementing the gravity equation have attempted to resolve the issue of measuring distance between countries considering the globalization effects, but with mixed success [160–166]. This means that the globalization effects can be reflected in the travel of intermediate goods and intra-industry trade flows [167]. In

fact, intra-industry trade can promote exports, increase R&D investment, positively affect innovation, ultimately improve productivity, and promote the quality of export products [68,168–171]. As a result, the global value chains can be established to firstly reinforce trade with neighboring countries, very often employing a "hub-and-spoke" model, as may have been the case between EU-advanced economies and MEDA-transitional economies [172–174].

We have used cultural affinity to build the *w*-matrix of contiguity, as it is a proxy for the liability of foreignness between countries perceived by business decision-makers. With this variable, we intend to catch the effects that may not be observed directly but that influence trade flows, such as the business environment.

The variables in the models will have a positive or negative effect on the intra-industry trade flow of goods and services. Furthermore, other factors can influence the attractiveness between countries, and they should be considered in the gravity equation, for instance, the governance climate, financial, economic, and industrial, features.

We also include the dependent variable with one order of lags as a dynamic component in models to account for the potential effect of path-history dependency on trade flow [175]. With this variable, we catch the persistence effect between the economies that have traded in the last time-unit, and they want to keep active trade relations [176–178].

In other words, internationalized firms have higher trade flows abroad than competitors and are more productive or innovative [171,179–182]. We also insert dummies to capture the effect of Euro-Med agreements, as well as those from the upheavals.

We have estimated SAR-AR models that combine the specification of Spatial Auto-Regressive (SAR) with the Spatial Error-Mechanism (SEM) through a feasible estimation in two steps, ensuring consistency in estimates when the estimates obtained with the fixed-effects estimator in the first stage are consistent. In other words, we are not interested in directly investigating spatial dependence in covariates using the Spatial Durbin-Model (SDM). The parameters are consistent, regardless of whether the initial model estimates in the first stage also are [183].

We model the gravity equation through the spatial AR-autoregressive component of the SAR model. When all other localization factors are considered, it represents a pre-existing equilibrium situation derived from the assumption that variation in trade flow between pairs of countries depends on variation in trade flow between pairs of neighboring countries.

The theory of localization factors identifies spatial spillover changes of a country as correlated to those in neighboring countries. Changes in localization factors, because of spillovers, determine a change in the trade flow of countries, causing a change in the trade flow of neighboring countries.

We also include the autoregressive component of the SEM model's errors in the models to account for the presence of spatial dependence for any omitted variables.

As a result, we incorporated the residuals obtained in the first step, weighted with the w-matrix, into the models to account for the unobserved component. We have used the open-source statistical software gretl to estimate fixed-effects models

under the symmetry hypothesis (SFE) and with the least-squares dummy variables procedure (L-SDV).

Economic theory and mathematical-statistical formalization are combined in spatial econometrics. Its main axioms are [184]: (i) the spatial interdependence between countries; (ii) asymmetrical spatial relations; (iii) the identification of the spatial contiguity factor, whereby the intra-industry trade of a pair of countries is conditioned by that one of the pairs of neighboring countries; (iv) the explicit modelling of the spatial dependence when a country is related to the others based on the contiguity factor selected.

The concept of spatial dependence differs from the concept of spatial heterogeneity, which instead refers to the diversity of countries in terms of their propensity to trade or their different endowments of resources, capital, and technology, which are captured through individual effects or for pairs of countries.

There are at least two econometric reasons for using autoregressive models accounting for spatial dependence. The first reason concerns spatial dependence considered as a long-run equilibrium of an underlying space-time process. This leads to employing a SAR model containing the lag of the dependent variable among the explanatory variables. The second reason concerns omitted variables that may present spatial dependence or represent a random shock. As a result, a SEM model emerges when the omitted variables are not correlated with the explanatory variables present in the model.

However, the above reason can be complementary, thus can be considered jointly, as well as can also be the components of both SAR and SEM models. The joint model is called SAR-AR and considers the lag both in the dependent variable and the error component.

Another question concerns the contiguity *w*-matrix. This issue refers to whether the same *w*-matrix used for the lag in the dependent variable can also be used in the lag of the error terms. However, the analyses did not provide any motivation in this regard, therefore we have chosen an undifferentiated contiguity *w*-matrix, without prejudice to the construction method reported below.

Countries are thus placed in the space according to the order indicated by the *w*-matrix of contiguity. However, there are several ways to construct the contiguity *w*-matrix, which must be chosen according to the type of analysis. We can proceed by standardizing the matrix, since each row adds up to one. However, this procedure has the disadvantage of losing the symmetry between the couplings. In our analysis, we have constructed a contiguity *w*-matrix of order (n x m) using the radial criterion and without standardization. Countries have been ordered according to their decreasing cultural proximity to a given country, which varies within the 0-1 interval (**Table 3**).

Finally, models include a dependent variable with an autoregressive component with one order of lags and two specific components related to cultural affinity. In this way, we can keep under control the unobserved heteroskedasticity that characterizes a heterogeneous panel such as ours and in which we admit into models a weak endogeneity of the dependent variable due to its own presence with one order of lags inserted in the right side of regression equations.

Table 3. The *w*-matrix of contiguity using cultural affinity between countries.

	France		**Germany**		**Greece**		**Italy**		**Spain**	
1	Turkey	0.255	Turkey	0.280	Turkey	0.113	Turkey	0.249	Turkey	0.094
2	Syria	0.269	Israel	0.282	Tunisia	0.181	Israel	0.251	Tunisia	0.147
3	Algeria	0.273	Tunisia	0.379	Libya	0.225	Syria	0.294	Algeria	0.178
4	Libya	0.275	Syria	0.395	Algeria	0.226	Morocco	0.307	Libya	0.185
5	Tunisia	0.279	Algeria	0.412	Jordan	0.245	Tunisia	0.308	Syria	0.192
6	Morocco	0.316	Libya	0.426	Morocco	0.252	Libya	0.309	Morocco	0.213
7	Lebanon	0.342	Morocco	0.437	Syria	0.261	Lebanon	0.336	Jordan	0.228
8	Israel	0.360	Lebanon	0.450	Israel	0.286	Jordan	0.342	Lebanon	0.267
9	Jordan	0.373	Jordan	0.462	Egypt	0.316	Algeria	0.342	Israel	0.307
10	Egypt	0.465	Egypt	0.477	Lebanon	0.329	Egypt	0.400	Egypt	0.320

The two spatial components that refer to the cultural affinity in models capture effects that depend precisely on the culture and that are not easily observable but that influence the intra-industry trade flow. In this way, we can treat culture exactly for what it is (a fixed value), by resulting in a long-term space-time equilibrium value.

In other words, the SAR-AR model is the most suitable for inserting the cultural distance between the explanatory variables. We have compared the adequacy of the model at the second step with the model at the first step using the log-likelihood ratio test.

