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**Conference Paper**

## Modeling attractiveness of global places

50th Congress of the European Regional Science Association: "Sustainable Regional Growth and Development in the Creative Knowledge Economy", 19-23 August 2010, Jönköping, Sweden

**Provided in Cooperation with:**

European Regional Science Association (ERSA)

*Suggested Citation:* Beauguitte, Laurent; Grasland, Claude (2010) : Modeling attractiveness of global places, 50th Congress of the European Regional Science Association: "Sustainable Regional Growth and Development in the Creative Knowledge Economy", 19-23 August 2010, Jönköping, Sweden, European Regional Science Association (ERSA), Louvain-la-Neuve

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# Modelling Attractiveness of Global Places A worldwide survey on 9000 undergraduate students\*

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## Abstract

Being competitive in a globalized world has several meanings according to the topic taken into account. This paper focuses on the attractiveness of places, as we assume that being a known and popular place is an advantage for global competition. And our main question here is to catch the mental maps of the future elite on a world scale.

In the framework of FP7 EuroBroadMap Project, we realized an international survey on more than 9000 undergraduate students from 18 countries in 43 cities. The sample was stratified according to six academic fields. The first part of the survey allows us to get explanatory variables. The second part of the questionnaire is related with places where students would and would not like to live in a near future. We asked the question for both cities and countries because we expected different results; some global cities might have a really positive image even if the country where it's located is often quoted negatively.

The first step was to compare two basics indicators: the first one regards the knowledge aspect (a country/a city is quoted or not), the second one is an asymmetry index measuring the balance between positive and negative quotations. These two indicators were then used as input to build a gravity model to explain (part of) the results. As expected (at least by geographers), size and distance still matter, specifically regarding the knowledge indicator. Regarding asymmetry, situation is much more balanced and need complementary explorations. Then we built a logit model in order to control sample size effects and to see, all things being equal, which countries are the most competitive from an attractiveness point of view.

Key-words: Attractiveness, Global cities, Globalization, Mental Maps, Political Geography, Spatial Interaction Models, World

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\*The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n.225260. [www.eurobroadmap.eu](http://www.eurobroadmap.eu)

## **Introduction: Distance and Mental Maps**

Let us start with an affirmation about globalization. Whatever the reduction of transport costs, whatever the reduction of political barriers, whatever the increase of information society... distance, and more precisely the Euclidean one measured by grand circle between two points of the earth will remain for a very long time a major obstacle to social and economic interactions between individuals, groups and societies. This affirmation is nothing more than the so-called 'first law of geography' formulated by Waldo Tobler in the 70's that we consider as still accurate in the Global World of the 21<sup>th</sup> Century.

At first glance, this defense of distance and related models of spatial interaction based on gravity models could appear as provocative to the post-modern reader which has the feeling to live in a more connected planet where creative class is living in an unbounded space of flows. But we will demonstrate by both theoretical considerations and empirical evidences that it is partly an illusion. The core of our demonstration aims to prove that, even if material flows seem less and less related to physical distance, it is not the case of mental maps and representation which are more resilient and definitively more influenced by gravity laws.

Our empirical basis is an international survey on the world vision of more than 9000 undergraduate students from 18 countries in 43 cities, according to six academic fields (social sciences, art, health, political science, business, and engineering). These students presently 20-25 years old are observed at the key moment where they will enter to the last step of education before becoming professional actors. They are representative of the future elites in their respective domains of activities and countries. Many countries fight to attract them, in the name of the so-called concept of 'chosen immigration' (which is nothing more than a way to capture for free the added value of education provided by the country of origin of highly educated migrants).

Defining what are the places (countries or cities) where these students would like to live (or not to live) in a near future is certainly one of the best way to evaluate the attractiveness of global places, and to check if distance still does matter or not in the global economy. Many authors give examples of networks between places of the world in the field of knowledge and innovation that seem to be fully independent from distance (e.g. connection between Bangalore and Silicon Valley for computer sciences). But what is the statistical reality of this phenomenon when we consider representative samples of students and not only exceptional cases?

### **The rise of network geography**

At the beginning of the 2000's, precisely at the moment where many economists rediscovered the importance of physical proximity and political bor-

ders, many geographers and sociologists (Sassen, 2002 [25]) adopted the reverse paradigm of neglecting the importance of spatial proximity and proposed studies focusing on linkages (air flows, connections between firms) without considering physical distance as a factor of interest. The decreasing use of spatial interaction models (Fotheringham & O’Kelly, 1989 [9]) and the increasing development of methods based on network analysis (Wasserman & Faust, 1994 [31]; Guimera *et al.*, 2005 [15]) were the clear signal of a deep conceptual change. It does not mean that the authors supporting the new paradigm assumed that distance decay effects has disappeared (Beaverstock *et al.*, 2000 [2]; Taylor, 2001 [27], Taylor *et al.*, 2007 [28]). But they were considered as residual in two senses: (i) a factor of decreasing importance in the history of humanity; (ii) a factor that should therefore not more be introduced *a priori* as explanatory factor in the modelization of flows or networks.

This decreasing interest for gravity model is not only related to a modification of scientific paradigm, but is also related to the growing interest for cities instead of states in most recent researches on globalization. Taylor illustrates clearly this point through the analysis of the content of the journal *The Economist*:

the official vision of the world provided by statistical tables of the journal is still based on a territorial division of the world by states and continents, but the network vision of a world ruled by global cities is dominant if we analyze the most frequent geographical places mentioned in the advertisement published by this newspaper : And yet the magazine remains dominantly territorial in its view of the world, it provides its readers with reports on regions and countries. Its text describes an international economy as a space of places: I refer to it as *The Economist* World I. However, an alternative picture can be found in the magazine between the pages of text; the advertisements describe a network world. They engage with a global economy as a space of flows: I refer to this as *The Economist* World II.

From a more theoretical point of view, Taylor suggests that we are actually living a transition between two metageography: ‘globalization represents a metageographical moment, a time when the taken-for-granted way in which, collectively, we organize our knowledge of the world as spatial structures is being eroded. Globalization challenges the mosaic metageography of states with a new putative network metageography of connections’ (Beaverstock *et al.*, 2000 [2]).

## **The interest of mental maps for the theoretical debate on globalization**

Taylor's point of view is not very far from the vision suggested by most economists specialized in international trade flows about the so-called paradigm of the end of geography formulated by O'Brien in 1992. Krugman (2004 [17]) considers that 'What seems to have emerged from the empirical work of the past dozen years is a compromise vision. Distance matters a lot, though possibly less than it did before modern telecommunications. Borders also matter a lot, though possibly less than they did before free trade agreements. The spaceless, borderless world is still a Platonic ideal, a long way from coming into existence'. But the discourse of economists, especially specialists from global trade concerning the effect of distance is really ambiguous and characterized by a 'frustration fascination'. Geographers are more open to the debate on distance and gravity model because they use it in a more inductive way than economists and do not consider distance only as a cost or an obstacle (see Annex B). It is the reason why it is not surprising for geographers to observe that distance effects concern not only material flows but also mental maps. Moreover, as explained by Hägerstrand 60 years ago, we can consider that all material flows are related to information flows (Grasland, 2009 [14]).

