

# Country Selection for New Business Venturing: A Multiple Criteria Decision Analysis

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Venturing into international markets has become increasingly common for firms of all sizes. Selecting a country in which to establish a new business venture is a significant and important managerial decision, and requires the evaluation of many criteria. To date, studies that focus on identifying a country for foreign direct investment list the factors one must consider, but the formal use of Multiple Criteria Decision Analysis (MCDA) methods has not been revealed in the literature. This article illustrates how the use of MCDA can facilitate the decisionmaking process on which country to venture into.

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## Introduction

Company executives who wish to expand internationally face a bewildering choice of countries to enter. As a first step, the aspiring international entrepreneur must gather information on potential locations and evaluate this under several criteria. Such evaluation is often performed in an ad hoc fashion, but a more formal approach can greatly assist decisionmakers in their country selection. The use of Multiple Criteria Decision Analysis (MCDA) involves measurement, articulating the knowledge about decision processes, and explores possible outcomes. It therefore provides a rigorous and consistent approach, the transparency of which allows the decisionmaker to justify the outcome to stakeholders.

This article offers an overview of this methodology and, using a commercially available software packages, analyses the problem of selecting countries. The paper begins with the background to MCDA, followed by a review of relevant literature. The subsequent section offers an example of

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how the decision of selecting a foreign country for new business venturing can be approached by first enumerating the criteria and countries involved in that decision. A description of the decision model tested on five volunteers precedes a summary of sensitivity analyses. A discussion of the practical applicability of the MCDA procedure and suggestions for further enhancing its attractiveness conclude this article.

### **Background on MCDA**

The original motivation for the development of the MCDA field was the realisation that decision-makers needed tools beyond financial analysis to assist them in resolving conflicts between various interests and goals. Instead of transforming all interests and goals into monetary units and performing a cost benefit or cost effectiveness analysis, MCDA acknowledges that not all factors can be expressed in money terms. One of its most important contributions is the development of approaches that help decisionmakers organise and synthesise information of a complex and conflicting nature by taking explicit account of intangible criteria.<sup>1</sup> MCDA seeks to integrate objective measurements with value judgment and thus makes inevitable subjectivity explicit and attempts to better manage it.

MCDA proposes to aid decisionmakers in the understanding of trade-offs, resulting in a ranking of alternatives whenever possible, and allowing the elimination of clearly inferior alternatives. The result tends to be a better, less controversial and more defensible decision. This methodology does not propose to “decide for the decisionmaker”. Current research concentrates mostly on structuring a problem that requires a decision and on helping decisionmakers learn more about the problem through the model. The final output of these models is not to be understood as an “answer to the problem” but rather as a clearer picture of the consequences of selecting a certain course of action. When trade-offs among economic, social, environmental and other criteria have to be made, MCDA helps decisionmakers understand and communicate these trade-offs, thus promoting good decisionmaking.<sup>2</sup>

Almost any decision is inherently a multiple criteria decision, yet no one in their right mind would apply a MCDA methodology to decisions that have to be made quickly or to decisions that, in the grand scheme of things, really are not that important. Belton and Stewart (2002) recommend applying MCDA to explore “decisions that matter”, as measured by the level of conflict between criteria or by the level of disagreement among stakeholders as to the relative importance of criteria. If an overseas site needs to be located into a network of suppliers and users that is predetermined, the importance of the criterion “proximity to network of buyers and suppliers” may assume such proportions that all other criteria pale in comparison. Applying MCDA may not be necessary in this case. If, however, a handful of locations pass the “proximity to network” test, then MCDA may play an important role (in this situation one would probably eliminate the “proximity to network” criterion from the list of criteria used to further narrow the selection).

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This article extends the use of MCDA to the internationalisation process of new business ventures. The literature reviewed next is mostly orientated towards firms that are already large multinationals. MCDA has important implications for foreign country selection by enterprises of all sizes, but especially for new ventures where resources are limited and one mistake is sufficient to jeopardise survival. In addition to providing country ranking, MCDA helps decisionmakers eliminate inferior country alternatives, obtain the relative importance of criteria to be used in the country selection decision, and explain and defend the country selection to stakeholders. Furthermore, MCDA facilitates the inclusion of subjective aspects in the decision process, can be customised for any industry and easily replicable by entrepreneurs.

