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THE ATTRACTIVENESS OF COUNTRIES FOR FDI.

A FUZZY APPROACH

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Abstract. This paper presents a new method for measuring the attractiveness of countries for *FDI*. A ranking is built using a fuzzy expert system whereby the function producing the final evaluation is not necessarily linear and the weights of the variables, usually defined numerically, are replaced by linguistic rules. More precisely, weights derive from expert opinions and from econometric tests on the determinants of countries' *FDI*. As a second step, the view-point of investors from two different investing economies, the UK and Italy, are taken into account. Country-specific factors, such as the geographic, cultural and institutional distances existing between the investing and the partner economies are included in the analysis. This shows how the base ranking changes with the investor's perspective.

Keywords: foreign direct investments, fuzzy expert systems, attractiveness

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1. INTRODUCTION

What makes countries attractive to the foreign direct investments (*FDI*) of multinational firms? And, similarly, which are the most attractive countries? These related questions are generally approached by two distinct branches of economic literature. One econometrically tests the relationship that exists between investments abroad and the various potentially-related receiving country factors, such as labour costs, market dimension, purchasing power, human capital and, in some cases, institutions and culture. The other uses much of the same economic data to build rankings of countries' attractiveness. Instead of testing, it takes the experts' opinions on the importance of each factor for their prospective investments into account. The degree of attractiveness of each country and its position in the ranking are then determined by using weighted averages and linear relations between these variables. Often, the information provided by the resulting order is supposed to hold a general validity that is useful for investors from different parts of the world (a review is in Groh and Wich (2009)).

This second line of research considers the experts' opinions as more reliable predictors for future investments than the results of regressions on the determinants of *FDI*. While this can be a sensible choice for variables that change rapidly through time, such as exchange rates, inflation and country risk, it makes less sense for factors that vary slowly, such as institutions, culture, social norms and corruption. Experts' opinions on these factors may be vaguer, but they can, nonetheless, strongly influence their investment choices (Chackrabarti, A. 2001).

This paper presents a new methodology for measuring the attractiveness of countries for *FDI* and uses it to build two different types of rankings: the first one, following the usual procedure, is potentially useful for any 'representative' investing firm and any country of origin; the other takes specificities of the origin country into account that appear to influence its investments abroad. The latter, therefore, is an index of countries' attractiveness and of *accessibility*.

The general index is built by using, firstly, the economic data available to econometrically test the impact of economic and non-economic factors of a high number of countries on the *FDI*; the resulting information is then merged with the experts' opinion of the importance of these same factors. A 'base' index, or ranking of countries, is then built by using a fuzzy expert system, whereby the function producing the final evaluation is not necessarily linear and the weights, generally defined in a numerical way, are replaced by linguistic rules. Two specific indexes regarding the investing economies of Italy and the UK are subsequently built by adding some country-specific factors, such as the geographic, cultural and institutional distances existing between the investing and receiving countries to the general index and by merging, again, the results of our regressions on these factors with the experts' opinions on their importance. This shows how the base 'neutral' ranking varies once the perspectives of specific investors are taken into account and the accessibility, besides attractiveness, is considered. The paper is structured as follows. Section 2 presents the methodology

utilized in the construction of the Fuzzy Expert System; Section 3 the selection of variables and the data; Section 4 the basic index and the two country-specific indexes; and Section 5 concludes.

2. METHODOLOGY

2.1. FUZZY EXPERT SYSTEMS

Only a very limited number of papers focus on the methodological issues concerning indexes of countries' attractiveness to international investments and their construction (among these: Facchinetti, Marchi, Mastroleo, and Vignola (2008), M Groh and Wich (2009), Pantelidis and Nikopoulos (2008), Nardo et al. (2005)). These indexes are based on weighting aggregation models, i.e. on aggregation functions where the variables' coefficients, or 'weights', are deduced from the experts' opinions. A drawback of this method is that experts are asked to numerically evaluate a large number of variables, which may provoke cognitive stress or circular thinking. Another serious limit is that values are points of the hyper plane R^n, representing the aggregation function itself, which is necessarily linear. With this underlying structure, final results can be sensitive to slight data modification.

We present a new approach to the *FDI* ranking problem, the Fuzzy Expert System (FES), which is based on fuzzy logic and on an expert system. The main phases of a FES design are as follows.
First: design of the FES that best suits the problem under consideration. In this case, we start by drawing a decision tree with the roots representing the output and every branch representing an independent FES. In general, larger trees with a higher number of branches encompass larger data inputs.
Second: identification of input and output variables, their linguistic attributes (fuzzy values) and their membership function ("fuzzification" of input and output).
Third: definition of the set of heuristic fuzzy rules (IF-THEN rules).
Fourth: translation of the fuzzy output in a crisp value ("defuzzification" methods).
Fifth: choice of the fuzzy inference method (selection of aggregation operators for precondition and conclusion).
Sixth: test of the fuzzy system prototype, sketch of the goal function between input and output fuzzy variables, change of the membership functions and fuzzy rules if necessary, tune of the fuzzy system, validation of results (sensitivity analysis, test with prototypes, perturbations of data and robustness of the system).

This frees the FES procedure from most disadvantages of the weighting aggregation models seen above. In particular, it is based on linguistic descriptions of phenomena or processes and on a small number of very flexible rules. This helps to overcome most of the problems related to low data reliability or to lack of accuracy in experts' opinions. By being asked to linguistically evaluate phenomena, experts experience very low levels of cognitive stress. Moreover, system solutions are

multiple, each is characterized by a degree of 'truth' that can range from 'completely untrue' to 'completely true', and can be consequently evaluated.