Globalization can't be considered only as an economic or financial issue, it also involves some cultural moves, especially regarding individual trajectories and perceptions. Dealing with this last aspect, we postulate that, to analyze the spatial organization of a phenomenon, it's mandatory to understand how people perceive space. The practices and actions of people and societies can be understood only when one takes into account the partial and subjective representation of spaces that are embodied with cultural meaning. With this approach, mental maps appear as a powerful tool to investigate the attractiveness (and repulsiveness) of places. If they were first used to highlight perceptions of small areas, especially urban ones (Lynch, 1960 [21]), they were soon used to determine regional, national (Gould & White, 1974 [13]) and world perception (Saarinen, 1998 [23]; Saarinen & MacCabe (1995) [24]). The two main objectives of this literature are to reveal the diversity of points of view and/or to test the geographical literacy of some segments of the world population. But it could also, and that's one of our objectives, be used in order to explain differences in perceptions.

# Measuring global attractiveness through mental maps of undergraduate students

## The EuroBroadMap Survey

The EuroBroadMap survey took place last fall and winter in 41 cities from 18 countries all around the world, and we gathered around 9000 questionnaires. The sample was stratified according to six academic fields (social sciences, art, health, political science, business, and engineering). The first part of the survey allows us to get explanatory variables like age, gender, spoken languages, field of study, socioeconomic background and mobility practices. The second part of it was four questions about places (first cities, then countries) where students would and would not live to live in the near future (the first page of the questionnaire is reproduced on Annex A). Quoting its country of citizenship or a city located in this country was not permitted, as we were interested in the image of the ‘outside world’.

We choose to ask question for both countries and cities as we assume that the image of a city could be different from the image of the city’s country. For example, we could perfectly imagine students declaring they would like to live in San Francisco without telling they would like to live in United States. It was crucial to realize the survey in all countries in the shortest period possible to avoid media effects, especially regarding the ‘would not like to live’ side of the question.

The following table sums up the number of answers gathered for this specific question on the global sample. We can already, even if the question came first, the total amount of quotation for cities is less than for countries, and students globally respected the balance between positive and negative appreciations.

	WOULD	WOULD NOT	TOTAL
CITIES	37581 (54.7%)	31129 (45.3%)	68710
COUNTRIES	39954 (51.4%)	37790 (48.6%)	77744

## Attractiveness, Knowledge and Asymmetry

There are different possible ways to exploit this survey. Before treating specifically attractiveness of places, it can be useful to present general results regarding two complementary aspects; knowledge and asymmetry. There are two successive steps to consider. Firstly, a country/city can be quoted or not - the positive or negative opinion doesn’t matter at this point. The simple fact to get a country/city often quoted shows that this country/city counts in students’ perception of the world. So we can build an indicator of knowledge aggregating of answers (positive plus negative) given by the students. Once the distinction is made between known and unknown places,

we use a classical asymmetry index for each country and city

$$A_i = \frac{sumP - sumN}{sumP + sumN}$$

where  $sumP$  = number of positive quotations,  $sumN$  = number of negative quotations. The index ranges from -1 (all answers are negative) to 1 (all answers are positive). We assume that attractiveness is related with both indicators: asymmetry is useful to catch popularity of a place among young students but knowledge also matters. If this last wasn't considered, a place quoted positively by one single student among 9000 would become the most attractive place, which would obviously be meaningless.

### **Global vision of the world by students involved in EuroBroad-Map survey**

The global picture regarding knowledge and asymmetry of countries can be illustrated either by a graphic or a cartogram (Figure 1) The graphic representation defines the position of the country as a combination of the degree of knowledge (on the horizontal axis) and the asymmetry of the balance between students declaring they would like to live or not like to live (on the vertical axis). For a better visualization, we decided that countries with low degree of knowledge (quoted by less than 1% of students) will not be represented and we adopt a logarithmic scale for degree of knowledge. As a whole, the graphic help to visualize easily the attractive countries (top right) which combines a high degree of knowledge and a positive asymmetry (France, UK, Germany, USA. . .) and the repulsive countries with high degree of knowledge and negative asymmetry (Iran, Iraq, Afghanistan, Pakistan, China, Russia. . .). It is also possible to analyze the case of countries that are well known but with an equal balance of positive and negative opinions like Japan, Southern Africa, or Brazil. Some countries appears very attractive but not mentioned by many students (New Zealand, Singapore, Sweden. . .) and the same is true for countries very repulsive but not mentioned by many students (Serbia, Chad, Niger, Bangladesh. . .).

The cartogram representation is less precise statistically speaking but offers a better vision of the spatial clusters of repulsive and attractive countries as well as a picture of the most known or ignored part of the world by students. The surface of countries is proportional to the number of quotation (knowledge) and the color is related with the asymmetry index, from dark green (countries where most students declare they would not like to live) to dark orange (countries where most students declare they would like to live). As a whole, we can notice a very big cluster of attractive countries in Northern and Western Europe which appears bigger than the equivalent cluster of Northern America (USA & Canada) and Eastern Asia (Japan). This 'Great Triad' is completed by a 'Small Triad' of relatively attractive countries in

Southern hemisphere (Brazil, Argentina, Chile, Southern Africa, Australia, New Zealand). The most repulsive part of the world for our sample of students is located in Southern Asia, Middle East, Sub-Saharan Africa and Central America. The countries often mentioned by global media (newspaper, TV channels) as places of crisis or war are particularly visible (Israel, Pakistan, Iran, Iraq, Afghanistan...). We can observe that poverty is not necessary related to knowledge, except in case of tragedy. Most countries of Sub-Saharan Africa are simply ignored<sup>1</sup> and only the biggest ones are mentioned.

It is important to observe that the picture presented in Figure 1 cannot be considered as representative at world scale as it is limited to the 9000 students involved in the survey. Moreover, the number of answers is not proportional to the number of students of the different countries and was built in order to benchmark different situations as regard to European Union: old members states (France, Sweden, Belgium, Portugal), new member states and candidate countries (Malta, Hungary, Romania, Turkey), Eastern neighbors (Moldova, Russia, Azerbaijan), Southern neighbors and former colonies (Egypt, Tunisia, Cameroon, Senegal), remote emerging countries (India, China, Brazil).

### **Specific example of the perception of USA**

For a country like USA, the mean value of knowledge (59%) and asymmetry that we have computed for the whole sample of students can recover important variations between countries. We can appreciate it on Figure 2 that describes the situation of USA for each country where the survey took place. We can see that the degree of knowledge vary from 31% in Malta to 69% in Cameroon. And the balance of students who declare they would like to live or not like to live in USA can vary from slightly negative in Tunisia (-0.28) to nearly fully positive in Cameroon (+0.82). This variation are not sample errors as important variations can be observed not only for countries with reduce number of surveys (Malta, Tunisia) but also between countries where a huge number of surveys was realized (Russia, Brazil, China, Cameroon).