This article applies a class of MCDA models generally known as value measurement models, which are based on Multiattribute Value Theory (MAVT).<sup>3</sup> MAVT is one of the most widely-employed MCDA methods in practical applications, and in the authors' personal experience easily understood by individuals who are part of the business world.<sup>4</sup> This approach requires careful development of the scales in which each criterion is evaluated. Value functions attempt to translate the relationship between a certain evaluation and the satisfaction this evaluation brings to the decision-maker. The relative importance of each criterion is then assessed, and an overall score for each alternative is developed. General road maps applied by MCDA modellers typically involve six steps, which are discussed in [Appendix A](#) for value function based methods.<sup>5</sup> Experienced business decisionmakers are no doubt capable of making informed country selection decisions without the aid of a decision model. The employment of a formal method such as MCDA may nevertheless lead to a better analysis of all facets of the problem, and may help lead to decisions that can be better explained and defended.

Innovation literature has addressed the issue of whether metrics are valuable tools to help managers measure the merits of new projects.<sup>6</sup> Similarly, the knowledge management literature discusses the idea of rationalising what is usually done by instinct. Zollo and Winter (2002) state that people “often think imperfectly but constructively”. They also argue that knowledge articulation, whereby “implicit knowledge is articulated through collective discussions, debriefing sessions, and performance evaluation processes”, helps firms create and maintain more consistent performances across time.<sup>7</sup> Boisot and MacMillan (2004) differentiated among managerial and entrepreneurial mindsets.<sup>8</sup> Whereas the manager bases decisions on experience and “uses probabilities to justify its actions” the entrepreneur, lacking a body of evidence, makes decisions based on what appears to be plausible and coherent. Boisot and MacMillan call for knowledge management tools that would allow entrepreneurs to explore possible outcomes and assess their plausibility. The use of MCDA involves measurement, articulating the knowledge about decision processes, and involves exploring possible outcomes. It could thus contribute to more consistent and coherent decision-making. Consistency cannot, however, imply stagnation. Good knowledge management – and sound decisionmaking – require evolution, reassessment and adaptation.

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### *Good knowledge management – and sound decisionmaking – require evolution, reassessment and adaptation*

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Among businesses, ad hoc or “gut feel” country selection decisions are very common, whereas the use of analytical decision models is not. Multicriteria methodologies are rarely used in private companies, and even more rarely among small business owners. Pomerol and Barba-Romero (2000) listed published real-world MCDA applications.<sup>9</sup> Although some managerial and strategic decision situations arise on their list, none of those applications relates to the stage in the decision process where the decisionmaker must select a country in which to establish a new business venture.

Kasanen and colleagues (2000) proposed that the reason why relatively few MCDA models have widespread applications in the business world might be that its theory oversimplifies real-world decision processes.<sup>10</sup> Pomerol and Barba-Romero (2000) contended that MCDA could sometimes be rejected because of simplifying assumptions, and other times because of overly complicated questioning of decisionmakers. By testing a MCDA model on five practising entrepreneurs, this article shows that MCDA has the potential to improve the decision process in cases where managerial decisions overlook options, fail to evaluate consequences in terms of explicitly stated criteria and are less than efficient.

#### **Criteria-Based Applications in International Business Literature**

This section reviews relevant studies on foreign direct investment (FDI) decisions and on country investment risk assessment that, similarly to MCDA, involve sets of criteria. The criteria for country

selection chosen to exemplify the application that appears in the next section reflect indicators that are repeatedly alluded to in the literature. The reviewed literature has not been sufficiently explicit on the use and the practice of, and on the relationships between, those indicators. The following paragraphs review key FDI research, important country risk assessment work and finally demonstrate that MCDA has certain advantages over each of the methodologies developed by scholars. Table 1 summarises the objective of and the measures used in the studies reviewed.<sup>11</sup>

The 1976 work of Kobrin used socioeconomic and political indicators to investigate the relationship between various aspects of the environment and flows of US FDI in manufacturing. He applied regression analysis to correlate FDI to measures of government instability and subversion, socioeconomic development, market size and potential and economic growth. This work highlighted the importance of economic, cultural and demographic indicators, but, contrary to the next studies, the unimportance of political indicators. A regression approach shed light on to which criteria were relevant for FDI in a specific context. However, it did not provide a country ranking, nor did it help decisionmakers eliminate inferior country alternatives, obtain the relative importance of criteria to be used in the country selection decision, or better explain and defend the country selection to stakeholders.