Functions are non linear, which is useful in overcoming the natural vagueness of real-world problems. More precisely, a FES can be described as a function approximator with a high level of non linearity. It aims to perform an approximate implementation of an unknown mapping $f: A \subseteq R^n \rightarrow R^m$ where A is a compact of R^n. Kosko (1992) and Wang (1992) independently prove that fuzzy systems are dense in the space of continuous functions on a compact domain and can therefore approximate any continuous function arbitrarily well.

To sum up, the main advantages of using a FES are the non linearity of functions, the possibility for experts to follow simple linguistic rules and, finally, the possibility of using vague data.

2.2. A FUZZY APPROACH TO COUNTRY RANKING

The FES is an aggregator that can be represented as a decisional tree, with inputs and outputs at its top and at its base (or left and right ends in horizontal representations). While inputs and outputs are the only crisp entities, every node of the tree represents an intermediate logical step of experts' reasoning, which connects basic factors with the final output. Usually, intermediate nodes are fuzzy variables. In this case, however, intermediate stages will be defuzzified and shown: they contribute to make up the final ranking but are indexes themselves. Seeing these values is useful not only for grasping their significance in affecting the final index, but also for comparing their importance in different specifications of the final index. In the following sections we shall build a basic specification of the attractiveness index and two country-specific specifications, which will include the view-points of investors from Italy and the UK.

3. SELECTION OF VARIABLES AND DATA

The first step of our analysis concerns the construction of a base index of economic attractiveness. To this end, we consider the effects of variables regarding the economic, institutional and social characteristics of countries on *FDI*. According to literature on *FDI*, firms invest abroad for two main reasons: to sell the goods sold at home abroad (horizontal *FDI*), and to find low-cost locations for production (vertical *FDI*). A review of this literature can be found in Barba Navaretti and Venables (2004). In both cases, demand and supply factors interact to determine the investment locations of firms. Variables such as the countries' *GDP* or total population are generally used as proxies of the size of the market, crucial for horizontal *FDI*. In this paper, we choose to use the *GDP* variable, while the per-capita *GDP* is used to denote relative costs and the abundance of factors, important for vertical *FDI* but also for demand.

We consider a sample of 117 countries during the 2005-2008 period and econometrically test the effects of the above and the following variables on the *FDI* stocks. The data sources used are listed in Table A1.

Labour costs represent a cost of production but also a demand component; because of this dual role, econometric tests on the effect of this variable on *FDI* show that coefficient values tend to be ambiguous (Groh and Wich (2009)). The productivity of factors, on the other hand, has a more definite relation with international investments: high productivity can compensate for high labour costs and make even a rich country a potential attractive location for vertical *FDI*, while low labour costs not matched by sufficient productivity can make even a poor country unattractive for *FDI*. In this paper, as a proxy of factors' productivity, we use the *productivity of labour* denoted by the country's *GDP* per employed worker.

The productivity of labour is often related to the level of 'human capital' existing in the economy and to the labour force's level of skill. Several empirical papers have found a positive relation between a country's inward *FDI* and the level of skills of its labour force (a review can be found in Kugler and Rapoport (2007)). We use the *expected years of schooling* as a proxy of this variable.

A crucial element in influencing firms' choices of *FDI* is the *expected growth of GDP* of foreign economies. Because of demand reasons, i.e. for horizontal *FDI*, for firms investing abroad a higher growth rate implies an expansion of the market and makes a foreign country more attractive. For firms investing because of cost reasons, i.e. for vertical *FDI*, a higher growth rate can imply higher labour costs, which are expected to have a negative impact on *FDI*, but also better infrastructures and higher levels of efficiency in production, which instead have a positive impact on vertical *FDI*. Several papers show that the latter influence tends to dominate, i.e. the positive values of the foreign countries' expected growth rate positively and significantly affect foreign firm investments Barba Navaretti and Venables (2004).

Empirical studies on the relationship between *FDI* and countries' openness to trade have produced mixed results. On the one hand, direct investments can substitute exports to countries with high barriers to trade, in this case *FDI* and *openness* are substitutes; on the other hand, *FDI* can generate trade when goods or intermediate inputs are produced in one location to be shipped to other markets, in this case *FDI* and *openness* are complementary. The gradual reduction of trade barriers over recent decades has increased the relative importance of the complementary relation. Moreover, our regressions find a positive coefficient of the variable denoting countries' *openness* to trade , which is measured as (*Imports+Exports)/GDP* at constant prices. As such, we assign a positive sign to *openness* in the construction of the attractiveness index.

A quantitative and synthetic measure of *doing business* in a high number of countries is provided by a *World Bank* indicator, which concerns the regulations for starting a business, dealing with construction permits, employing workers, registering property, getting credit, protecting investors,

paying taxes, trading across borders, enforcing contracts and closing a business. We use this measure as a proxy for the possibility of successfully investing in foreign countries.

The World Bank also provides an indicator of the quality of *governance* (Kaufmann, Kraay and Mastruzzi (2009)) , which captures six key dimensions: Voice and Accountability, Political Stability and Lack of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption between 1996 and now. It is based on around 40 data sources produced by over 30 different organizations worldwide and updated on an annual basis since 2002. As the coefficient of the governance variable in our regressions is always positive, we assign a positive value to the variable in terms of *FDI* attractiveness.