## **A macroscopic approach: the gravity laws of mental perception**

The students from a country of survey  $i$  who declares that they would like to live in another country of the world  $j$  are aggregated in order to build

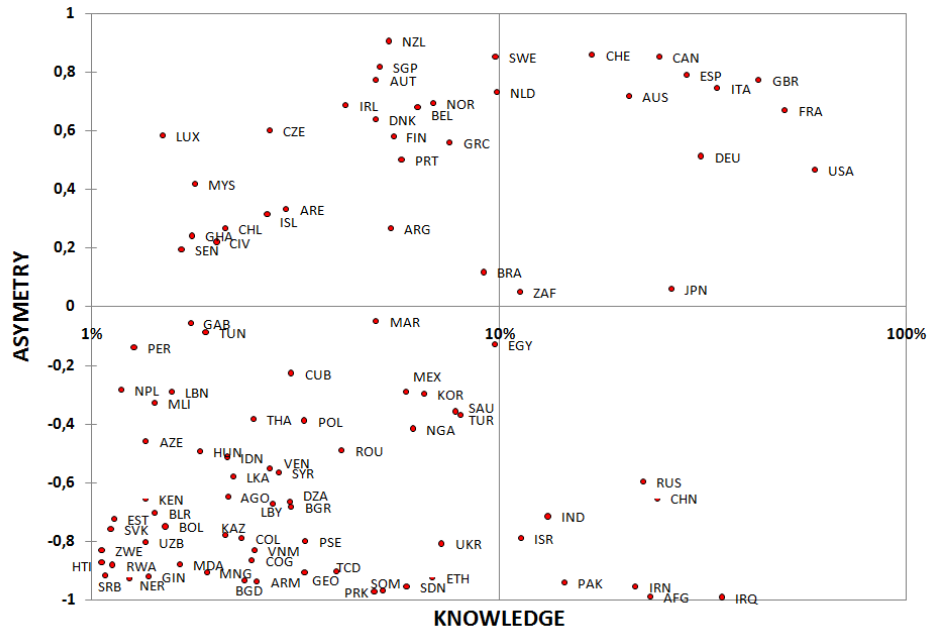
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<sup>1</sup>Many students consider this area as a whole and simply answer 'Black Africa' or 'Sub-Saharan Africa' in their answers to the question. It means that regarding mental maps, the majority of small states of sub-Saharan Africa does not exist as political entity and is considered as a 'big whole'.



Figure 1: Two visions on undergraduate students' visions

a) Global vision



b) Cartogram visualization

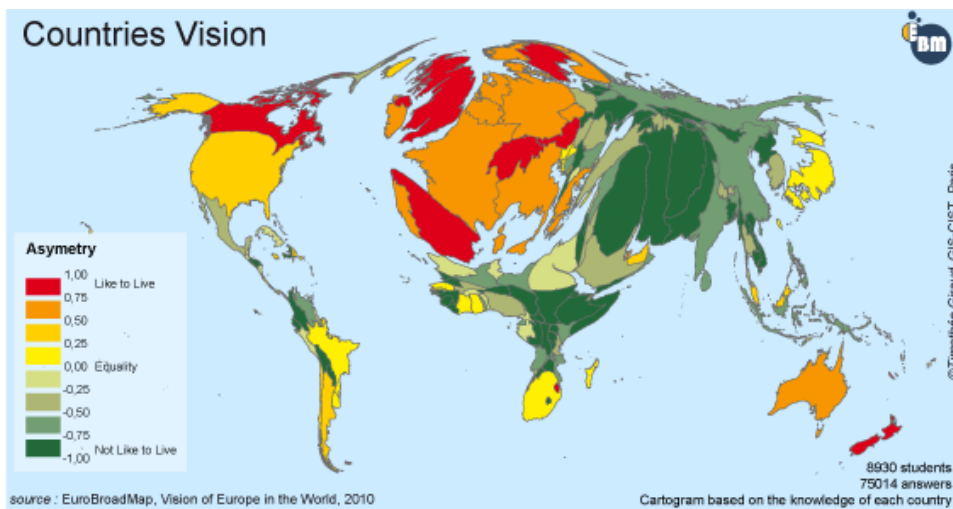
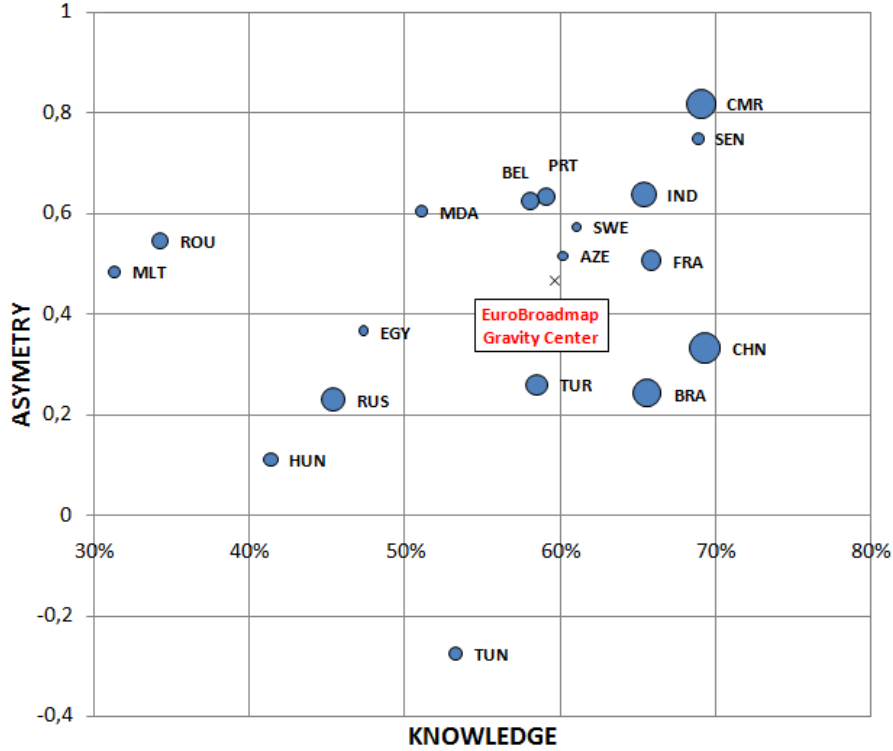


Figure 2: USA seen by 9000 students from 18 countries



The size of countries is proportional to the number of answers  
(e.g. China=1166 answers, Malta=198)

a matrix of flows  $LIKE_{ij}$  with 18 lines (the countries surveyed by EuroBroadMap) and about 200 columns (countries mentioned by the 9300 students as possible destination). Each cell of the matrix represents therefore the number of students from a country  $i$  who declared that they would like to live in a near future in a country  $j$ . The same procedure could be applied for the construction of a matrix of flows  $UNLIKE_{ij}$  representing the countries  $j$  where students declared they would not like to live in a near future. For statistical reason, we have reduced the number of destination to 144 countries and eliminated the ones who were quoted by less than 20 out of the 9300 students of the survey.

### A gravity model describing the aggregated choices of students

Whatever the matrix under investigation ( $LIKE_{ij}$  or  $UNLIKE_{ij}$ ) we have decided to apply the same model in order to benchmark the values of the parameters explaining choices made by students. The matrix of flows is therefore presented under the name  $F_{ij}$ , representing either the countries

where student would like to live or not like to live. The target model is formulated as follow:

$$F_{ij} = k.(POP_j)^{\beta_1}.(GNI_j)^{\beta_2}.(SUP_j)^{\beta_3}.(DIST_{ij})^\alpha.(\lambda_1)^{CONT_{ij}}.(\lambda_2)^{LANG_{ij}}.(\lambda_3)^{COLO_{ij}}$$

Size effect is measured by a combination of three parameters describing the effect of demographic size ( $POP_j$ : share of world population in 2005), economic size ( $GNI_j$ : share of world gross national income in 2005) and geographic size ( $SUP_j$ : share of world land area in 2005, excluding Antarctica). Here, we simply assume that students are more likely to choose bigger countries of the World and they are likely to ignore the majority of small and medium countries. But we do not precise immediately what is the most important factor of knowledge (population, GNI, area). The parameters of elasticity ( $\beta_1, \beta_2, \beta_3$ ) are supposed to be different for each factor of size which make possible to derive various combination of effects, according for example to GNI per capita ( $\beta_2, \beta_1$ ) or to population density ( $\beta_1, \beta_3$ ).