A decade later, Meyer-Ehrman and Hamburg developed and tested a normative model to help firms identify a subset of countries for manufacturing investment. These authors noted that, while Aharoni had empirically observed that “firms do not look at the entire world when seeking potential location sites for FDI”, other researchers had stressed the need for a normative approach to country selection.<sup>12</sup> In response, Meyer-Ehrman and Hamburg offered a prescriptive method that incorporates both highest mean scores and highest variance scores (a measure of risks) for each individual indicator. Their country ranking was based on an aggregate measure of the weighted probability that each indicator scores above a corresponding threshold. This work also highlighted the importance of economic and cultural indicators, in addition to political and legal ones. MCDA is superior to this approach because it can be used to perform sensitivity analysis first, to help decisionmakers observe the implications on their decisions from changes in the relative importance of criteria (as represented by weights); and, second, to allow for a discussion that aids them in understanding the implications of their expressed preferences.

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### *Unlike survey-based methodologies, MCDA is easily replicable by entrepreneurs*

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For export-orientated FDI, Woodward and Rolfe (1993) focus on the Caribbean Basin, using a logit model to estimate the probability of a country being selected for investment in manufacturing. They mainly focused on political variables, but found that unionisation rate and land area were insignificant indicators. In 1994, Kumar examined the role of structural and policy factors in explaining a country’s attractiveness for investment by US firms. Based on ordinary least square regressions, Kumar concluded that all of his economic variables were significant except export-orientation of US affiliates, international orientation and stock of US FDI per capita. As mentioned earlier, MCDA offers multiple advantages over regression-based methods.

More recently, Brush, Maritan, and Karnani (1999) focused on the empirical determination of the relative importance of factors impacting a plant-opening decision for four types of manufacturing operations. They asked individuals to what degree each economic, political, legal and cultural indicator had influenced their location decision. Unlike survey-based methodologies, MCDA is easily replicable by entrepreneurs. Closest to the present decision-aid focus is the 2002 work of Zhao and Levary, which, based on economic and political indicators, ranked countries for FDI in the e-retail industry. The current article complements this work in two ways. It offers a general model (and indicators) that can be customised for any industry, and further develops Zhao and Levary’s

**Table 1. Country selection criteria proposed in business literature**

Study	Objective	Criterion				
		Economic	Political	Legal	Cultural	Other
Foreign direct investment						
Kobrin 1976	To develop and test a descriptive model for investigating the relationship between aspects of the environment and flows of US FDI in manufacturing	% of economically active population in agriculture % of economically active population in mining and manufacturing GDP GDP per capita GNP growth rate GNP growth rate per capita	Character of bureaucracy Regime type Changes in effective executive Major cabinet changes General strikes Riots Government crises Purges Assassinations Armed attacks Coups d'état Guerilla warfare Revolutions Irregular executive transfers		Interest articulation by associational group Interest articulation by non-associational group Ethnic and linguistic fractionalisation Literacy	<i>Demographics</i> population 1965 Urbanisation Primary and secondary school enrollment Human resource utilisation Telephones per capita Radios per capita Newspaper circulation per capita Commercial vehicles per capita Transportation
Meyer-Ehrman and Hamburg 1986	To develop and test a normative model for determining how firms should select the country to be used in the information search for FDI in manufacturing	GNP GNP growth rate Income Availability of local capital Availability of labour Stability of labour Corporate tax level Annual inflation Number of devaluations	Political stability Government intervention in business Likelihood of internal disorder and vandalism Delays in getting approval Desire for foreign investment	Probability of nationalisation Restrictions on capital movement Limits on foreign ownership Limits on expansion of foreign-owned firms Restriction on foreign trade	Cultural interaction	

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Table 1 (continued)

Study	Objective	Criterion				
		Economic	Political	Legal	Cultural	Other
		% of devaluation Currency forecast Overall balance of payment Reserves/imports ratio Convertibility in foreign currencies	Quality of infrastructure			
Woodward and Rolfe 1993	To develop and test a predictive model for estimating the probability of country selection for export-orientated FDI in manufacturing	GNP per capita Wage rate Exchange rate devaluation Inflation rate Transport cost Manufacturing concentration Land area Profit repatriation restrictions Tax holiday length	Political stability Unionisation rate	Free trade zones		
Kumar 1994	To develop and test a descriptive model for examining the role of structural and policy factors in explaining a country's attractiveness for export- orientated FDI by US firms	Export-orientation of US affiliates Wage rate Employment in export processing zones Industrial capacity Dependence on intrafirm imports International orientation				Opec member dummy