Manufacturing industries have been unbundled according to their degree of technological intensity, provided by UNCTAD following Pavitt [185]. The SAR-AR model has then been formulated as follows Equation (2):

$$Y_{ij,t} = \tau + \psi Y_{ij,t-1} + \delta X_{i,t} + \vartheta X_{j,t} + \varphi X_{ij,t} + \gamma \sum_{hk}^{mn} W_{ij,hk}\, Y_{hk,t-1} + \lambda \sum_{hk}^{mn} W_{ij,hk}\, U_{hk,t} + E_{ij,t} \quad (2)$$

where: τ is time-trend effect as a proxy of development-path of countries, $Y_{ij,t}$ is the dependent variable with one order of lags that captures the persistence effect on trade flows, X_i and X_j are vectors for a set of country specific variables—including dummy variables that capture the upheaval effects, X_{ij} is a vector for a set of specific variables for pairs of countries—including dummy variables that capture effects of partnership agreements and joint fixed-effects, $W_{ij,hk}$ is a vector for values of the *w*-matrix of contiguity, $U_{hk,t}$ is a vector of error terms in the first SAR-regression, and $E_{ij,t}$ is a vector of error terms of the regression. Finally, indexes hk indices identify pairs of neighboring countries in increasing order within each cultural distance group.

Importantly, according to Baldwin and Taglioni [186] the multilateral resistance factor, defined as "gravitational un-constant" error, which occurs in the error term and proportionally in other estimates, is the gold-medal bias. Therefore, these authors recommend using time-varying and time-invariant country-pair dummy

variables together to avoid this type of bias. In summary, time-invariant country-pair dummy variables can only eliminate part of the gold-medal bias. They are superior to country-dummy variables in panel data analysis, allowing one to capture policy effects occurring when there is significant time variation in the policies underlying the impact of the variables being estimated. However, the inclusion of country-pair dummies also means that no time-invariant parameters can be estimated, such as distance between countries—which is not an issue here, because the distance measure adopted in the attractiveness index is not physical or geographical.

Silver-medal bias is also avoided because models are estimated for total trade flows. Bronze-medal bias is also avoided by using the PPP for the per-capita GDP in computing the mass effect.

Finally, we use the time-trend that controls for technical progress and considers idiosyncratic shocks of the time-varying variables, with the advantage of avoiding the nuisance proliferation of time dummies.

In conclusion, our theoretical framework makes the estimates in our models consistent in theory and robust in the estimation methodology adopted. Trade in similar goods and services within the same industry is the most recognizable feature of the current globalization phase and trading task along global value chains, particularly between advanced and emerging economies, which is realized in repeated trade relationships, especially between countries that already traded in the past [187].

Traditional trade theories focus primarily on international trade, while have difficulty to fully explaining intra-industry trade, particularly between countries with high differences in economic development. Therefore, spatial models incorporating geographical heterogeneity are particularly useful to studying intra-industry trade flows across heterogeneous economies [188,189].

3. Results and discussion

Any regression involving a time series can suffer from autocorrelation. This makes the test on the significance of coefficients less powerful. We have then tested the existence of an issue of potential serial-autocorrelation between variables in **Table 2** of the panel-data by industry for the null-hypothesis of non-correlation. On average, we reject the null-hypothesis for $\alpha = 0.05$, and thus the correlation between variables is significant. The presence of a non-negligible statistical association between variables poses an issue in the empirical estimation of models, which we resolve using robust standard errors.

We used Arellano's [190] robust standard errors for panel data to account for the heteroskedasticity and autocorrelation of variables. We have checked the correct specification of the models with the Welch-F and Hausman tests (**Table 4**). In other words, due to the presence of correlation, the estimate using the least-squares method would be distorted. Besides, the introduction of the lagged dependent variable among the regressors causes further bias.

Despite their relatively low values, the coefficients of the two spatial components within the models demonstrate the importance of fully accounting for the effects of cultural affinity in the analysis of intra-industry trade flow between

countries, as demonstrated by the LR-tests on the first and second step models. The LR-test determines whether we were able to significantly extend the SAR model with the spatial component of the SEM model on the error term.

We do not estimate the reduced models since we want to estimate the effects of all variables inserted in them that we think are necessary for the accuracy of the analysis and the correct specification of the gravity equation. Therefore, we have followed an approach that moves from the specific to the general. We justify this choice with the fact that we are interested in estimating the effect of these variables, this being an innovation in international trade analyses that recur to spatial-gravity models.

However, we must be careful in explaining the effects of cultural affinity, as this is specific to pairs of countries. The contiguous countries can have a lower cultural distance due to common historical-political-linguistic factors that can affect them, for instance, the colonial past, also considering the upheavals affecting trade. Furthermore, the effect measured by cultural affinity also considers the possibility that customers and suppliers may have more informal and personal contacts based on mutual trust in the search for the best business opportunities.

We have found that the cultural affinity effect is negative for intra-industry trade with the lowest technological content and value added—primary, labor, and low-tech intensive—which then concerns the most trade between EU-advanced and MEDA-transitional economies in the cluster.

The average effect decrease of cultural affinity is about −0.07 for these three industries, and it is only significant in the primary. If nothing else, this one is most important for the supply of inputs in the value chain of firms. While, in the remaining three industries—those ones less affected by the value chains—we have found that the cultural affinity effect on trade is positive and non-significant. There is, on average, a decrease of about 0.01 in the cultural affinity.

This one suggests to us that cultural affinity—which is little or almost nothing—matters in the trade between EU-advanced and MEDA-transitional economies in the cluster for these industries. When cultural affinity increases, its effect is negative and significant. There are then differences, albeit minor ones, between countries in their tolerance for risk and ambiguity that are not directly observed, which can increase exporters' transaction costs and negatively affect trade flows between countries.

Conversely, smaller negative—or even positive—effects associated with an increase in cultural affinity, if non-significant, can be indicative of the existence of an acceptable trade-off in the mutual country risk assessment. In other words, we have the effect of non-directly observable costs related to a dynamic adaptation to the business environment of exporters, and the results of our models are in line with this consideration. The presence of these hidden costs can be justified by the existence of a concave, non-monotonous relationship between cultural affinity and intra-industry trade flow [30,129].

We have replicated the models on the trade flow of each industry, almost always finding the same significant variables. We have found a significant persistence effect on intra-industry trade flow measured by the dependent variable with one order of lags—the highest in the labor-intensity industry—as well as the

effect of middle productivity of firms in both groups of countries, as well as variables for socioeconomic and financial development.

Non-significant but noteworthy variables are in- and out-flows of worker remittances; outflows are significant only in intra-industry trade in low-tech, where most of the workers abroad from these countries are likely to be located—the dummy capturing both the Euro-Med agreements effect and the upheaval effects. However, this latter is significant in the service and low-tech industries, with a net positive impact.