The second step of our analysis concerns the construction of indexes that include the view-point of investors of given countries. In particular, we consider two countries, the UK and Italy, which are of interest because their investments abroad follow different patterns. Our regressions show their outward *FDI* are affected by a variety of factors, with components that are shared by most countries of our base regressions, and components that are specific to each of them. The latter, in particular, concern institutional and cultural similarities between the investing and the receiving countries, as well as links built by a transnational network of migrants. The first of these factors is *distance* (the geographic distance between the capital cities of the sending and receiving countries), which in our regressions has a positive and significant correlation with the outward *FDI* of the UK and a negative and significant correlation with the outward *FDI* of Italy. Moreover, the *religion* variable (the share of Christians on the population of partner countries), which is a proxy of the cultural proximity between countries (a review can be found in Tadesse and White (2008) and regarding Italy in Murat, M., Pistoresi, B (2009), has a positive impact on the Italian *FDI* but a non-significant impact on the UK *FDI*. Furthermore, the stock of *immigrants* originating from the partner countries, a proxy of transnational networks (Rauch (2001)), has a positive impact on the UK's outward *FDI*, but not on those of Italy. Instead, Italy's outward *FDI* are strongly attracted by the presence (stocks) of Italian emigrants in the partner economies. Finally, the presence of a common language between the investing and the receiving country, *language*, plays a weak but positive role on the UK's investments abroad (higher than that of the country's ex-colonies) and is of no significance to the Italian *FDI*. The results of these regressions can be found in Flisi and Murat (2010).

4. RESULTS

4.1. THE BASIC INDEX

Figure 1 depicts the methodology used for the construction of the basic index. Starting from the right hand side, the final *Attractiveness* index derives from the combination of two nodes, or sub-indexes that concern, respectively, *Economic Attractiveness*, which includes strictly economic factors, and the *Extended Attractiveness* sub-index, which contains economic, institutional factors and

variables. The disassembling of this second level shows that the economic dimension depends on three important factors: *Demand*, *Supply* and *expected GDP growth*, while the *Extended Attractiveness* sub-index depends on four variables: *expected years of schooling, doing business, governance and openness*. Finally, the disassembling of the last level on the left shows that *Demand* is the composite of *GDP* and of *per-capita GDP*, and *Supply* is the aggregation of *labour costs* and *productivity*.

Membership functions (MBF) are specific functions of Real numbers ranging from 0 to 1, where 0 indicates “no membership” and 1 indicates “complete membership”, that transform crisp values into fuzzy variables. An example is provided by Figure 2, which depicts the fuzzy representation of *per capita GDP*. It summarizes how the three thresholds, low, medium and high, are identified.

Table 1 summarizes all the input variables used in the basic index and how they are fuzzyfied. The “Shape” column indicates the specific form of each MBF. While the triangle is the more common figure, the trapezoid and half triangle are also present. Since these functions correspond to figures in a Cartesian plane, the coordinates of each MBF definition point are easily identified: the first is the variable level and the second is the value assumed by the specific MBF for that level.

The number of membership functions increases with every level of aggregation, *Demand, Supply* and *Extended Attractiveness* is composed by five membership functions, while *Extended Attractiveness* and *Attractiveness* are composed by seven membership functions. All output variables are represented by triangular or half triangular membership; they are linearly distributed and normalized in the output range 0-100.

FES requires the data matrix to be dense. No missing values are admitted for the evaluation of the fuzzy attractiveness index, but in our case figures of *labour costs* or *productivity* were missing for some of the 117 countries of the sample. They have been replaced by the experts’ evaluations and, consequently, we have been able to utilize a balanced database with all countries.

From the list of steps leading to the construction of a FES under Section 2.1, it can be seen that there are now four more tasks to perform; they are, respectively, the choice of heuristic IF-THEN rules to insert in the rule blocks, the input fuzzification, the output defuzzification and the inference method to be used in the interaction between rules. Rule blocks are composed of hundreds of rules that cannot be shown here, but are available from the authors upon request. Meanwhile, Table 2 depicts a synthetic scheme that shows the importance of each factor (input and intermediate) in the composition of output variables.

The “Center of Maximum” (CoM) defuzzification method has been used for the construction of the final attractiveness index and for the intermediate indexes. For this particular FES, it delivers the best performance of activated rules when compared with other available methods, such as the “Center of Area” (CoA) or “Mean of Maximum” (MoM).

The fuzzy inference method concerns point five in the list under Section 2.1. We have used the MIN operator method for the input aggregation of all rule blocks, while we have opted for the Bounded Sum (BSUM) for the aggregation
of results. The BSUM sums all the activated values for every term up to the membership level of 1.0. Table 4 depicts the first 30 countries of the Basic Attractiveness ranking.

Economically, the ranking emerging from the final *Attractiveness* index can be judged positively. The higher positions are occupied by a mix of developed, emerging and developing countries, showing that no distortions favour a group of countries over others. The combined effects of high productivity and demand, efficient supply and good institutions tend to favour countries such as Australia, Sweden, Canada (at the top of the *doing business* and *governance* rankings) or the USA, despite their high labour costs. At the same time, the low costs and high expected growth rates favour economies such as China, India, Chile and others, despite their lower productivity and less reliable institutions.

4.2. AN INDEX FOR UK INVESTORS

Figure 4 depicts the Attractiveness index for UK international investors. With respect to the basic index, *distance*, *language* and *immigration* have now been included into the evaluation process and, consequently, into the graph.

It is worth noting that the upper part of the graph is the same as the basic index graph, while the lower part has been modified and widened. More precisely, the variable *distance* has been added to the *Extended Attractiveness* evaluation block. Also, and more evidently, *immigration* and *language* now make up a new decision block that has been given the name *Links and Similarity* and is directly connected to the final *Attractiveness* block.

Table 4 shows the effects of the new variables on the output variable they contribute to evaluate (respectively *Extended Attractiveness, Links and Similarity and Attractiveness*).