Geographical proximity is measured through a combination of two parameters. Firstly a classical distance decay function based on a measure of mean distance between inhabitants of countries of origin and countries of destination ( $DIST_{ij}$  measured in km). The form of the decrease of knowledge with distance is a Pareto (negative power) with exponent  $\alpha$  as we have verified that it provides better fit than a negative exponential function. Secondly, we introduce a dummy variable related to the existence of a common border between countries ( $CONT_{ij}$ ) associated to a parameter  $\lambda_1$  which measure the relative increase (or decrease) of flows for contiguous countries. We assume here that, all things being equal with size, students are more likely to mention positively (or negatively) the countries located at a short distance from the places where they live. The effect of proximity can be either continuous (effect of distance  $\alpha$ ) or discrete (effect of common border  $\lambda_1$ ) or complex (if the parameter  $\alpha$  and  $\lambda_1$  are both significant).

Historical and cultural heritage is measured through the introduction of two dummy variables describing the existence of a common historical or cultural heritage. The first dummy variable ( $LANG_{ij}$ ) is related to the existence of a language spoken by minimum 20% of inhabitants of each country. If the condition is verified, the flows are supposed to be multiplied by a parameter  $\lambda_2$ . The second dummy variable ( $COL_{ij}$ ) is related to the existence of a colonial relation between the two countries still active in 1945, whatever the sense of the relation (colonized or colonizer). If the colonial relation existed, the flows are supposed to be multiplied by a parameter  $\lambda_3$ .

The evaluation of the parameter of such a model is ordinary made by

OLS after log linear transformation of the equation :

$$\begin{aligned} \log(F_{ij}) = & a_0 + a_1 \ln POP + a_2 \ln GNI + a_3 \ln SUP + a_4 \ln DIST \\ & + a_5 (CONT) + a_6 (LANG) + a_7 (COLO) + \epsilon_{ij} \end{aligned}$$

The linear transformation provides easiest statistical solution but introduces many problems in the estimation of the model, especially when equation is solved by Ordinary Least Square (OLS) :

- Zero flows are removed or fixed to an arbitrary value
- Gaussian assumption of residuals is not fulfilled
- Real uncertainty of flows (that is ordinary proportional to the square root of  $F_{ij}$ ) is not properly taken into account

A more convenient solution from statistical and thematic point of view is offered by the family of Poisson regression models that uses a variant of Maximum Likelihood criteria on flows without logarithmic transformation, making possible to keep zero flows in the analysis and insures a better representation of each flow as regard to the uncertainty of measure. An important point for the use of Poisson regression model (d'Aubigny *et al.*, 2000 [12]) is to introduce a scale parameter (internal to the model) that allows a stability of the results, independently from the unit of measurement of trade flows (\$, thousands of \$, billions of \$, ...). Accordingly, the model to be solved can be written as :

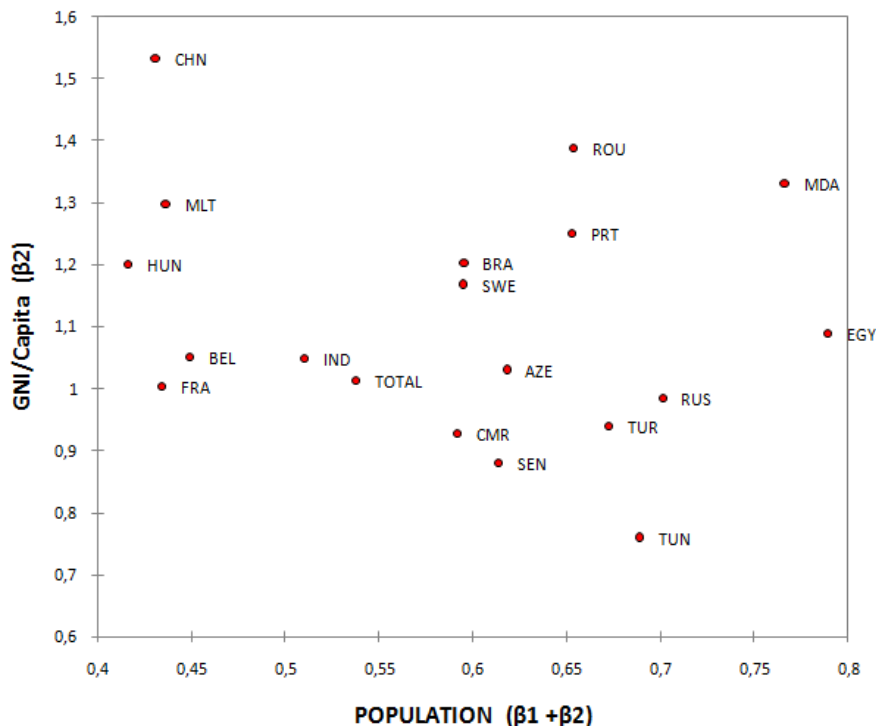
$$\begin{aligned} F_{ij} = & SCALE.exp[a_0 + a_1 \ln POP + a_2 \ln GNI + a_3 \ln SUP + a_4 \ln DIST \\ & + a_5 (CONT) + a_6 (LANG) + a_7 (COLO)] + \epsilon_{ij} \end{aligned}$$

We have computed the model for the whole sample of students (TOTAL: matrix of 18 origins and 144 destinations) but also computed one model for each of the 18 countries of survey in order to analyze the variations in the rules of definition of countries where students would like to live or not like to live.

### **Analysis of factors of attractiveness at macro level**

Explanatory power is very high. The model describing countries where students would like to live (Table 1) offers a nice confirmation of the theoretical validity of Tobler's first law of geography and confirms also the empirical efficiency of gravity model, not only for material flows (trade, migration) but also for virtual flows of imagination. We observe indeed that for all the 18 places of survey, the model as a whole explains 77% to 90% of the variation of choices made by students. The only exception is the global model that explains only 60% but remains nevertheless very significant.

Figure 3: The effect of population and GNI per capita on the choice of countries where students would like to live



Size effect is always very significant which is not very surprising as it is logical that students would mention firstly the biggest countries of the world as they often ignore the name of a lot of small and medium ones. But what is more interesting is the fact that the parameters of elasticity associated to population, distance and wealth are very stable from one country to another. Population and Gross National Income are always very significant with a typical combination of medium negative population effect ( $\beta_1$  between -0.30 and -0.60) and high positive income effect ( $\beta_2$  between +0.90 and +1.20). The result means that students are more likely to choose big countries ( $\beta_1 + \beta_2$ ), which is a pure size effect, but all things being equal with size, they are more attracted by countries with high GDP per capita (Figure 3). Concerning the geographical size, the effect is insignificant in a majority of countries but when it exists, it appears as positive (Belgium, Cameroon, France, Malta, Senegal, Sweden) and reveals preferences for countries with relatively low density of population like Canada, Australia, and Scandinavian countries.