The negative impact of the EU-advanced economies' governance climate on all intra-industry trade is intriguing. Instead, one of MEDA-transitional economies is positive, but it is significant only in the intra-industry trade of technological manufacturing and negative in the trade of services. Signs of the two indicators seen together are almost always discordant, in the sense that, if it is reasonable to expect a positive effect on the indicator of the governance climate of MEDA-transitional economies—since they have higher imbalances, it is not equally reasonable to expect a negative effect on EU-advanced economies. Surprisingly, this one indicates that improvements in their political and regulatory framework are detrimental to international trade flow with the MEDA-transitional economies.

Also interesting is the effect of remittances from migrant workers that depend on migration processes, as these ones can stimulate international trade and development [191]. The presence of migrant workers has the effect of increasing the aggregate demand of countries by expanding the domestic market, as they seek products imported from the country of origin. Therefore, trade flows between countries increase if migration has a positive impact on the country's competitiveness. Moreover, the presence of migrant workers can also contribute to reducing cultural differences between countries and, ultimately, increasing the skills of workers [192,193]. In other words, remittances may work towards supporting the economic growth of the target country.

We also find that the explanatory variables of the gravity equation, population, and per-capita GDP of MEDA-transitional economies, are significant in all industries with high technological intensity. The main theories argue that the GDP mass variables should have coefficients of unity, however, other theories explain why they can deviate from this value [186]. The GDPs are often corrected for the destination country's expenditure on tradable goods and the origin country's production of tradable goods, biasing the economic mass coefficients towards zero.

First, we have considered the per-capita GDP, so that the attractiveness index denominator is coherent with the numerator. Second, the mass effect in our index is given by the product of the populations of the respective countries, therefore the coefficients of the variables can be higher. Concluding, in our study the bias on the magnitude of GDP coefficients is not questionable compared to other studies [194–197].

Tariff barriers are significant in MEDA-transitional economies, with a negative sign only in primary and high-tech industries. However, the interpolation methodology used to reconstruct otherwise fragmented time-series may have an impact on this evidence. The time trend has always been found to be significant as a

proxy for a country's development path, but with a negative sign, and this may be due to the delay in the development of MEDA-transitional economies.

Stock market capitalization and exchange rate are also significant. Except in services, the market capitalization of MEDA-transitional economies is always significant and negative. This indicates how the greater financial depth of their markets depresses the trade flow of commodities and goods with EU-advanced economies, which instead has often been linked to development and increased trade. On the contrary, the market capitalization of the main EU-advanced economies is not always significant and almost always has a negative sign. In the former case, however, it has a positive sign and is the strongest. This can be due to the increased need for raw materials from EU-advanced economies that supply them from MEDA-transitional economies rich in raw and natural resources.

Exchange rates then indicate how a revaluation of domestic currencies against the international currency for trading (the US dollar) almost always has a significant and negative impact on the intra-industry flow. A stronger Euro appears to support only primary sector trade, whereas stronger currencies in MEDA-transitional economies appear to support service sector trade.

In conclusion, our results show a good fit of the models to the intra-industry trade flow, by confirming the importance of variables chosen to extend the gravity equation, with R-squared values above 85%, and by confirming the spatial dependence is significant. This one ultimately motivates the choice of the SAR-AR model, by confirming the theory of spillovers, locational factors, and the effect of migratory flows and persistence on trade for the cluster of the main EU-advanced economies and MEDA-transitional economies.

Finally, we show *p*-values from the Welch-F and Hausman tests. A low *p*-value by the Welch-F test counts against the null-hypothesis that the pooled model is adequate to support the fixed-effects model, as does a low *p*-value by the Hausman test, which rejects the null-hypothesis that the random-effects model is adequate with respect to the fixed-effects model. In this way, we have two-way confirmation of the adequacy of the model chosen.

Table 4. Models estimated by industry, 1990–2020.

	Primary			**Manufacturing**											**Services** [1]		
				Labor intensive			***Low-tech intensive***			***Medium-tech intensive***			***High-tech intensive***					
	Trade Flow																	
	Coeff.	*Std. Err.*		*Coeff.*	*Std. Err.*		*Coeff.*	*Std. Err.*		*Coeff.*	*Std. Err.*		*Coeff.*	*Std. Err.*		*Coeff.*	*Std. Err.*	
Trade Flow (t−1)	0.425	0.041	***	0.576	0.051	***	0.329	0.033	***	0.479	0.047	***	0.399	0.051	***	0.294	0.027	***
Population-MEDA	0.823	0.176	***	0.310	0.132	**	0.654	0.266	**	0.432	0.207	**	0.521	0.169	***	1.500	0.344	***
Population-EU	0.548	0.498		0.373	0.484		1.428	0.620	**	0.941	0.526	*	0.894	0.437	**	−0.651	0.789	
Per-capita GDP-MEDA	0.303	0.067	***	0.254	0.065	***	0.188	0.086	**	0.202	0.083	**	0.275	0.066	***	0.348	0.069	***
Per-capita GDP-EU	−0.221	0.282		0.034	0.216		0.043	0.389		−0.059	0.248		−0.004	0.245		0.012	0.169	
Openness-MEDA	0.823	0.176	***	0.450	0.067	***	0.599	0.103	***	0.516	0.089	***	0.447	0.085	***	0.906	0.096	***
Openness-EU	0.548	0.498		0.578	0.123	***	0.905	0.182	***	0.626	0.121	***	0.499	0.126	***	0.349	0.119	***
Tariff Barriers-MEDA	−0.150	0.024	***	−0.032	0.032		−0.045	0.029		−0.021	0.026		−0.068	0.029	**			
Tariff Barriers-EU	0.046	0.029		0.031	0.035		−0.010	0.043		0.002	0.047		0.039	0.047				
Middle Productivity-MEDA	0.286	0.037	***	0.177	0.042	***	0.155	0.029	***	0.102	0.029	***	0.169	0.040	***	0.172	0.029	***
Middle Productivity-EU	0.289	0.043	***	0.346	0.066	***	0.586	0.067	***	0.431	0.044	***	0.260	0.057	***	0.459	0.035	***
Remittance Inflow-MEDA	−0.072	0.057		−0.019	0.040		−0.049	0.066		−0.049	0.045		−0.023	0.051		0.333	0.101	***
Remittance Outflow-EU	0.028	0.057		0.014	0.045		0.159	0.067	**	0.059	0.048		0.031	0.044		-0.016	0.032	
Stock Market Capitalization-MEDA	−0.117	0.025	***	−0.047	0.017	***	−0.101	0.025	***	−0.087	0.023	***	−0.059	0.017	***	0.058	0.035	
Stock Market Capitalization-EU	0.066	0.028	**	−0.047	0.021	**	−0.008	0.035		−0.061	0.019	***	−0.042	0.026		−0.057	0.033	*
Governance Climate-MEDA	0.013	0.137		0.196	0.121		0.618	0.145	***	0.421	0.137	***	0.240	0.135	*	−0.186	0.073	**
Governance Climate-EU	−2.168	0.518	***	−1.393	0.455	***	−2.360	0.441	***	−1.689	0.428	***	−1.060	0.420	**	−0.632	0.369	*
Exchange Rate LCU-USD	−0.075	0.028	***	−0.046	0.018	**	−0.110	0.045	**	−0.065	0.028	**	−0.063	0.021	***	0.730	0.210	***
Exchange Rate EUR-USD	0.096	0.226		−0.377	0.184	**	−0.851	0.242	***	−0.506	0.183	***	−0.259	0.221		−0.971	0.273	***
Euro-Med Agreements Effect	−0.005	0.041		0.054	0.041		0.064	0.044		0.040	0.036		0.058	0.036				
Socio-economic and Political Turmoil Effect	−0.015	0.045		0.030	0.038		0.089	0.045	*	0.019	0.047		−0.004	0.043		0.066	0.025	**

Table 4. (*Continued*).