Brush, Maritan and Karnani 1999	To develop and test a descriptive model for investigating the determinants of four plant location strategies	<p>Stock of US FDI per capita</p> <p>Proximity to important markets</p> <p>Proximity to key customers</p> <p>Proximity to key supplies</p> <p>Proximity to other facilities</p> <p>Raw materials</p> <p>Energy</p> <p>Capital local technology</p> <p>skilled labor</p> <p>Low cost labour</p> <p>Access to protected markets</p> <p>Tax conditions</p>	<p>Regional trade barriers</p> <p>Government subsidies</p> <p>Exchange rate risk</p> <p>Advanced infrastructure</p> <p>Politics</p>	<p>Labour practices and regulation</p> <p>Environmental regulation</p>	<p>Language</p> <p>Culture</p>
Zhao and Levary 2002	To develop and test a normative model for ranking countries for FDI in the e-retail industry	<p>Growth rate of internet users</p> <p>Skilled local personnel</p> <p>computer and information technologies</p> <p>Currency convertibility</p> <p>Consumer purchasing power</p> <p>GNP growth rate</p> <p>Controls on profit repatriation</p>	<p>Local infrastructure for package delivery</p> <p>Political stability</p> <p>Degree of bureaucracy</p> <p>Degree of incentives for FDI</p> <p>Government restrictions on ownership of operation</p>		

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Table 1 (continued)

Study	Objective	Criterion				
		Economic	Political	Legal	Cultural	Other
Country investment risk assessment						
Cosset, Siskos and Zopounidis 1992	To develop a normative model for ranking countries as per their risk	GNP per capital Propensity to invest Net foreign debt to exports Reserves to import ratio Current account balance on GNP Export growth rate Export variability	Political instability			
Cook and Hebner 1993	To develop a normative model for ranking countries as per their risk	Industrialisation Economic problems Growth potential Balance of payments Debt servicing capacity International standing	Political stability Consistency of policies Fiscal policy Monetary policy Susceptibility to war Foreign investment policy Foreign exchange policy			Social stability
Doumpos, Zanakis and Zopounidis 2001	To develop a normative model for ranking countries as per their risk	GNP per capita Real GDP growth rate Projected GDP growth rate Projected inflation rate Short-term interest rate				<i>Firm specific</i> Depth and liquidity Performance and value Economic and market risk Regulation and efficiency

approach by proposing a more rigorous methodology for obtaining the weights of criteria used in the country evaluation.

Cosset, Siskos and Zopounidis (1992), Cook and Hebner (1993) and Doumpos, Zanakis and Zopounidis (2001) developed MCDA models for ranking countries by risk level based on economic and/or political indicators. In contrast, this article deals not only with country investment risk, but also with a myriad of other indicators. This is in line with Khanna, Palepu and Sinha (2005) who caution aspiring international business people against relying solely on country investment risk.<sup>13</sup> The MCDA model we propose is intended to eliminate inferior alternatives for market entry, considering financial risk as well as legal and cultural aspects which are important for country selection. This framework helps the inclusion of these often subjective aspects in the decision process.<sup>14</sup>

The literature review on formal models of country selection coupled with testimonials from professionals in the field has revealed an extensive list of indicators often considered in country selection. The criteria selected for the present application follows the necessary conditions for the use of a MCDA approach: avoiding the pitfalls of redundancy, lack of independence, and extreme complexity while being comprehensive and sensitive to criteria relevance. Equal weights of these factors are observed in some country ratings.<sup>15</sup> Equal weights, however, are essentially arbitrary and do not necessarily reflect the priorities of entrepreneurs.<sup>16</sup> In the present MCDA application not all factors are weighted equally, and weight variation and the trade-offs among factors are acknowledged and incorporated in the decision process.

### **Using Real Decisionmakers to Illustrate the MCDA Approach for Country Selection**

This section first describes the criteria from existing literature used in this illustration, then explains the criteria weighting. Value function elicitation is discussed next, and results are presented in the section that follows.

#### ***Decision Criteria and Country Alternatives***

The problem of selecting a foreign country for new business venturing is modelled from the point of view of an entrepreneur who has to evaluate a host of countries. The approach was tested on five US-based subjects with various degrees of international expertise.