Geographical proximity is generally very significant, but with one tricky exception called China and (as a consequence of previous exception), no significance at aggregated level of the 18 countries. In 17 of the 18 countries investigated, we can notice a significant relation between geographical dis-

tance and decrease of quotation of countries, all things being equal with their economic, demographic and geographic size. The distance decay varies between -0.16 (France) and +1.48 (Cameroon) which appears relatively large. But it has to be appreciated in combination with the contiguity effect which can sometimes capture a part of the distance effect. For example, the parameter of contiguity is equal to  $\ln(\lambda_1)=0.48$  for France, which means that the probability to choose a country with a common border is multiplied by  $e^{0.48}=1.61$  and is therefore increased of +61% as compared to a country of equivalent size and located at the same distance. If we have introduced only distance as geographical factor, the parameter of distance decay would have been higher and more significant for France. We can also observe more complex configurations of geographical proximity like in the case of Cameroon where distance effects are very strong (-1.48) but contiguity effect is inverted with  $\ln(\lambda_1)=-1.44$  which means that the probability to choose a country with a common border is multiplied by  $e^{-1.44}=0.24$  and is therefore reduced of -76% as compared to a country of equivalent size and located at the same distance. In other words, French students don't hesitate to declare they would like to live in countries at long distance but have also strong preferences for the neighbouring countries. On the contrary, students from Cameroon prefer generally to declare they would like to live in countries located at relatively short distance but with a strong exclusion of their immediate neighbours.

Historical and cultural proximity are not always measurable as some countries have not sufficient links of this type to test it in an isolated way. It is therefore more relevant to examine the TOTAL sample for the analysis of this effect which appears very significant and positive in both cases. Common language produces an increase of +77% of the probability that students declare that they would like to live in a country, and former colonial relations produce also an increase of 52%. These effects are often cumulative, as many colonial relations were associated to the diffusion of language. In the case of Tunisia, for example, the parameter is higher than usual and the probability to choose a country with the same language is a multiplication by 7.6 and a country with colonial relation multiplies one more time by 3: in other words, France will be 23 times more attractive for Tunisian students than Germany which does not share common language and history. But we have to be cautious in the analysis as different combinations can be observed. In the case of Cameroon, the linguistic parameter remains positive ( $\times 3.2$ ) but the colonial parameter is negative ( $\times 0.5$ ). It means that in the case of former colonizer of Cameroon with common language like France or UK, the attractiveness related to historical and cultural factor is only equal to  $3.2 \times 0.5=1.6$ . Cameroon students are therefore more attracted by Canada or USA which offers common language without being former colonizer. But it does not mean that more students will choose this destination as distance and size effects have also to be combined.

The exception of China is striking and needs further analysis. A first pos-

sible interpretation could be related to geographical location of China. According to gravity model, the most attractive place should be Japan (which is the most important concentration of wealth at short distance from China) but Japan has been closed to immigration for a very long time which could explain why Chinese students does not declare they would like to live here in a near future. Moreover, the historical conflicts between Japan and Chinese and the related negative image of Japan in China could contribute to explain this exception. As a consequence, Chinese students would focus more on the other poles of the Triad (USA and Western Europe), explaining the reduction of the effect of distance. The analysis of residuals, reveals negative declaration of 'like to live' not only for Japan (267 observed against 380 expected) but also for USA (538 against 871). Chinese students seem to be definitively more attracted by countries like France (626 observed against 276 expected), United Kingdom (480 against 269), Switzerland (283 against 165), Australia (402 against 201), New-Zealand (116 against 50), Korea (129 against 62) and, very curiously, by Egypt (40 against 1.2) and Maldives (30 against 0.2).

## **A microscopic approach: individual and collective factors deterring the attractiveness of countries**

We have seen in previous section that distance and size play a major role in the knowledge of country at aggregated level. We try now to evaluate what can determine the choice of students at individual level and to examine in particular if the domain of study and the gender have an influence on the choice of countries where students would like to live (or not) in a near future. We could for example imagine that students in engineering are more likely to be attracted by Germany and Japan than students in Arts; but we can also imagine that among students in engineering, there are differences between men and women. If such kind of micro effect exists at individual level, are they more important than the geographical macro effects that we have discussed before?

### **A logit level describing the individual choices of students**

We have firstly selected the 7873 students who have declared at least 1 country where they would like to live and 1 country where they would not like to live and excluded the students that gave no answer or answer of only one type (all positive or all negative). If we consider now a target country (USA) we can build three different choice models according to our assumptions on the dependent variable:

- Model 1-a (LIKE/ IGNORE): probability to mention USA as country where student would like to live in a near future

Table 1: Gravity model of countries where students would like to live in a near future

SAMPLE		MODEL			PARAMETERS								
Place	N	DevTot	DevMod	% expl	Intercept	InPOP	InGNI	InSUP	InDIS	CONT	LANG	COLO	Scale
AZE	114	1228	217	82,3%	9,769	-0,412	1,030	0,144	-0,594	1,969	-2,410	-1,249	1,873
					0,000	0,003	0,000	0,126	0,019	0,000	0,034	0,021	
BEL	475	6489	962	85,2%	8,279	-0,602	1,051	0,189	-0,301	-0,152	-0,054	1,937	2,848
					0,000	0,000	0,000	0,002	0,000	0,603	0,802	0,347	
BRA	1005	16379	2440	85,1%	17,665	-0,606	1,201	0,024	-1,233	0,005	1,470	x	4,281
					0,000	0,000	0,000	0,635	0,000	0,991	0,000		
CHN	1198	19025	2823	85,2%	5,714	-1,102	1,533	0,088	-0,018	0,937	1,906	x	7,445
					0,006	0,000	0,000	0,262	0,935	0,286	0,001		
CMR	1167	16934	2675	84,2%	20,225	-0,334	0,926	0,215	-1,483	-1,441	1,175	-0,622	4,701
					0,000	0,000	0,000	0,000	0,000	0,005	0,000	0,026	
EGY	98	1624	380	76,6%	16,883	-0,298	1,088	0,076	-1,422	-1,946	0,870	x	3,253
					0,000	0,197	0,000	0,578	0,000	0,093	0,010		
FRA	627	7696	1035	86,6%	7,603	-0,568	1,002	0,249	-0,162	0,482	0,118	0,740	2,931
					0,000	0,000	0,000	0,000	0,077	0,020	0,546	0,084	
HUN	244	3691	492	86,7%	8,141	-0,784	1,200	0,051	-0,501	0,063	-0,464	x	2,259
					0,000	0,000	0,000	0,383	0,000	0,824	0,508		
IND	908	11936	2191	81,6%	10,754	-0,538	1,049	0,080	-0,547	0,550	0,670	0,582	4,690
					0,000	0,000	0,000	0,217	0,043	0,344	0,000	0,043	
MDA	242	3877	418	89,2%	12,958	-0,564	1,330	0,139	-0,846	0,593	0,983	0,328	2,425
					0,000	0,000	0,000	0,087	0,000	0,417	0,160	0,540	
MLT	211	3326	420	87,4%	12,040	-0,862	1,298	0,220	-0,949	x	0,697	0,837	2,940
					0,000	0,000	0,000	0,040	0,000		0,076	0,044	
PRT	481	8840	866	90,2%	12,383	-0,597	1,250	0,048	-0,787	-0,017	2,177	1,497	4,086
					0,000	0,000	0,000	0,568	0,000	0,965	0,000	0,072	
ROU	439	6505	650	90,0%	12,144	-0,734	1,388	0,075	-0,800	-0,484	-0,993	x	2,542
					0,000	0,000	0,000	0,196	0,000	0,560	0,334		
RUS	827	11253	1814	83,9%	16,151	-0,282	0,984	0,083	-1,069	-0,822	0,366	-0,128	3,991
					0,000	0,004	0,000	0,211	0,000	0,013	0,540	0,840	
SEN	208	3179	623	80,4%	15,092	-0,266	0,880	0,220	-1,052	1,027	1,372	-0,556	2,497
					0,000	0,026	0,000	0,001	0,000	0,154	0,000	0,096	
SWE	110	1434	211	85,3%	8,113	-0,573	1,168	0,161	-0,428	-0,011	x	x	1,548
					0,000	0,000	0,000	0,014	0,000	0,976			
TUN	255	3521	741	79,0%	13,354	-0,071	0,760	0,156	-0,900	-2,052	2,028	1,109	2,890
					0,000	0,610	0,000	0,118	0,000	0,005	0,000	0,000	
TUR	734	8356	1441	82,8%	12,297	-0,266	0,938	0,084	-0,648	-0,241	-0,830	0,367	4,337
					0,000	0,017	0,000	0,239	0,000	0,625	0,708	0,901	
TOTAL	9343	131366	52222	60,2%	5,949	-0,475	1,013	0,030	-0,045	0,432	0,569	0,423	6,066
					0,000	0,000	0,000	0,190	0,281	0,004	0,000	0,013	