	Primary			**Manufacturing**														**Services** [1]		
				Labor intensive			***Low-tech intensive***			***Medium-tech intensive***			***High-tech intensive***							
	Trade Flow																			
Cultural Affinity Effect (γ)	−0.113	0.045	**	−0.075	0.045		−0.035	0.041		0.009	0.033		0.005	0.044		0.018	0.059	
Cultural Affinity Bias (λ)	0.156	0.041	***	0.117	0.061	*	0.080	0.048	*	0.139	0.060	**	0.140	0.042	***	0.208	0.084	**
MEDA-EU Country Effect	yes (-)			yes (-)			yes (-)		**	yes (-)			yes (-)		**	yes (-)		
Time-trend Effect	yes (-)		***	yes (-)		**	yes (-)		***	yes (-)		**	yes (-)		**	yes (-)		**
Standard Error	0.294			0.241			0.335			0.273			0.250			0.149		
F-Test (*p*-value)	(0.000)			(0.000)			(0.000)			(0.000)			(0.000)			(0.000)		
Observations (%)	1500 (97)			1500 (97)			1500 (97)			1500 (97)			1500 (97)			1500 (97)		
Non-Observation (%)	50 (3)			50 (3)			50 (3)			50 (3)			50 (3)			50 (3)		
R-square	0.881			0.877			0.858			0.885			0.857			0.858		
Welch-F Test (*p*-value)	(0.000)			(0.000)			(0.000)			(0.000)			(0.000)			(0.000)		
Hausman Test (*p*-value)	(0.000)			(0.000)			(0.000)			(0.000)			(0.000)			(0.000)		
LR-Test on *(λ)* (*p*-value)	(0.000)			(0.003)			(0.043)			(0.000)			(0.000)			(0.000)		

Note: (***) significance for α = 0.01; (**) significance for α = 0.05; (*) significance for α = 0.10. [1] 2005−2020.

4. Conclusion

4.1. Contribution and concluding remarks

Our findings concern intra-industry trade flow, and they can be useful for evaluations of managers and policymakers. Indeed, the choices range from considering the liability of foreignness to the formal and informal rules resulting from country heterogeneity, which is typically a barrier to economic activity [104], which we consider in models with the variable of cultural affinity and governance climate.

The liability of foreignness has taken on increasingly sophisticated connotations, where in addition to geo-spatial elements, other aspects have also been considered [198,199]. For instance, other non-spatial and proximity factors such as cultural, social, and regulatory can be added to geographical distance and transport costs [200].

On the other hand, the liability of foreignness perceived by economic agents may differ significantly across MEDA-transitional economies. This means there can be a lot of heterogeneity between and within them, not only in cultural terms but also in terms of institutional and business environments and resource endowment.

The economic and political upheavals of the last two decades have had a greater impact on the socioeconomic systems of MEDA-transitional economies. In some of these, weak industrial systems have arisen based on the wide availability of cheap labor—as in the extractive and mining industries—a limited tertiary sector, with the involvement of the public sector and multinationals [201–203].

Due to globalization, which has accelerated the spread of crises, investors may have preferred to divest from some industries to invest in others, otherwise, they can prefer to transfer their own firms to countries where governance is perceived as more reliable or that are perceived as more culturally neighboring [117,170,204].

In other words, firms previously located in MEDA-transitional economies fled when the economies became unstable, or they may have preferred to incentivize short-run market-relations [31,180,205,206]. For example, to reduce uncertainty in the decision-making process, focus on the low specificity of resources invested and on frequent relationships.

This means trading with partners requires recombination of available resources, but it also requires more managerial capabilities when firms are completely outside the host business environment. As a result, international expansion will be slower, with cultural differences between countries acting as a hidden cost of dynamic adaptation [30,129].

Finally, as a corollary to the analysis, we want to see if there are any spillover effects from market volatility in EU-advanced economies and MEDA-transitional economies that can affect intra-industry trade flow. In fact, we have found evidence to support this hypothesis in all countries and for all industries analyzed (**Table A1** in the Appendix). This evidence supports the hypothesis that two upheaval periods have caused negative “external spillover-effects” on the intra-industry trade flow between the EU-advanced and MEDA-transitional economies of the cluster, by also impacting on the probability of attractiveness, except for some countries—Spain,

Italy, and Greece, as well as Turkey, which has collapsed since 2010 (**Table A2** in the Appendix). In other words, Turkey is the most important of the markets of the Near Middle-East, whereas Spain, Italy, and Greece are European countries that can have the most interests in the Mediterranean area. Furthermore, the highest likelihood of attractiveness occurred in the Nineties and continued into the first half of the Two-thousands. Following this one, the MEDA-transitional economies with the highest likelihood of attractiveness were: Israel for Spain and France, Libya for Spain, France, Germany, and Italy—the latter also with Lebanon—Greece, like Italy, for all periods, with Morocco and Syria in the 1990s, thus before the latter's upheaval.

4.2. Policy implications

European governance should aim at creating effective bilateral or plurilateral partnerships for the supply of raw materials and resources, as well as in industrial cooperation between Euro-Mediterranean countries to alleviate exogenous shocks to country systems. Based on balanced and fair competition, Europe should not consider partner countries only as suppliers of raw materials or semi-finished products but should instead incentivize the creation of favorable institutional and business environments, investing in research and development and encouraging the growth of local economy.

Under the renewed push for technological progress and the green transition, the progressive reduction of trade barriers and transport costs, countries' production systems have rapidly transformed and acquired a new form. The focus has shifted from the simple trade of goods and services to the trade of tasks and the related services required to produce these goods and services. Production has been organized along value chains articulated at global, regional, and local level, in which firms from different countries can interact and participate in succession to the value-added creation.

This leads to a geographical fragmentation of production, and the establishment of intense and complex industrial relations. Firms, even small and medium-sized, can enter these global chains and specialize in specific tasks and services. However, participation in value chains brings with it risks and opportunities. Firms with high-quality products can export more and to many markets. Therefore, European and MEDA firms may find in the integration along the regional value chains the best strategy to exploit their comparative advantages and overcome some difficulties in their internationalization process, especially if they are small and medium-sized.

To diversify global value chains and minimize dependency on a few major trading partners, the European Union should develop its plurilateral trade partnerships not by pursuing "hub-and-spoke" policies but "region-to-region" policies [207]. Consequently, European governance should continue to provide technical and financial assistance to firms to enable them to penetrate new emerging markets and diversify global value chains [208].