The process of criteria selection was developed with a top-down approach and a value tree framework, both as described in [Appendix A](#). Once the overall goal of “selecting the best country to venture into” was defined, four perspectives (higher level criteria) emerged: political, legal, economic and cultural. Seventeen measures (sub-criteria) fell under one of these perspectives, resulting in the hierarchy of criteria as in [Figure 1](#) and listed in [Table 2](#). The criteria employed here should not be interpreted as a prescription. Decisionmakers wishing to approach a country selection problem with a MCDA methodology are encouraged to add or delete criteria based on their industry and situation. All MCDA requires is that criteria meet the conditions listed in [Appendix A](#).

Publicly-available indices were used to reflect the performance of countries under each of the measures of the value tree shown in [Figure 1](#) (except for measures under the cultural perspective). A description of these published indices is in [Appendix B](#). Khanna, Palepu and Sinha caution entrepreneurs against a sole reliance on published indices that fail to incorporate information about the institutional context in each country. The merit of relying on indices published by established organisations to represent the criteria used in the country analysis is their availability to the public at low or no cost. A small business could easily undergo an analysis such as the one proposed here by relying mostly on these published indices, complemented by a few customised cultural aspects. An entrepreneur with more significant resources (e.g. ready access to consultants and/or experts in various fields), however, does not need to be constrained by the criteria in this article. Measures under the cultural

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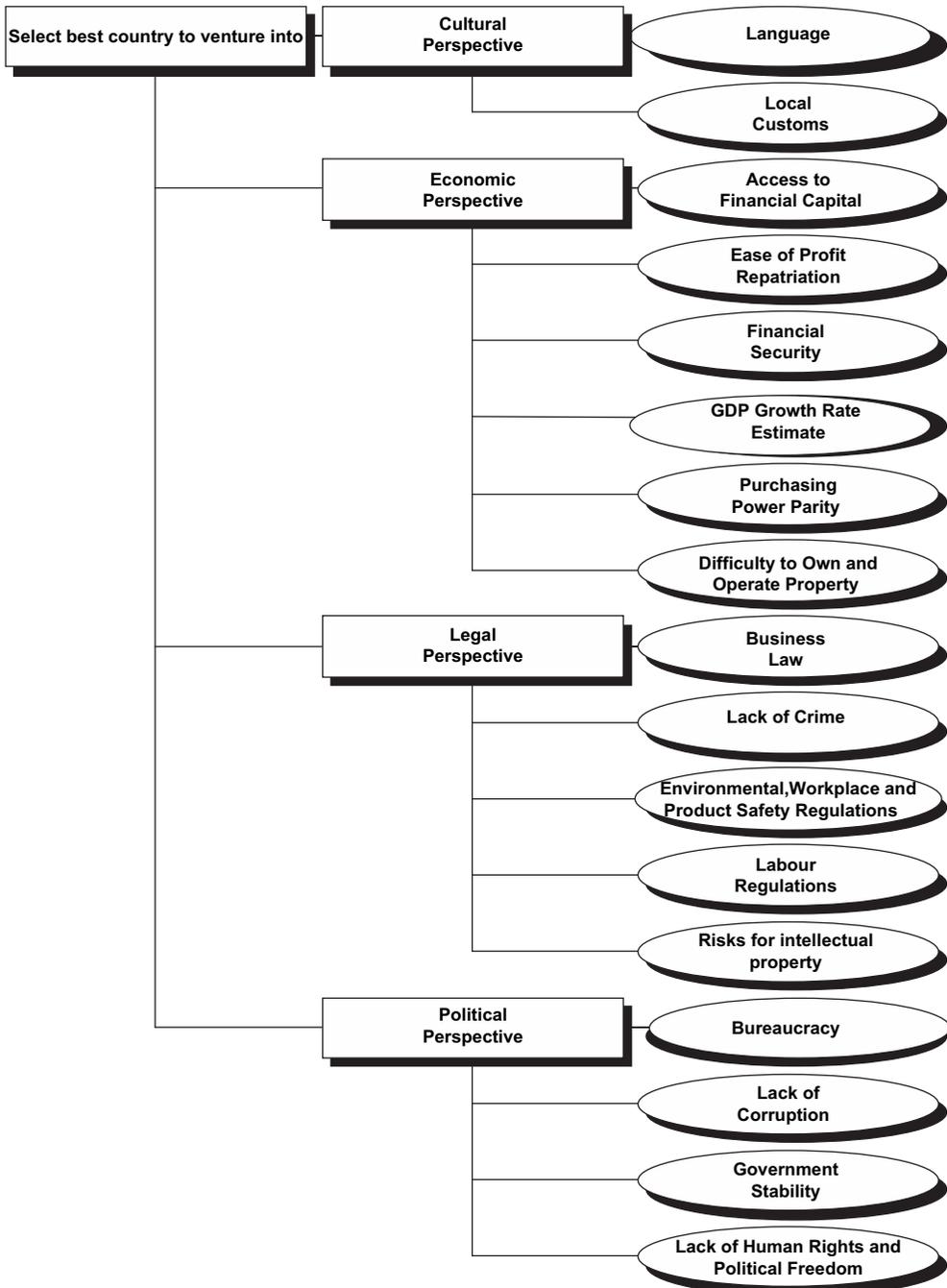