Like the basic Attractiveness Index, the fuzzy transposition of every new variable is based on the three membership functions (low, medium and high). Their definition points are summarized in Table 5 where, in order to keep the system as similar as possible to the basic one, the defuzzification method used remains CoM, and the number of terms of the new intermediate output variable (*Links and Similarity*) is kept to five. All other variables that appear in the UK Index remain the same of the base index, and have been fuzzified as described in Table 2.

Table 6 clearly shows that the inclusion of the new rule block into the evaluation tree, containing the investing country cultural similarity with the partner economies and its transnational links (proxied by *language* and immigration), together with the inclusion of *distance* into the factors affecting the *Extended Attractiveness* index, modifies the final ranking of countries.

Economies such as India, Honk Kong, New Zealand, USA, Canada and China now rank higher than they did in the basic model. From an economic view-point, these results are as expected. With the exception of China, these countries are more institutionally and culturally similar to the UK than the average worldwide economy. They can be far, as indeed China or India are, but, as we already mentioned, our regressions show that UK multinationals are not at all deterred by geographic distance.

4.3. AN INDEX FOR ITALIAN INVESTORS

Taking the results of our regressions and the experts' opinions into account, the basic index is now modified in order to include factors that are specific to Italian international investors. Figure 5 depicts the decision tree. As for the UK index, *distance* has been added to the *Extended Attractiveness* node, but, unlike there, it now has a negative value. It has also been added a new node, which includes institutional and cultural factors. The latter now refer to *religion*, a proxy of cultural similarity that, from our regressions, positively affects the country's outward *FDI*, and by two proxies of migrant networks: stocks of immigrants and emigrants. Again, unlike the UK, *immigration* in this case bears a low value, while *emigration* has a strong and positive effect.

The models regarding Italy and the UK are equal except for the components of the *Links and Similarity* block, which differ substantially. The definition points of these new variables are summarized in Table 7. All other variables are defined as for the UK's case.

The full framework of the specific factors affecting the index for Italian investors is summarized in Table 9.The ranking of countries again changes, both with respect to the basic index and with respect to the UK index. In this case, countries more accessible to Italian investments, and not just attractive from a purely economic view-point, move upwards. Among these: France, Germany and the UK are contiguous or nearby countries, while the United States, Canada and Australia are more distant economies, but characterized by a substantial presence of Italian emigrants. Moreover, all of them are attractive from a purely economic view-point, as shown by the basic index.

The marked difference between the *Attractiveness* final indexes for the UK and Italy, which also emerges from their respective *Links* and *Similarities* blocks and sub-indexes and from their *Extended Attractiveness* sub-indexes (affected by the different role played by *distance*) in Tables 6 and 9, mirrors the different economic interactions of the two countries with the world markets. In turn, the latter can be related to the UK and Italy's respective histories of imperial power and mass emigration during the first half of the past century, as well as to the present differences in the average size of the two countries' multinationals, which are smaller in Italy's case.

5. CONCLUSIONS

This paper show that using a fuzzy approach to build country rankings of attractiveness for *FDI* produces sound results and is free from the main shortcomings of weighted average models, namely the lack of robustness of results to slight data modifications. A FES has been described and used firstly to build a 'general' index of attractiveness. At this stage, the common procedure of considering all investors as agents holding similar view-points and internationalization prospects has been followed; economically, it equals the classical assumption of a 'representative agent' or a representative country. Secondly, two examples regarding different investing economies have been proposed. This has shown how rankings change in each case with respect to the basic index, and how they differ between them. By looking at the internal nodes of the FES three, comparisons have also been made between the intermediate rankings of the three indexes. The two country-specific indexes depict the attractiveness together with the accessibility of foreign countries for the investors under consideration.

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Figures, Tables and Appendix