In fact, the European Union has sought Euro-Med cooperation to promote political, economic, and trade reforms, human rights, and to ensure regional peace, cooperation, and prosperity [5,6]. Among the objectives were the promotion of

cultural and economic unity between the institutions and the creation of the Mediterranean free trade area.

This purpose has been in part neglected because it required sustainable and shared development, the improvement of living conditions, a decrease in unemployment, and social integration. The signatory countries agreed to work together to improve the integration of manufacturing systems along global value chains, harmonize trade practices, and promote cultural diversity. Therefore, we have inserted into the models some variables to capture these aspects.

In this sense, the study attempted to empirically capture the socio-economical characteristics of the markets [209–212], and considering the existence of cultural affinity between the markets assisted us in explaining the intra-industry trade flow between countries.

Euro-Med cooperation was built primarily on trade agreements to eliminate tariff and non-tariff barriers, as well as a significant amount of financial assistance from the European countries to MEDA-partner countries [41–43]. This one should be strengthened considering the cultural affinity that characterizes the socio-economic systems of the countries involved in the Euro-Med partnership agreements. The lack of significance of the dummies that capture the effect of Euro-Med agreements in the models can be interpreted based on the non-achievement of the objectives declared.

As far as we know, the formulation of the attractiveness that we propose for the gravity equation and the approach we used to estimate spatial models that consider a variable capable of capturing cultural affinity have never appeared before in the empirical studies that deal with international trade in goods and services between the considered EU-advanced and MEDA-transitional economies, hence our results are original.

In other words, analyses on the effects of culture on the economy are still in their initial stages, so we hope our study can contribute to research in this direction.

We also calculated in an original way an indicator that measures the attractiveness of countries—which can increase in the coming years—without being affected by the methodological issues that previous studies have found and that we have mentioned. We have also built the probability density to have interpretable data on the attractiveness, and we have shown whether, for each country and industry, there has been contagion or interdependence based on the intra-industry trade flow between the periods of low and high economic-political volatility.

In conclusion, we believe it is important that the European Union has traced new guidelines for Euro-Med policy through forms of multilateral integration in order to prevent the political and economic relations among countries in the region from deteriorating [6]. The need to reduce tariff and non-tariff barriers can further stimulate trade between regions that are perceived as culturally different.

The maintenance of stable relations with the neighboring countries in the South-East of the Mediterranean Sea should be one of the main objectives of the European Union. Therefore, its aim should be to strengthen the economic and political order in the Euro-Med region. These advancements would aid in the improvement of the business environment, the establishment of industrial networks and clusters, and, ultimately, the attractiveness of countries.

4.3. Limitations and suggestions

To better understand the possible intra-industry dynamics, further expansions of this study could consider sectors merchandise-divided, offering more insights and details for the analysis.

A possible alternative way to analyze intra-industry trade flows could be the use of input-output tables. The information contained in these tables would allow of estimating exports based on added value, separating the latter into domestic and foreign. As a result, it allows to avoid the double counting of the added value in the exported and imported goods and services caused by the crossing of borders.

In fact, in a context where the production is globally fragmented, firms' involvement in value chains is crucial for the competitiveness of countries' manufacturing system, but statistics on the international trade include the value of goods and services sold abroad, regardless of whether a part of the export value may derive from imported inputs. However, input-output tables may have an insufficient industry disaggregation.

From a methodological point of view, further studies could use the coefficients resulting by our specification of the gravity equation for the "out-of-sample" analysis to estimate trade potential of counties, extending the existing body of literature. This approach would allow to control for the possible parameter overestimations in the models that could have remained uncontrolled.

Furthermore, as an alternative to the GDP, another indicator to capture the development-gap between countries can be considered. For instance, the Human Development Index (HDI) developed by the United Nations [213], in addition to per-capita income, also captures aspects of welfare and quality of life. However, we would not have a concordant attractiveness index in the numerator and denominator values that are instead measured in units—since HDI is expressed within value one. This issue pushes us to consider the distance in terms of economic development between the EU-advanced and MEDA-economies that are geographically neighboring. If we used physical distance, our results could be affected by methodological issues, and we could not catch the liability of foreignness, which instead underlies political and business decisions.

Otherwise, future studies could also consider other measures of distance across countries—always as an alternative to the geographical one—such as the interesting geopolitical distance [214–216].

As a result, this measure could be considered as an alternative proxy for country risk perceived by business decisionmakers and foreign investors [217], which has been effectively highlighted in recent theories [218–220].

Finally, future studies could also analyze the determining-variables of firms' internationalization across MEDA transitional economies using data from the World Bank Enterprise Surveys (WBES), for instance, employing probabilistic models and instrumental variables approach.

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Appendix

I. The definition of contagion

We have borrowed the definition of contagion from Forbes and Rigobon [221], which define it as the significant increase in the correlation (positive) between the co-movements after a shock has occurred in the markets. However, if the degree of correlation is negative, or if it is positive but not significant, the relationship is instead called interdependence (**Table A1**).