Place: ISO3 code of surveyed Country N: number of answers

DevTot: initial deviance - DevMod: final deviance

%expl: deviance explained by the model

Parameters: For each parameter, the first line indicates the estimated value and the second line the test of significance (prob>Khi2).

The symbol 'x' indicates that a variable is not available (e.g. Malta has no terrestrial borders and CONT is removed)



- Model 1-b (UNLIKE/IGNORE): probability to mention USA as country where student would not like to live in a near future
- Model 2 (LIKE/NOT LIKE): probability to declare ‘would like to live in USA’ against ‘would not like to live in USA’

The models 1-a and 1-b can be applied to the whole sample of 7873 students but the model 2 is applied to a reduced sample of 4771 students who has declared either they would like to live or not live in USA. In this third model, the 3102 students that did not mentioned USA at all are removed from the table. To compare the results, of the three logit models, we have used in each case the same set of explanatory variables defined as follow:

- NB\_Like: number of answers to the question ‘would like to live’ (1 to 5)
- NB\_Unlike: number of answers to the questions ‘would not like to live’ (1 to 5)
- State: place of survey (18 modalities)
- Study: domain of study (6 modalities)
- Gender: gender of the student (2 modalities)
- Age: Age of student in three classes ( <20 ; 20-22 ; >22)

The reader will notice that we have not introduced variables related to distance, contiguity or language as we assume that the variable State will capture all the information related to the macroscopic determinant of choice. What we try to analyze here is the relative importance of macroscopic effects (summarized by the country variable) and the microscopic effects related to individual characteristics of domain of study, and gender.

### **Analysis of factors of attractiveness at micro level**

The general fit of the different models appears pretty good and all parameters introduced in the models appears significant with the exception of number of ‘not like answers’ in Model 1.a, gender in Model 1.b and Age in model 2. Looking in more details, we can observe that the place of survey appears in all models as the most prominent explanatory factor, which confirms that students’ visions of the world are firstly determined by collective representation that are strongly related to the place where they live. But individual factors can also contribute to introduce marginal modification and it is particularly obvious in the case of the domains of studies which introduce significant differences in the perception of USA. Concerning gender, the effect is significant for the declaration of ‘like to live’ but not for the reverse declaration of

‘would not like to live’. Finally, age does not play an important role which is logical as the survey focused on the target group of undergraduate students (20-22) and a small variation of age around this target groups does not seem to introduce significant variations of results.

The place of survey’s effect can be analyzed in two different ways. Looking at the parameters of models 1-a and 1-b, we can firstly measure the variations in the probability for students to declare USA as one of the five countries where they would like to live (mean=44.5%) or one of the five countries where they would not like to live (mean=16.1%) in a near future. We can define different situations according to the position of countries in the figure 4.

Attraction (down right) means that students has more declared than expected that they would like to live in USA and less declared than expected that they would not like to live in USA. It is typically the case of sub-Saharan countries (Cameroon, Senegal) and at a lesser degree Western European countries (Portugal, Sweden). Repulsion (top left) defines the reverse case of countries where students declare less than expected USA as a country where they would like to live and more than expected a country where they would not like to live. It is typically the case of Tunisia and at a lesser degree of Egypt, Russia and Hungary. Knowledge (top right) is a specific situation where students declared USA more than expected both as country where they would like and not like to live. It means that USA plays an important but contradictory role in their perception. This model is observed for example in the case of China and Azerbaijan.

Ignorance (down left) defines the reverse case where students declared less than expected USA as a place where they would like or not like to live. It is typically the case of Malta and Romania where students seem to be the least interested by USA, either positively or negatively.

The model 2 proposes a different view of the problem as it considers only the variation of the probability to choose ‘would like’ instead of ‘would not like’ when USA are mentioned (mean=73%). In this case, the effect of knowledge is removed and the analysis focuses purely on the asymmetry of choices, i.e. the balance of positive and negative opinion. The parameter reveals therefore an opposition between the places of survey where students are more likely to declare they would like to live rather than not like to live in USA (Cameroon, Senegal, Belgium, Sweden, Portugal, India) and the places of survey where students are more likely to declare they would not like to live in USA rather than like to live in USA (Tunisia, Hungary, Brazil, China, Russia, Turkey).

The effect of individual characteristics is clearly less important but introduces some interesting discoveries concerning the vision of USA by students of the 18 countries of EuroBroadMap survey. We limit here the analysis to the model 2. All things being equal with the place of survey, it appears that USA are perceived as more attractive by students in the field of Engineer-

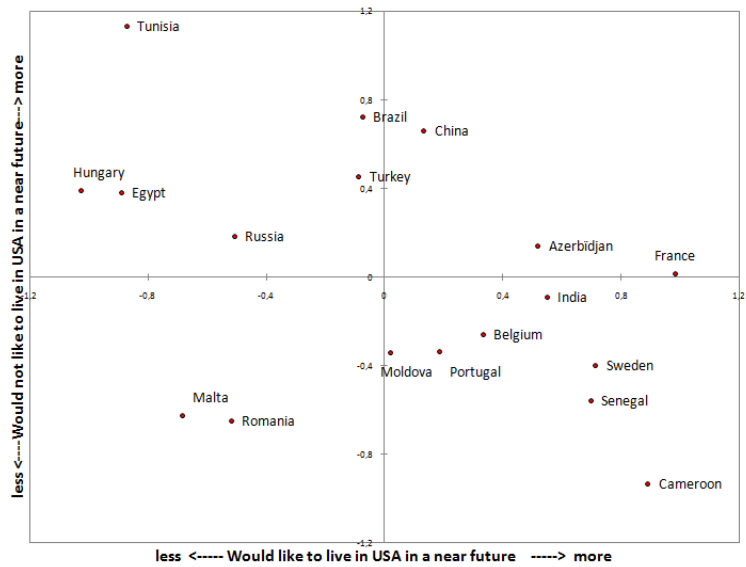


Figure 4: Vision of USA according to survey place

ing, Business and Health, but less attractive by students in Political Science and Social Sciences. Moreover, it appears that women are significantly less attracted by USA than men, all things being equal according to the other variables of the model. Age appears as not very significant, even if USA appears a bit more attractive for the youngest than for the oldest.