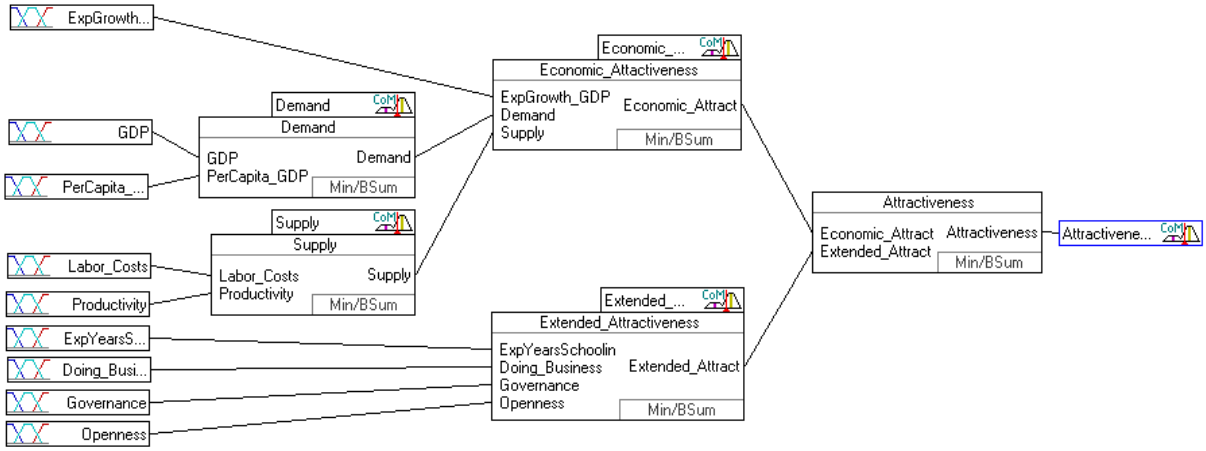

Fig. 1 Basic attractiveness index model

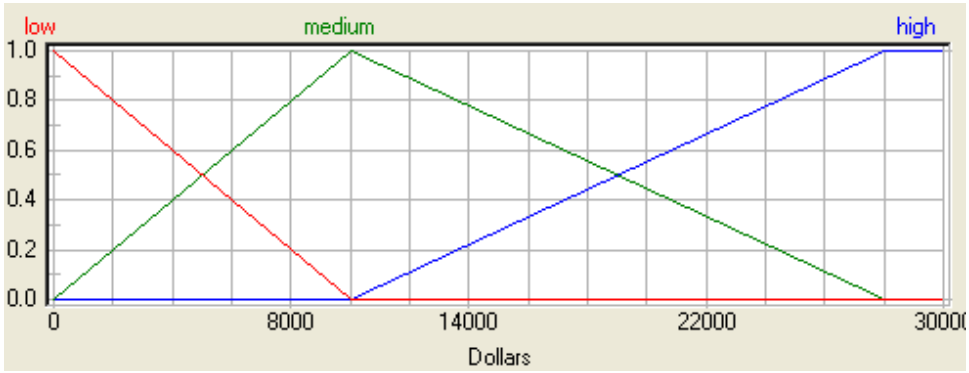

Fig. 2. The fuzzy representation of per capita GDP

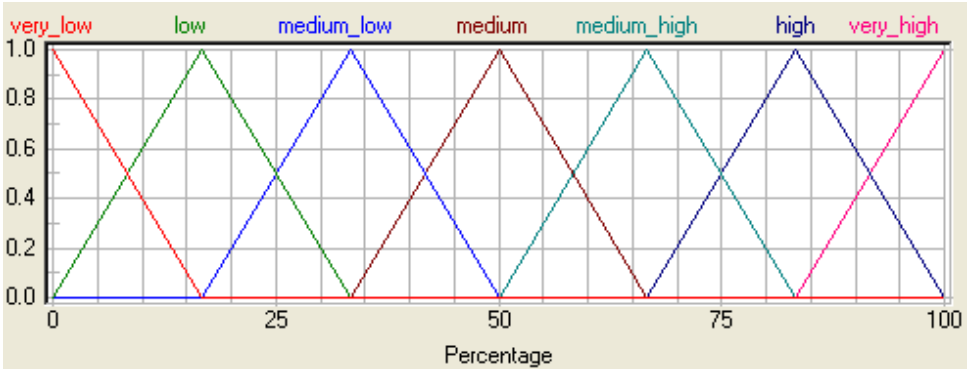

Fig. 3 A fuzzy representation of Attractiveness

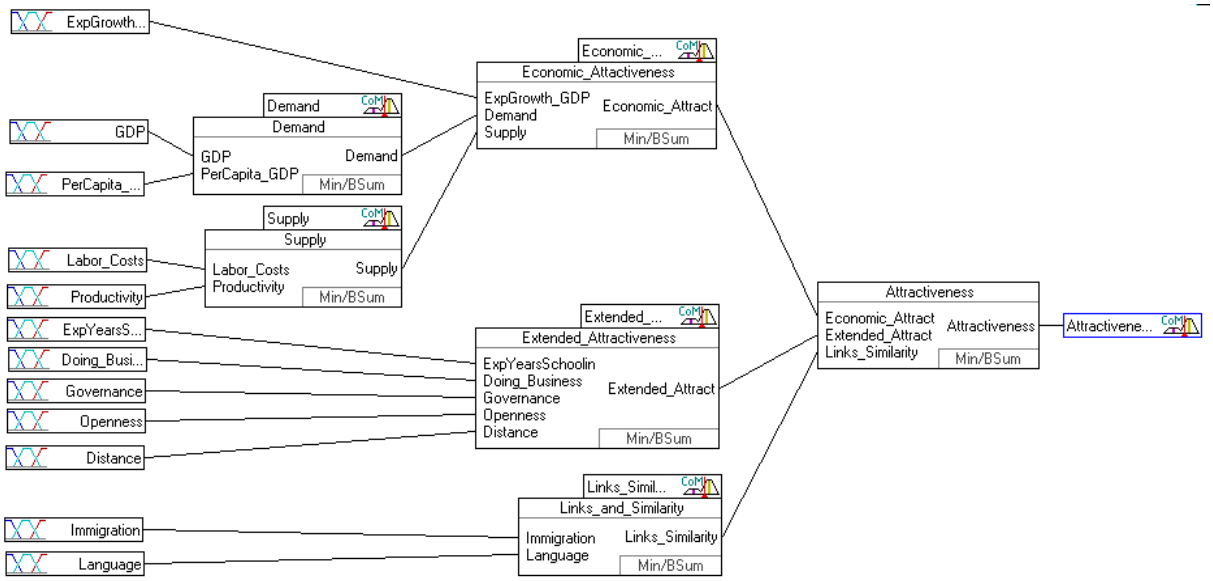

Fig. 4 The Attractiveness Index model applied to the UK

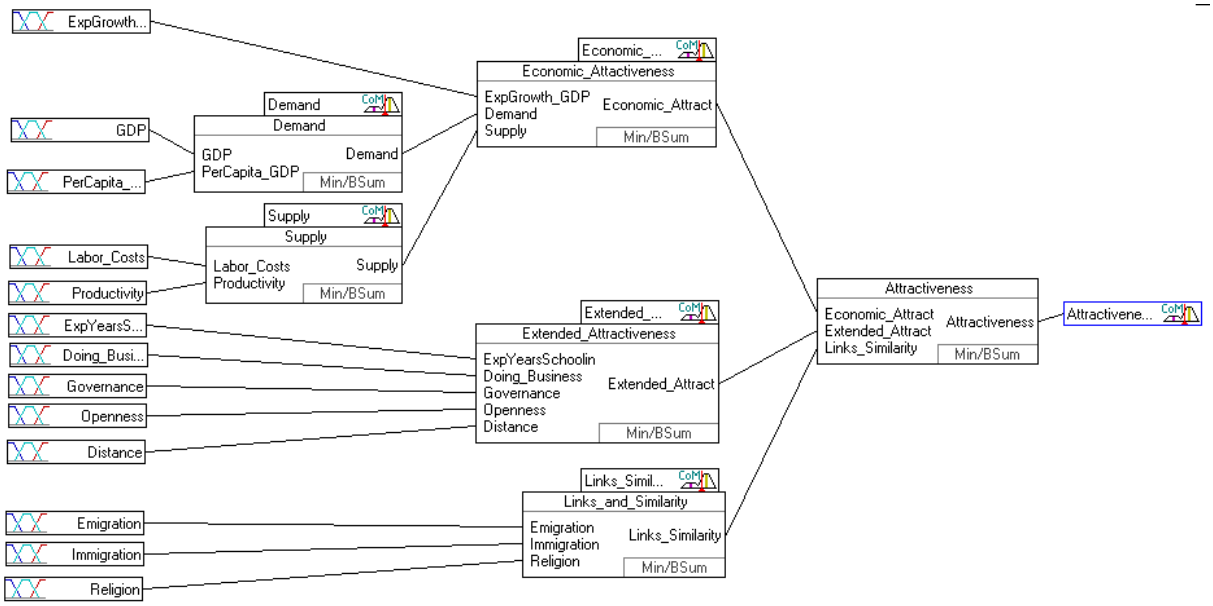

Fig. 5 The Attractiveness Index model applied to Italy

Table 1. Definition points for the fuzzification of the basic index input variables

Variable Name	Membership function's name	Shape	Definition Points (x, y)				
Doing Business (Unit: International ranking)	low	Half Triangle	(100, 1)	(40, 0)	(1, 0)		
	medium	Triangle	(100, 0)	(40, 1)	(1, 0)		
	high	Half Triangle	(100, 0)	(40, 0)	(1, 1)		
Expected Growth Of GDP (Unit: growth in %)	low	Trapezoid	(-∞, 1)	(0, 1)	(1, 0)	(3,0)	(∞, 0)
	medium	Triangle	(-∞, 0)	(0, 0)	(1, 1)	(3, 0)	(∞, 0)
	High	Trapezoid	(-∞, 0)	(0, 0)	(1, 0)	(3, 1)	(∞, 1)
Expected Years Of Schooling (Unit: Years of schooling)	Low	Trapezoid	(0, 1)	(4, 1)	(10, 0)	(20, 0)	(∞, 0)
	medium	Triangle	(0, 0)	(4, 0)	(10, 1)	(20, 0)	(∞, 0)
	High	Trapezoid	(0, 0)	(4, 0)	(10, 0)	(20, 1)	(∞, 1)
GDP (Unit: Billion Dollars)	Low	Half Triangle	(0, 1)	(700, 0)	(1200, 0)	(∞, 0)	
	medium	Triangle	(0, 0)	(700, 1)	(1200, 0)	(∞, 0)	
	High	Trapezoid	(0, 0)	(700, 0)	(1200, 1)	(∞, 1)	
Governance (Unit: %)	Low	Half Triangle	(0, 1)	(40, 0)	(100, 0)		