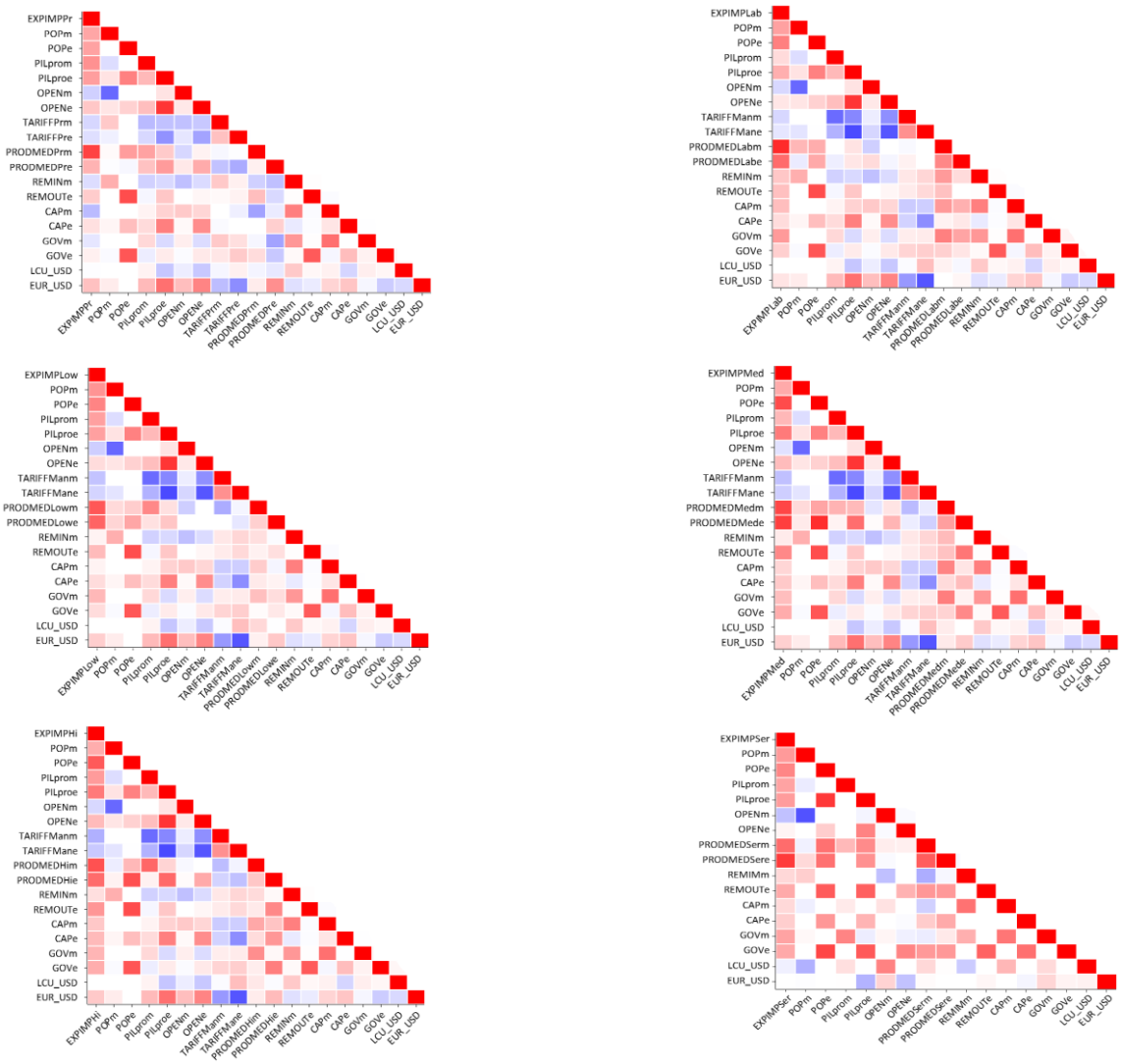

Figure A1. The correlations between the variables.

Coded labels: EXPIMPPr ↔ Trade Flow Primary; EXPIMPLab ↔ Trade Flow Labor intensive; EXPIMPLow ↔ Trade Flow Low-tech; EXPIMPMed ↔ Trade Flow Medium-tech; EXPIMPHi ↔ Trade Flow High-tech; EXPIMPSer ↔ Trade Flow Services; POPm ↔ Population-MEDA; POPe ↔ Population-EU; PILprom ↔ Per-capita GDP-MEDA; PILproe ↔ Per-capita GDP-EU; OPENm ↔ Openness-MEDA; OPENe ↔ Openness-EU; TARIFFPrm ↔ Tariff Barriers-MEDA Primary; TARIFFPre ↔ Tariff Barriers-EU Primary; TARIFFManm ↔ Tariff Barriers-MEDA Manufacturing; TARIFFMane ↔ Tariff Barriers-EU Manufacturing; PRODMEDPrm ↔ Middle Productivity-MEDA Primary; PRODMEDPre ↔ Middle Productivity-EU Primary; PRODMEDLabm ↔ Middle Productivity-MEDA Labor intensive; PRODMEDLabe ↔ Middle Productivity-EU Labor intensive; PRODMEDLowm ↔ Middle Productivity-MEDA Low-tech; PRODMEDLowe ↔ Middle Productivity-EU Low-tech; PRODMEDMedm ↔ Middle Productivity-MEDA Medium-tech; PRODMEDMede ↔ Middle Productivity-EU Medium-tech; PRODMEDHim ↔ Middle Productivity-MEDA High-tech; PRODMEDHie ↔ Middle Productivity-EU High-tech; PRODMEDSerm ↔ Middle Productivity-MEDA Services; PRODMEDSere ↔ Middle Productivity-EU Services; REMINm ↔ Remittance Inflow-MEDA; REMOUTe ↔ Remittance Outflow-EU; CAPm ↔ Stock Market Capitalization-MEDA; CAPe ↔ Stock Market Capitalization-EU; GOVm ↔ Governance Climate-MEDA; GOVe ↔ Governance Climate-EU; LCU_USD ↔ Exchange Rate LCU-USD; EUR_USD ↔ Exchange Rate EUR-USD.

Contagion (C) implies that the relationship between markets must be significantly altered following a shock. While the interdependence (I) does not imply a substantial change of state in the relationship, it suggests the co-movements across markets during the turmoil period are the continuation of the real linkage between the two economies.

We measure contagion using a correlation coefficient between the co-movements of cluster countries' intra-industry trade flows. MEDA-transitional economies have integrated into global value chains, and they have signed preferential trade agreements. However, this positive trend has been interrupted by the turmoil. As a result, the attractiveness of their manufacturing systems along global value chains has suffered, prompting us to investigate the effect of contagion.

The correlation coefficients used have been adjusted to take account of the heterogeneity of the panel. We highlight industries with high levels of interdependence or contagion. Usually, the stable period is longer than the turbulent period, or at least of the same length.

According to Forbes and Rigobon [221], the existence of contagion is always subject to preliminary conditions in which the standard deviation of the high-instability period (turmoil) is greater than the standard deviation of the low-instability period (stable). We have considered the shocks of the turmoil as the only period of volatility [222], and we have tested the null-hypothesis of non-contagion: $\dot{\rho}_h \geq \dot{\rho}_l$ or $\left(\dot{\rho}_h - \dot{\rho}_l\right) \leq 0$. The type of statistic-test used should have no effect on the outcome. For the test, we use an asymptotic distribution and a *t*-test to see if there is a significant increase in correlation coefficients during the period of turmoil. The degrees of freedom of the *t*-test are given by the duration of the overall period considered minus the two periods into which it is subdivided Equation (A1).

$$\dot{\rho}_{ij} = \frac{\rho}{\sqrt{1 + \delta[1 - \rho^2]}}; \delta = \frac{\sigma_{h,(i+j)}}{\sigma_{l,(i+j)}} - 1 \text{if} \sigma_{h,(i+j)} > \sigma_{l,(i+j)}; t_{ij} = \left(\dot{\rho}_h - \dot{\rho}_l\right) \sqrt{\frac{N-2}{1 - \left(\dot{\rho}_h - \dot{\rho}_l\right)^2}} \quad \text{(A1)}$$

Table A1. Contagion (c), or significative interdependence (i) on the basis of the intra-industry trade flow.