Figure 1. Hierarchical structure of the country selection problem

**Table 2. Published indices used in the country selection problem**

Measure	Index	Source
1. access to financial capital	A component of the Economic Freedom of the World Index called “extension of credit”	The Fraser Institute, 2002 <a href="http://www.freetheworld.com">www.freetheworld.com</a>
2. ease of profit repatriation	A component of the Economic Freedom of the World Index called “restrictions in foreign capital market exchange/index of capital controls among 13 IMF categories”	The Fraser Institute, 2002 <a href="http://www.freetheworld.com">www.freetheworld.com</a>
3. financial security	International Country Risk Index	The PRS Group, 2002 <a href="http://www.prsgroup.com/icrg/sampletable.html">www.prsgroup.com/icrg/sampletable.html</a>
4. GDP growth rate	Growth of real gross domestic product	Global Economic Prospects, 2002 (estimate) <a href="http://www.worldbank.org/prospects/gep2003">www.worldbank.org/prospects/gep2003</a>
5. PPP	Purchasing power parity	World Bank World Development Indicators, 2001 <a href="http://www.worldbank.org/data/icp/pppdata.htm">www.worldbank.org/data/icp/pppdata.htm</a>
6. difficulty to own and operate property	A component of the Index of Economic Freedom defined as “the extent to which the government protects private property (...) and how safe private property is from expropriation”	Heritage Foundation, 2003 <a href="http://www.heritage.org/research/features/index/">http://www.heritage.org/research/features/index/</a>
7. business law	A component of the Economic Freedom of the World Index called “impartial courts”	The Fraser Institute, 2002 <a href="http://www.freetheworld.com">www.freetheworld.com</a>
8. lack of crime	A component of the Economic Freedom of the World Index called “law and order”	The Fraser Institute, 2002 <a href="http://www.freetheworld.com">www.freetheworld.com</a>
9. environmental, workplace and product safety regulations	One of six factors composing the “regulation” component of the Index of Economic Freedom	Heritage Foundation, 2003 <a href="http://www.heritage.org/research/features/index/">http://www.heritage.org/research/features/index/</a>
10. labour regulations	“Labour Regulations”, one of the topics of “Doing Business” that focuses on a lternative employment contracts, conditions of employment, job security, collective bargaining, worker participation in management, and collective disputes	“Doing Business”, a World Bank publication, 2002 <a href="http://www.doingbusiness.org/">http://www.doingbusiness.org/</a>
11. risks for intellectual property	Software piracy rates	7th annual Business Software Alliance Global Software Piracy Study, 2001 <a href="http://www.bsa.org">www.bsa.org</a>
12. bureaucracy	A component of “Entry Regulations” one of the topics of “Doing Business”, defined as the number of procedures to open business	“Doing Business”, a World Bank publication, 2002 <a href="http://www.doingbusiness.org/">http://www.doingbusiness.org/</a>
13. lack of corruption	Corruption Perception Index which “reflects the degree to which corruption is perceived to exist among public officials and politicians”	Transparency International, 2001 <a href="http://www.transparency.org">www.transparency.org</a>

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Table 2 (continued)

Measure	Index	Source
14. government stability	“Political Stability”, a governance indicator which is a compilation of perceptions of the quality of governance of a large number of enterprises, citizens, non governmental organisations, commercial risk rating agencies and think tanks	The World Bank Institute Worldwide Governance Research Indicators Dataset <a href="http://www.info.worldbank.org/governance/kkz2004/index.htm">http://www.info.worldbank.org/governance/kkz2004/index.htm</a>
15. lack of human rights and political freedom	The levels of political rights and civil liberties worldwide by assigning each country and territory the status of “Free”, “Partly Free” or “Not Free”	The Freedom House Country Ratings, 2001–2002 <a href="http://www.freedomhouse.org/ratings/index.htm">www.freedomhouse.org/ratings/index.htm</a>

perspective reflect cultural preferences particular to each decisionmaker, and were therefore considered separately.