	medium	Triangle	(0, 0)	(40, 1)	(100, 0)		
	High	Half Triangle	(0, 0)	(40, 0)	(100, 1)		
Labour Costs (Unit: Levels 1 to 8)	Low	Trapezoid	(1, 1)	(1.7, 1)	(4.5, 0)	(7.3, 0)	(8, 0)
	medium	Triangle	(1, 0)	(1.7, 0)	(4.5, 1)	(7.3, 0)	
	High	Trapezoid	(1, 0)	(1.7, 0)	(4.5, 0)	(7.3, 1)	(8, 1)
Openness (Unit: Openness rate 0 to 1)	Low	Trapezoid	(0, 1)	(0.2, 1)	(0.5, 0)	(1, 0)	
	medium	Triangle	(0, 0)	(0.2, 0)	(0.5, 1)	(1, 0)	
	High	Half Triangle	(0, 0)	(0.2, 0)	(0.5, 0)	(1, 1)	
Per Capita GDP (Unit: Dollars)	Low	Trapezoid	(-∞, 1)	(0, 1)	(10000, 0)	(28000, 0)	(∞, 0)
	medium	Triangle	(-∞, 0)	(0, 0)	(10000, 1)	(28000, 0)	(∞, 0)
	High	Trapezoid	(-∞, 0)	(0, 0)	(10000, 0)	(28000, 1)	(∞, 1)
Productivity (Unit: Dollars)	Low	Trapezoid	(0, 1)	(5000, 1)	(12000, 1)	(31000, 0)	(∞, 0)
	medium	Triangle	(0, 0)	(5000, 0)	(12000, 0)	(31000, 1)	(∞, 0)
	High	Trapezoid	(0, 0)	(5000, 0)	(31000, 0)	(31000, 1)	(∞, 1)

Table 2. Relative effects of input and intermediate variables on output variables

Effect on Demand	
GDP	Very Positive
GDP Per Capita	More Than Positive
Effect on Supply	
Labour Costs	Very Negative
Productivity	Positive
Effect on Economic Attractiveness	
Expected Growth Of GDP	Very Positive
Demand	Positive
Supply	More Than Positive
Effect on Extended Attractiveness	
Expected Years Of Schooling	Positive
Doing Business	Very Positive
Governance	Weakly Positive
Openness	Weakly Positive
Effect on Attractiveness	
Economic Attractiveness	Very Positive
Extended Attractiveness	Very Positive