Table 2: Parameters of the 3 logit models

Model 1-a: Probability to declare that one would like to live in USA  
(Obs=7873)

Source	DDL	Khi <sup>2</sup> (Wald)	Pr>Wald	Khi <sup>2</sup> (LR)	Pr>LR
NB_Like	1	111.041	<0.0001	111.041	<0.0001
NB_Unlike	1	0.031	0.859	0.031	0.859
State	17	407.153	<0.0001	407.153	<0.0001
Study	5	44.042	<0.001	44.042	<0.0001
Gender	1	15.828	<0.0001	15.828	<0.0001
Age	2	7.385	0.025	7.385	0.025

Model 1-b: Probability to declare that one would not like to live  
in USA (Obs=7873)

Source	DDL	Khi <sup>2</sup> (Wald)	Pr>Wald	Khi <sup>2</sup> (LR)	Pr>LR
NB_Like	1	29.509	<0.0001	29.509	<0.0001
NB_Unlike	1	14.296	0.000	14.296	0.000
State	17	261.523	<0.0001	261.523	<0.0001
Study	5	32.188	<0.0001	32.188	<0.0001
Gender	1	1.265	0.261	1.265	0.261
Age	2	0.606	0.739	0.606	0.739

Model 2: Choice model between would like and would not like to  
live  
in USA (Obs=7873)

Source	DDL	Khi <sup>2</sup> (Wald)	Pr>Wald	Khi <sup>2</sup> (LR)	Pr>LR
NB_Like	1	83.071	<0.0001	83.071	<0.0001
NB_Unlike	1	8.372	0.004	8.372	0.004
State	17	297.820	<0.0001	297.820	<0.0001
Study	5	44.968	<0.0001	44.968	<0.0001
Gender	1	5.778	0.016	5.778	0.016
Age	2	2.221	0.329	2.221	0.329

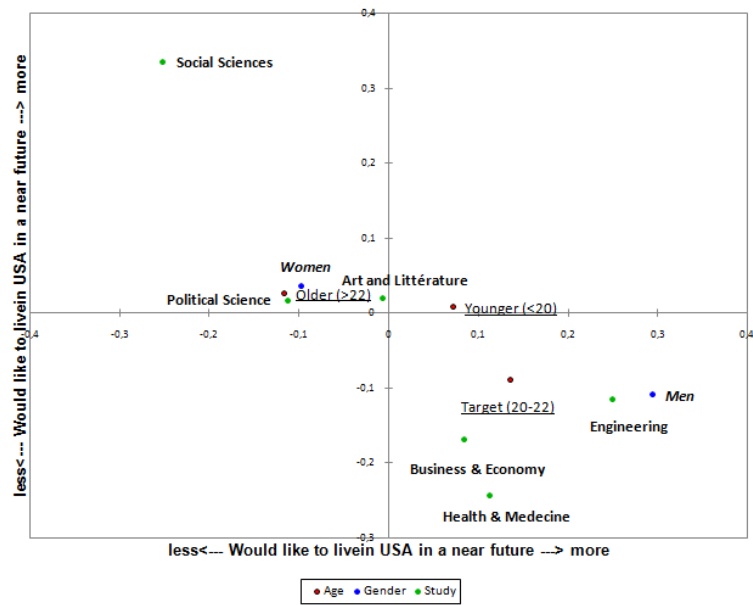


Figure 5: Vision of USA according to age, gender and field study

## **Conclusion: Space does (and will) still matters...**

As we announced in the very beginning of this paper, we do believe, and we hope our demonstration is convincing enough, that distance still matters and still must be taken into account dealing with representation and attractiveness. This future elite surveyed in the EuroBroadMap project is not composed of ‘rational agents with complete information on all actors’. Their mental pictures of the world can find robust explanations when history, language, migration opportunity and richness are introduced as explanatory variables. And the trivial Euclidian distance still appears nowadays as a strong explicative factor. As mental representations seem more resilient than evolution of the World-System, it could partly explain why the ‘tyranny of distance’ still plays an important role, despite the decreasing of its absolute importance regarding strictly material flows.

These first results could of course be completed in the future and further steps are already planned. It could be of great interest to treat data as a rectangular matrix giving the city surveyed as origin and places quoted as destination, and to work on both scales, saying countries and cities. One of our work hypotheses is that these two scales do not fit perfectly and that some cities can get knowledge and asymmetry indices much higher, or lower, than the country itself (but it’s not proven yet).

The work done here for USA could easily be done for the others often quoted countries as less than 20 countries represent more than 60% of all answers (for both negative and positive appreciations). An option would also be to build a logit model not with the whole sample but country by country in order to see where and how structural variables (gender, field studies, age, mobility practices and so on) explain students’ choices.

## **Acknowledgments**

Thanks to the searchers of the 18 countries involved in the EuroBroadMap Project who has contributed to the realization of the global survey, especially C. Didelon (CNRS, France), G. Van Hamme (ULB, Belgium), E. Marques da Costa (CEG, Portugal), A. Dubois (Nordregio, Sweden), A. Spiteri (IRMCo, Malta), O. Groza (UAIC, Romania), O. Zengingonul (DEU, Turkey), N. de Mello (USP, Brazil), A. Bopda (CAUPA, Cameroon), Y. Ning (ECNU, China), M. Thapan (Univ. of Delhi, India), A. Bennisr (Univ. of Sfax, Tunisia) and V. Kolossov (Russian Institute of Geography, Russia).

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## Annex A: Part A and B of the EuroBroadMap Survey on undergraduate students

Country	City	Field	Number
_____	_____	_____	_____

### HOW DO YOU SEE THE WORLD?

Thank you for your participation in this worldwide survey. Please note that this questionnaire is not a knowledge test and that the identities of all respondents will remain strictly anonymous.

### SOME QUESTIONS ABOUT YOU

<b>A.1)</b> Sex : <input type="checkbox"/> Female <input type="checkbox"/> Male	<b>A.2)</b> Year of birth?
<b>A.3)</b> Your country of birth: ..... What is your father's country of birth?..... What is your mother's country of birth?.....	<b>A.4)</b> What is your current citizenship/nationality? (If you have dual citizenship list both)
<b>A.5)</b> Which main language(s) was/were spoken at home when you were five years old?	<b>A.6)</b> Which language(s) do you currently speak on a <b>daily</b> basis?
<b>A.7)</b> Which <b>other</b> language(s) can you speak?	<b>A.8)</b> In which country or countries have you previously lived for an uninterrupted for a period of <b>more than four months</b> (not including your current place of residence)?
<b>A.9)</b> Please name the last 5 countries you have visited: ..... .....	<b>A.10)</b> How would you rate your family's income level? Please mark the appropriate level. <span style="float: right;">← Low High →</span> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<b>A.11)</b> How would you rate your mother's educational level? Please mark the appropriate level. <span style="float: right;">← Low High →</span> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<b>A.12)</b> How would you rate your father's educational level? Please mark the appropriate level. <span style="float: right;">← Low High →</span> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<b>A.13)</b> What expression defines you best : "I belong to ..." <input type="checkbox"/> a town / city / village" <input type="checkbox"/> a sub-national area" <input type="checkbox"/> a country or state" <input type="checkbox"/> a continent / world region" <input type="checkbox"/> the World" <input type="checkbox"/> other": ..... (If you have more than one answer, <b>please rank order them: 1, 2, 3 etc.</b> You can give equal weight to more than one choice.)	<b>A.14)</b> Do you have a feeling of belonging to a particular religion or another coherent set of beliefs? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I prefer not to answer this question. If "yes", please name or briefly describe your choice: .....