				Turmoil (*h*)			Into turmoil				
Countries		**Industry** [1]	**Delta (δ)**	**Stable (*l*) 1990–2008**	**Full 2009–2020**	**Middle 2009–2014**	**Long 2015–2020**	**Low (*l*) 2015–2020**	**High (*h*) 2009–2014**	***t*-test** [2]		**C/I**
				Unconditional-Rho (ρ_{ij})								
Spain	**Algeria**	Primary	0.247	0.621		0.899				1.389	*	C
			1.203					0.433	0.839	1.405	*	C
		Med-tech	1.223	0.157		0.433				1.377	*	C
		Services (*)	1.898					0.104	0.592	1.768	*	C
	Tunisia	Services (*)	0.377					−0.151	0.682	1.981	**	C
	Libya	Primary	0.204	−0.094		−0.365				1.351	*	I
			0.517	−0.084			0.530			2.396	**	C
	Israel	Low-tech	0.068	0.305	−0.650					1.984	**	I
			0.350	0.274		−0.871				3.569	***	I
			1.387					0.349	−0.800	1.596	*	I
	Jordan	Labor	0.398	0.008	0.512					3.138	***	C
			0.758	0.007		0.730				5.014	***	C
		Med-tech	2.432	0.475			0.803			1.665	*	C
		Services (*)	2.677					−0.319	0.932	2.453	**	C
	Lebanon	Labor	2.345	0.106			0.394			1.443	*	C
		Services (*)	1.419					0.071	0.794	3.316	***	C
	Syria	Labor	0.564	0.444	0.931					3.000	***	C
			0.808	0.419		0.990				3.340	***	C
			5.701					−0.311	0.966	2.738	**	C
		Low-tech	1.393	0.112	0.710					4.024	***	C
			1.832	0.103		0.590				2.674	***	C
		Services (*)	3.551					0.241	0.660	1.458	*	C

Table A1. (*Continued*).

				Turmoil (*h*)			Into turmoil				
Countries		**Industry** [1]	**Delta (δ)**	**Stable (*l*) 1990–2008**	**Full 2009–2020**	**Middle 2009–2014**	**Long 2015–2020**	**Low (*l*) 2015–2020**	**High (*h*) 2009–2014**	***t*-test** [2]	**C/I**
				Unconditional-Rho (ρ_{ij})							
France	**Libya**	High-tech	2.953	0.097	0.597					3.110	***	C
			2.869	0.098		0.534				2.327	**	C
			2.081	0.110			0.575			2.521	***	C
		Services (*)	0.172					−0.082	−0.750	2.836	***	I
	Egypt	Low-tech	0.125	0.122			0.645			2.943	***	C
	Jordan	Labor	0.024					0.066	−0.616	2.083	**	I
		Med-tech	0.174	0.312			0.897			3.463	***	C
	Lebanon	Labor	0.467	−0.202			0.781			3.405	***	C
		Low-tech	0.201	0.483			0.752			1.336	*	C
		Med-tech	0.006	0.307			−0.776			2.548	***	I
		High-tech	0.517	−0.089	−0.382					1.647	*	I
		Services (*)	0.206					−0.300	0.731	1.512	*	C
	Syria	Primary	0.302	0.298	0.695					2.330	**	C
		Labor	1.164	0.054	0.727					4.901	***	C
			1.175	0.054		0.571				2.899	***	C
		Low-tech	1.158	0.068	0.721					4.651	***	C
			1.427	0.064		0.594				3.001	***	C
		Med-tech	0.023	0.057		0.952				9.637	***	C
			18.52					0.026	0.580	2.102	**	C
Germany	**Algeria**	Primary	1.165	0.386		0.663				1.379	*	C
		Labor	0.202	0.151		−0.508				1.832	**	I
		Low-tech	0.715	0.116		0.928				6.668	***	C
			0.646					−0.204	0.931	3.348	***	C
		Services (*)	1.040					0.040	0.541	1.830	**	C

Table A1. (*Continued*).

Countries		Industry [1]	Delta (δ)	Turmoil (*h*)			Into turmoil		*t*-test [2]		C/I
				Stable (*l*) 1990–2008	Full 2009–2020	Middle 2009–2014	Long 2015–2020	Low (*l*) 2015–2020	High (*h*) 2009–2014			
				Unconditional-Rho (ρ_{ij})								
	Tunisia	Med-tech	0.251					0.097	0.648	2.090	**	C
	Libya	Labor	0.386	−0.110		−0.408				1.499	*	I
		Low-tech	0.172	−0.112		−0.617				2.803	***	I
		Med-tech	1.225	0.071	0.465					2.306	**	C
		High-tech	0.234	0.128	0.519					2.286	**	C
			0.233	0.128		0.394				1.320	*	C
	Israel	Labor	0.323					0.488	0.934	1.575	*	C
		Low-tech	0.335	0.226			0.689			2.508	***	C
		Services (*)	1.274					0.098	0.727	2.559	**	C
	Lebanon	Primary	0.430	0.232		0.953				4.990	***	C
			0.404					−0.310	0.953	2.657	**	C
		Labor	0.188	0.175	0.574					2.342	**	C
		Services (*)	1.602					−0.049	0.657	2.424	**	C
	Syria	Primary	0.341	0.565	0.903					1.933	**	C
			0.526	0.540		0.847				1.545	*	C
		Labor	2.486	0.149	0.793					4.527	***	C
			2.750	0.144		0.690				3.123	***	C
		Low-tech	0.947	0.505	0.764					1.446	*	C
		Med-tech	0.617	0.203	0.448					1.365	*	C
		High-tech	0.503	0.710	0.962					1.401	*	C
			0.632	0.695		0.990				1.479	*	C
			12.37					−0.036	0.926	6.189	***	C
		Services (*)	16.40					0.080	0.694	2.461	**	C

Table A1. (*Continued*).

				Turmoil (*h*)			Into turmoil				
Countries		**Industry** [1]	**Delta (δ)**	**Stable (*l*) 1990–2008**	**Full 2009–2020**	**Middle 2009–2014**	**Long 2015–2020**	**Low (*l*) 2015–2020**	**High (*h*) 2009–2014**	***t*-test** [2]	**C/I**
				Unconditional-Rho (ρ_{ij})							
	Turkey	Primary	0.260					0.175	0.786	2.441 **	C
		Labor	2.524					0.032	0.683	2.712 **	C
		Med-tech	1.667					−0.295	0.761	1.664 *	C
		High-tech	0.755					−0.038	0.474	1.531 *	C
		Services (*)	0.853					0.087	0.770	2.956 ***	C
Italy	**Morocco**	High-tech	0.613					0.208	0.639	1.510 *	C
	Libya	Labor	1.044	0.014	0.673					4.714 ***	C
			0.771	0.015		0.425				2.153 **	C
		High-tech	1.071	0.480	0.785					1.726 **	C
			1.266	0.464		0.731				1.329 *	C
	Jordan	Labor	0.221					−0.196	0.649	1.610 *	C
		Med-tech	0.176	0.146	−0.487					1.953 **	I
			0.387	0.135		−0.611				2.597 ***	I
	Lebanon	Primary	0.500	−0.197	0.450					1.409 *	C
			0.539	−0.194		0.619				2.249 **	C
			0.275	−0.213			0.528			1.593 *	C
		Med-tech	0.138	0.040	0.289					1.379 *	C
		High-tech	0.661	−0.037			−0.390			1.806 **	I
	Syria	Primary	0.655	0.569	0.925					2.052 **	C
			0.981	0.535		0.887				1.804 **	C
		Labor	0.148	0.342	0.895					3.571 ***	C
			0.165	0.340		0.815				2.587 ***	C
		Low-tech	0.732	0.060	0.758					5.256 ***	C
			0.823	0.058		0.610				3.169 ***	C

Table A1. (*Continued*).