Table 3 Basic attractiveness index: the first 30 countries

Country	Demand	Supply	Economic Attractiveness	Extended Attractiveness	Attractiveness
New Zealand	54.57	40.90	62.67	94.45	82.16
Singapore	56.50	44.92	64.32	92.56	81.87
Hong Kong	57.68	48.21	66.04	89.72	81.38
Korea, Republic of	74.55	43.05	70.41	81.15	79.18
Australia	90.65	30.63	60.70	91.61	78.68
Sweden	67.11	31.04	60.51	86.11	76.66
Canada	100.00	30.98	60.96	87.65	75.58
Israel	57.21	43.74	65.89	75.77	75.52
United States	100.00	30.35	59.08	88.33	75.34
United Kingdom	100.00	30.35	52.46	87.67	74.30
Malaysia	27.34	51.33	65.21	75.58	73.60
Iceland	50.61	25.00	50.48	85.40	73.54
Mexico	69.79	45.56	71.45	59.71	71.45
Thailand	22.21	41.60	62.12	71.98	71.12
Norway	66.14	25.00	46.55	88.73	70.79
South Africa	24.50	33.93	59.58	70.97	70.09
United Arab Emirates	59.36	30.44	64.14	70.82	69.51
Denmark	62.14	25.00	44.23	90.41	69.45
Chile	31.43	54.22	69.15	64.37	69.15
Georgia	8.39	55.32	59.64	74.56	69.13
France	100.00	30.35	50.70	78.37	68.01
Qatar	53.64	43.36	66.10	67.69	67.43
Bosnia and Herzegovina	12.83	75.00	67.08	50.49	66.99
Finland	59.71	30.35	41.37	87.23	66.83
China	58.15	51.78	75.36	51.20	66.81
India	52.54	69.65	80.44	50.00	66.67
Japan	100.00	31.61	49.27	83.16	66.30
Colombia	22.68	43.66	62.01	61.43	65.81
Uruguay	25.26	53.854	65.684	58.332	65.684
Cyprus	50.892	47.058	62.33	68.82	65.652

Table 4. Effects of variables on the index for UK investors

Effect on Extended Attractiveness	
Expected Years Of Schooling	Positive
Doing Business	Very Positive
Governance	Weakly Positive
Openness	Weakly Positive
Distance	Very Positive
Effect on Links and Similarity	
Immigration	Very Positive
Language	Weakly Positive
Effect on Attractiveness	
Economic Attractiveness	Very Positive
Extended Attractiveness	Very Positive
Links and Similarity	Positive

Table 5 Definition points for the fuzzification of variables added to the UK index

Variable Name	Membership function's name	Shape	Definition Points (x, y)				
Distance (Unit: Kms)	low	Half Triangle	(500, 1)	(2000, 0)	(4000, 0)	(∞, 0)	
	medium	Triangle	(500, 0)	(2000, 1)	(4000, 0)	(∞, 0)	
	high	Trapezoid	(500, 0)	(2000, 0)	(4000, 1)	(∞, 1)	
Immigration (Unit: number of people)	low	Trapezoid	(0, 1)	(18000, 1)	(40000, 0)	(60000, 0)	(∞, 0)
	medium	Triangle	(0, 0)	(18000, 0)	(40000, 1)	(60000, 0)	(∞, 0)
	high	Trapezoid	(0, 0)	(18000, 0)	(40000, 0)	(60000, 1)	(∞, 1)
Language (Unit: number of people)	low	Trapezoid	(0, 1)	(150000, 1)	(1050000, 0)	(2550000, 0)	(∞, 0)
	medium	Triangle	(0, 0)	(150000, 0)	(1050000, 1)	(2550000, 0)	(∞, 0)
	high	Trapezoid	(0, 0)	(150000, 0)	(1050000, 0)	(2550000, 1)	(∞, 1)

Table 6 Attractiveness index for UK international investors: the first 30 countries

Country	Demand	Supply	Economic Attractiveness	Extended Attractiveness	Links & Similarity	Attractiveness
Australia	90.65	30.63	60.70	91.61	100.00	75.91
Canada	100.00	30.98	60.96	85.29	100.00	75.00
Hong Kong	57.68	48.21	66.04	82.14	99.17	75.00
United States	100.00	30.35	59.08	84.37	100.00	75.00
South Africa	24.50	33.93	59.58	78.33	100.00	73.17
New Zealand	54.57	40.90	62.67	92.96	86.52	72.03
Malaysia	27.34	51.33	65.21	80.77	68.70	70.22
Cyprus	50.89	47.06	62.33	75.00	75.00	69.82
Pakistan	11.26	69.65	65.25	58.33	100.00	68.21
Kenya	4.88	75.00	67.35	53.57	100.00	67.35
Bangladesh	6.25	75.00	67.49	50.00	100.00	66.67
India	52.54	69.65	80.44	50.00	100.00	66.67
Nigeria	13.98	69.65	65.75	50.00	100.00	66.67
France	100.00	30.35	50.70	54.69	100.00	65.72
Singapore	56.50	44.92	64.32	85.54	48.26	64.71
China	58.15	51.78	75.36	56.36	69.61	64.26
Sri Lanka	8.27	54.30	60.46	50.00	89.33	61.68
Ghana	3.49	75.00	67.06	57.14	69.25	61.29
Uganda	2.62	75.00	67.01	50.00	81.44	61.08
Germany	100.00	25.00	35.66	62.50	100.00	58.96
Turkey	53.31	35.47	55.73	62.50	70.17	58.66
Jamaica	13.93	33.93	36.12	62.86	100.00	58.33
Israel	57.21	43.74	65.89	80.50	0.00	58.33
Italy	100.00	31.61	40.98	43.31	100.00	58.33
Mexico	69.79	45.56	71.45	66.91	25.00	58.33
Sweden	67.11	31.04	60.51	62.50	27.44	58.33
Poland	49.44	33.88	57.47	44.59	98.09	57.87
Greece	62.78	42.48	56.98	55.91	42.77	57.45
Ireland	59.57	30.35	26.33	61.49	100.00	56.89
Dominican Rep.	15.27	53.12	59.42	58.85	25.00	56.32