### YOUR VISION OF THE WORLD

**B.1.a)** With the exception of the cities of the country, or countries, where you currently have citizenship, list up to 5 cities for each of the following questions ...

.....where you would like to live in the near future?	.....where you would <b>NOT</b> like to live in the near future?
1 _____	1 _____
2 _____	2 _____
3 _____	3 _____
4 _____	4 _____
5 _____	5 _____

**B.1.b)** With the exception of the country or country(ies) where you currently have citizenship, list up to 5 country(ies) for each of the following questions ...

.....where you would like to live in the near future?	.....where you would <b>NOT</b> like to live in the near future?
1 _____	1 _____
2 _____	2 _____
3 _____	3 _____
4 _____	4 _____
5 _____	5 _____

## Annex B: Economists and geographers point of view on distance and gravity model

The relation of economists with gravity model in particular - and geography in general - is characterized by a strong ambiguity, that is perfectly illustrated by the different contributions of the book *The Regionalization of*

*the World Economy* published by Frankel (1998) [11]. As quoted by J.H. Bergstrand, there is a frustration fascination of trade economist with the gravity equation' because they recognized its very high explanatory power, but they have many difficulties to explain this explanatory power by 'real' economic theory like Heckscher-Ohlin model of equilibrium. In a review of thirty years of use of gravity model by trade economists, A.V. Deardorff (in Frankel (1998)[11]) observe that since the pioneer work of Tinbergen (1962) [29] or Linneman (1966) [20], the economist has encountered many difficulties to link the empirical model of gravity with relevant theoretical explanations on why it works. Initially, 'the gravity equation for describing trade flows first appeared in the empirical literature without much serious attempt to justify it theoretically'. But with further development of research (Linneman, 1966 [20]; Learner & Stern, 1971[19]; Leamer, 1974 [18]; Anderson, 1979 [1]; Bergstrand, 1985 [3], 1989 [4], 1990 [5]), another problem appeared as many economic theories of trade appeared likely to provide alternative explanations on why gravity model worked. . . As long as many economic theories are candidate to explain the empirical success of gravity model, none of them can take full benefit from it. As quoted ironically by G.M. Grossman in a comment of Deardorff derivation of gravity model from HO equilibrium model: 'This equation has been remarkably successful in innumerable empirical applications. Thus, the empirical success of the gravity equation cannot be taken as evidence in favor of 'newtrade models with imperfect competition and increasing returns to scale, as some previous authors may have suggested.' More important, Grossman suggest that none of the theories proposed by economists are sufficient to explain the power of distance decay effect in a globalised world where the cost of transportation has become relatively low: 'All this leads me to believe that something is missing from our trade models, be they of the Heckscher-Ohlin or Dixit-Stiglitz-Krugman variety. It seems we need models where distance (and common polity, and common language, and common culture) play more of a role. I suspect this is a model with imperfect information, where familiarity declines rapidly with distance.' In any event, while Deardorff can give us a convincing explanation for the existence of gravitational forces in trade, he cannot tell us why these forces are so strong.

Until now, we have focused on economic point of view on gravity model and, more precisely, on neoclassical economists' point of view that support the project of full abolition of borders that is supposed to increase global welfare. But at this point of discussion it is important to turn back to geographer's point of view on (1) theoretical justification of gravity model, (2) status of distance and (3) delineation of world region. The basic point of debate between geographers and economists is related to the interpretation of the role of mass (GDP, Population) and proximity (distance, contiguity, common language) in the gravity model.

For neoclassical trade economists, this factor is considered as 'natural'

or, more precisely, as exogenous parameter that is independent from the configuration of trade flows. As a typical example, Frankel *et al.*(1995) [10] indicate that the measure of the effect of Regional Trade Agreement is possible only when this exogenous factors are controlled: ‘First, we shall measure the extent, by looking at the magnitude of bilateral trade flows after one adjusts, by means of the gravity model, for such natural determinants of bilateral trade as GNPs and proximity’. The implicit assumption is therefore the existence of a universality of this factor that produces the same effect on trade all around the world. More precisely, it implies that (1) A given amount of GDP will generate the same amount of export or import all around the world (with eventual differences related to size effects but with the same elasticity) and (2) that a given transport cost will reduce the trade by the same amount, according to Samuelson’s iceberg hypothesis.

For geographers working on advanced spatial interaction model, the development of gravity models has followed a completely different way during the last 40 years with very important theoretical and methodological developments. From a statistical point of view, the initial formulation of the gravity equation in bi-logarithmic form has been replaced very early by more convenient models, taking into account the problems of error measurement and solving the question of zero-flows (Fotheringham & Kelly, 1989 [9]; Sen & Smith, 1995 [26]). More important, new forms of gravity model has been proposed with double constraint on origin and destination, either in multiplicative form (Wilson, 1967)[32] or additive form (Tobler (1983)[8]) that lead to a reconsideration of the role of ‘masses’ (population or GDP) that could be eventually removed. This family of double constraint model is particularly useful for the evaluation of barriers and preferences under the assumption of an equilibrium model of trade between countries of the world (i.e. under the assumption that all exports and imports of countries are given - margin of the matrix - this model provides an exact solution for trade allocation between countries). Despite its theoretical interest, this family of model was very few applied to world trade flows, with the notable exception of Bröcker(1990)[6]. But the most crucial difference between geographers and economists point of view is related to the question of distance that is not considered as an external factor but as a central parameter of the analysis. Contrary to the economists, geographers consider that flows and distance are not independent parameters. The classical assumption of the gravity models that flows depend from distance can be reversed and transformed into the reverse assumption that distance can be revealed by the observation of flows if we reverse the gravity model (Dorigo & Tobler, 1983 [30]).

The same is true for ‘regions’ that are not necessary considered as pre-defined for geographers. Of course, it is possible to adopt a deductive approach and to test the effect of a given division of the world that is supposed to have an influence on flows. From this point of view, geographers propose the same approach as economists and can introduce variables that try to

capture preferences and barriers according to different partitions of space that are established *a priori*: effect of RTA on trade (Bröcker & Rohweder, 1990), effect of linguistic barriers on telephone calls (Klaasen *et al.*, 1972 [16], MacKay, 2008 [22]), effect of political and historical divisions on internal migratory flows (Cattan & Grasland, 1992) [7]... But it is also possible to adopt an inductive approach and to try to reveal unknown divisions of space in region characterized by internal preferences and external barriers.

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