				Turmoil (*h*)				Into turmoil				
Countries		**Industry** [1]	**Delta (δ)**	**Stable (*l*) 1990–2008**	**Full 2009–2020**	**Middle 2009–2014**	**Long 2015–2020**	**Low (*l*) 2015–2020**	**High (*h*) 2009–2014**	***t*-test** [2]		**C/I**
				Unconditional-Rho (ρ_{ij})								
	Turkey	Primary	1.342					0.251	0.685	1.522	*	C
		Labor	1.660					0.038	0.577	2.028	**	C
		Med-tech	0.035					−0.004	0.737	3.404	***	C
Greece	**Morocco**	Primary	0.383	0.373			−0.669			1.486	*	I
	Algeria	Low-tech	1.161	0.285	0.696					2.430	**	C
		Med-tech	3.670	−0.114			−0.456			1.751	**	I
	Tunisia	Primary	4.332	−0.064			0.593			2.985	***	C
		Low-tech	1.935	−0.013	−0.300					1.608	*	I
			2.530	−0.012			−0.595			3.442	***	I
		Med-tech	0.613	−0.243	0.684					2.646	***	C
			0.086	−0.292		0.654				1.862	**	C
	Libya	Primary	0.371	0.525		0.833				1.551	*	C
			1.381					−0.055	0.752	3.070	***	C
		Med-tech	2.691	0.071	0.397					1.858	**	C
		Services (*)	5.629					0.058	0.480	1.474	*	C
	Egypt	Primary	2.310	−0.121		0.703				3.428	***	C
			0.603					0.254	0.818	2.157	**	C
		High-tech	0.252	−0.148	0.408					1.449	*	C
	Israel	Low-tech	8.279	−0.077		0.361				1.421	*	C
	Lebanon	Med-tech	0.571	0.187		−0.620				2.301	**	I
	Syria	Labor	10.02					−0.094	0.545	1.595	*	C
		High-tech	0.684	−0.083	0.646					3.676	***	C
			0.864	−0.078		0.519				2.356	**	C

Note: [1] (*) 2005–2020; [2] (***) significance for α = 0.01; (**) significance for α = 0.05; (*) significance for α = 0.10.

II. The probability of attractiveness

We also propose the computation of a probability function for the countries' attractiveness. Therefore, we have calculated the probability mass function $P(A_{ij,t})$ for the attractiveness index $A_{ij,t}$ with the middle value of the period considered $a_{\mu,t}$ as in the Equation (A2). The probability of attractiveness is distributed as a standardised Gaussian-normal function N with an average $\mu = 0$ and variance $\sigma^2 = 1$ as reported in the following **Table A2**.

$$P(A \leq a_{\mu,t})_{ij} \sim N(0, 1)_{ij,t} \quad \text{(A2)}$$

Table A2. The probability of attractiveness.

	North Africa					**Near Middle East**					
	Morocco	**Algeria**	**Tunisia**	**Lybia**	**Egypt**	**Israel**	**Jordan**	**Lebannon**	**Syria**	**Tuekey**	
Spain											
1990–1994	0.968	0.961	0.965	0.428	0.964	0.427	0.966	0.918	0.954	0.708	
1995–1999	0.737	0.677	0.758	0.428	0.722	0.427	0.709	0.787	0.783	0.432	
2000–2004	0.381	0.373	0.393	0.542	0.340	0.427	0.261	0.260	0.442	0.150	
2005–2009	0.260	0.301	0.280	0.428	0.239	0.427	0.241	0.206	0.353	0.164	
2010–2014	0.325	0.356	0.350	0.428	0.426	0.542	0.468	0.582	0.332	0.612	
2015–2020	0.167	0.157	0.138	0.428	0.175	0.429	0.206	0.199	0.101	0.744	
France											
1990–1994	0.959	0.953	0.952	0.424	0.955	0.336	0.960	0.907	0.933	0.952	
1995–1999	0.782	0.742	0.801	0.545	0.781	0.532	0.783	0.850	0.813	0.801	
2000–2004	0.471	0.472	0.500	0.425	0.458	0.201	0.346	0.374	0.537	0.500	
2005–2009	0.293	0.345	0.326	0.438	0.286	0.198	0.277	0.245	0.411	0.326	
2010–2014	0.250	0.281	0.260	0.424	0.298	0.641	0.336	0.417	0.288	0.260	
2015–2020	0.143	0.121	0.115	0.424	0.140	0.837	0.172	0.168	0.080	0.115	
Germany											
1990–1994	0.943	0.935	0.933	0.412	0.932	0.673	0.934	0.901	0.919	0.938	
1995–1999	0.798	0.765	0.813	0.451	0.803	0.935	0.820	0.871	0.823	0.803	
2000–2004	0.562	0.569	0.595	0.413	0.589	0.549	0.543	0.572	0.608	0.417	
2005–2009	0.340	0.385	0.372	0.589	0.359	0.340	0.377	0.347	0.430	0.303	
2010–2014	0.213	0.228	0.215	0.411	0.230	0.327	0.239	0.271	0.240	0.210	
2015–2020	0.117	0.105	0.099	0.411	0.103	0.139	0.102	0.098	0.078	0.206	

Table A2. (*Continued*).

	North Africa					Near Middle East					
	Morocco	**Algeria**	**Tunisia**	**Lybia**	**Egypt**	**Israel**	**Jordan**	**Lebannon**	**Syria**	**Tuekey**	
Spain											
Italy											
1990–1994	0.966	0.955	0.963	0.408	0.952	0.416	0.928	0.801	0.942	0.447	
1995–1999	0.725	0.663	0.742	0.613	0.653	0.416	0.574	0.637	0.781	0.311	
2000–2004	0.357	0.355	0.367	0.409	0.259	0.416	0.120	0.153	0.472	0.190	
2005–2009	0.243	0.317	0.276	0.442	0.212	0.416	0.216	0.207	0.418	0.235	
2010–2014	0.347	0.436	0.396	0.408	0.547	0.439	0.683	0.801	0.377	0.594	
2015–2020	0.195	0.148	0.155	0.407	0.280	0.553	0.453	0.429	0.076	0.888	
											
Greece											
1990–1994	0.959	0.958	0.948	0.355	0.936	0.693	0.925	0.768	0.935	0.379	
1995–1999	0.798	0.736	0.824	0.386	0.774	0.382	0.763	0.802	0.845	0.379	
2000–2004	0.380	0.364	0.390	0.479	0.319	0.499	0.259	0.238	0.465	0.377	
2005–2009	0.140	0.177	0.128	0.601	0.082	0.361	0.080	0.073	0.239	0.377	
2010–2014	0.336	0.411	0.396	0.515	0.510	0.362	0.504	0.687	0.334	0.387	
2015–2020	0.258	0.207	0.234	0.352	0.370	0.353	0.442	0.494	0.129	0.695