Table 7 Definition points for the fuzzification of the variables added to the model applied to Italy

Variable Name	Membership function's name	Shape	Definition Points (x, y)=(x, μ(x))				
Emigration (Unit: number of people)	low	Half Triangle	(0, 1)	(1000, 0)	(10000, 0)	(∞, 0)	
	medium	Triangle	(0, 0)	(2000, 1)	(4000, 0)	(∞, 0)	
	high	Trapezoid	(0, 0)	(2000, 0)	(4000, 1)	(∞, 1)	
Religion (Unit: share of Christians over population)	low	Trapezoid	(0, 1)	(25, 1)	(50, 0)	(70, 0)	(∞, 0)
	medium	Triangle	(0, 0)	(25, 0)	(50, 1)	(70, 0)	(∞, 0)
	high	Trapezoid	(0, 0)	(25, 0)	(50, 0)	(70, 1)	(∞, 1)

Table 8 Effects of variables on the index for Italian investors

Effect on Extended Attractiveness	
Expected Years Of Schooling	Positive
Doing Business	Very Positive
Governance	Weakly Positive
Openness	Weakly Positive
Distance	Very Negative
Effect on Links ans Similarity	
Emigration	Very Positive
Immigration	Weakly Positive
Religion	Positive
Effect on Attractiveness	
Economic Attractiveness	Very Positive
Extended Attractiveness	More than Positive
Links and Similarity	Positive

Table 9 Attractiveness index for Italian international investors: the first 30 countries

Country	Demand	Supply	Economic Attractiveness	Extended Attractiveness	Links & Similarity	Attractiveness
Australia	90.65	30.63	60.70	66.61	100.00	69.83
Canada	100.00	30.98	60.96	60.29	100.00	68.91
France	100.00	30.35	50.70	67.42	98.75	68.52
United States	100.00	30.35	59.08	59.37	100.00	68.28
United Kingdom	100.00	30.35	52.46	75.89	75.00	64.89
South Africa	24.50	33.93	59.58	53.33	80.01	62.78
Germany	100.00	25.00	35.66	71.42	100.00	61.72
Netherlands	83.85	31.61	45.13	70.37	61.40	61.17
New Zealand	54.57	40.90	62.67	67.96	52.97	59.91
Belgium	68.07	30.35	44.79	71.04	75.00	59.60
Switzerland	67.86	31.61	39.82	78.32	75.00	59.60
Sweden	67.11	31.04	60.51	66.60	41.03	58.46
Cyprus	50.89	47.06	62.33	58.85	50.00	58.33
Georgia	8.39	55.32	59.64	62.50	25.00	58.33
Poland	49.44	33.88	57.47	62.50	53.27	58.33
Spain	100.00	31.61	43.55	62.50	81.23	58.33
Chile	31.43	54.22	69.15	42.24	58.23	58.21
Slovak Republic	41.36	45.96	64.12	63.79	25.00	58.21
Hong Kong	57.68	48.21	66.04	57.14	25.88	57.92
Slovenia	50.71	42.16	62.22	65.15	29.14	57.76
Brazil	70.74	37.20	64.61	29.37	75.00	57.60
Singapore	56.50	44.92	64.32	60.54	23.57	57.49
Peru	18.14	37.62	60.14	40.96	54.34	56.88
Uruguay	25.26	53.85	65.68	33.33	65.48	56.49
Greece	62.78	42.48	56.98	58.01	49.96	56.35
Malaysia	27.34	51.33	65.21	55.77	25.00	56.25
Israel	57.21	43.74	65.89	62.50	19.27	55.76
Mexico	69.79	45.56	71.45	41.91	48.55	55.47
Turkey	53.31	35.47	55.73	60.80	33.03	55.41
Austria	64.82	25.00	43.66	74.36	52.47	55.33

Table A1 *Data and sources*

Data	***Source***
Gross Domestic Product: current prices, US billion dollars	World economic outlook 2009, International Monetary Found. (http://www.imf.org/external/pubs/ft/weo/2009/01/data/dbcdatm.cfm)
Per Capita Gross Domestic Product Deflator: index	*World Economic Outlook* 2009, International Monetary Found.
Distance	The great circle distance in km between capital cities, available on http://www.wcrl.ars.usda.gov/cec/java/lat-long.htm
Italian emigrants: stocks	AIRE (Anagrafe Italiani Residenti all'Estero); emigrants registered at AIRE database from 1990 to 2006
Immigrants: stocks	National censuses and statistics: *ISTAT* for Italy, *ONS* for the UK.
Openness	*Penn World Table Version 6.3*, *Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania*, August 2009
Expected Years of Schooling	UNESCO Institute of Statistics
Foreign direct investment inward and outward: current prices, U.S million dollars	*OECD International Direct Investment Statistics - International direct investment by country Vol. 2009 release 01* for Italy, from *UNCTAD WID Country Profiles and National Statistics* for the UK
Language	*Ethnologue, http://www.ethnologue.com/*
Governance, Doing Business	*The World Bank*
Christians: % of Christians (Roman Catholics, Greek Catholics, Protestants, Anglicans, Lutherans, Orthodox and other Christians) on population	*The World Factbook*, Central Intelligence Agency

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