The model was applied to a set of 14 alternatives/countries: Argentina, Brazil, Egypt, Germany, India, Indonesia, Iran, Japan, Mexico, Nigeria, Poland, Russia, South Africa and Turkey. These nations span stages of economic development and political climate, and data are available for them. The next step involved quantifying how well each country fared under each perspective, by defining the level of each measure for each alternative. This was paramount to obtaining information on how each country rated on each of the selected measures.

For the criteria measured by published indices, this step consisted of direct data collection and entry of numerical scores, ranges of possible values and reference points. Table 3 contains the numerical scores used in the model for the 14 countries. Because some published indices are composites of several factors, and because these factors are often given the same weight in the

Table 3. Country ratings on each measure

	Access to Financial Capital, 2002	Ease of Profit Repatriation, 2002	Financial Security, 2002	GDP Growth Rate, 2002 (estimate)	Purchasing Power Parity, 2001	Difficulty to Own and Operate Property, 2003	Business Law, 2002
Argentina	6.9	3.8	17	−11.9	11 690	4	5.2
Brazil	7.3	0.8	30.5	0.7	7450	3	6.2
Egypt	6.8	5.4	37	1	3790	3	5.7
Germany	8	9.2	38	0.4	25 530	1	9.2
India	6.3	0	41	4.8	2450	3	8
Indonesia	3.8	1.5	34.5	3.2	2940	4	4
Iran	9.5	0	39	4.8	6230	5	4.9
Japan	8.1	7.7	47	0	27 430	2	7
Mexico	4.1	1.5	37	1.3	8770	3	5.2
Nigeria	6.6	5.4	35.5	−0.6	830	4	3.6
Poland	6.6	0.8	39.5	1	9280	2	5.8
Russia	5.9	0	38	4.3	8660	4	5.2
South Africa	9.2	0.8	34	2.2	9510	3	8
Turkey	4.3	2.3	32	4.1	6640	3	6.5

composition of the index, numerical scores were often drawn from individual factors – the raw data upon which the index is built – and not on the composite indices. Whenever possible the global reference points for each criterion were set to best and worst measures of performance expected to occur in realistic situations and were based on the range of possible values for each index. In some instances the use of global reference points would be highly subjective (e.g. how high or low can be GDP growth). In those cases local reference points corresponding to best and worst measures of performance within the set of alternatives were used.<sup>17</sup> Table 3 is robust with respect to the sources of data for the 15 non-cultural measures detailed in Table 2, but, as time goes by, it would be advisable to refresh the data by looking at recent reports of the various sources of information. For the two measures that are part of the cultural perspective, the performance of each country depends on the cultural background of the decisionmaker. Furthermore, these performance measures are best described not by numerical scores, but by categorical labels. Four levels of performance – four categorical labels – were defined for each of the two cultural measures. For language these labels are “fluent”, “basic notions”, “easy to learn” and “difficult to learn” while for local customs they are “similar”, “easily learned”, “difficult to master” and “incompatible with my values”. The evaluation of the countries under the two cultural measures was done individually with each practitioner, reflecting their cultural background and perceptions of the countries under consideration.

**Value Function and Weight Elicitation for the Five Practicing Entrepreneurs**

The next steps of the MCDA were conducted by representing the preferences of five distinct decisionmakers. The intentions of this experiment were twofold. First, it attempted to test the feasibility of the application of MCDA. Second, by comparing the five experiments and contrasting them to a sixth “benchmark” result, it highlighted that there is no “right answer” to a multiple criteria analysis; rather the outcome of the analysis is a function of the values elicited from each individual decisionmaker.

Table 3 (continued)

Lack of Crime, 2002	Environmental, Workplace and Product Safety Regulations, 2003	Labour Regulations, 2002	Risks for Intellectual Property, 2001	Bureaucracy, 2002	Lack of Corruption, 2001	Government Stability, 2002	Lack of Human Rights and Political Freedom, 2001–02
8.3	3	3.49	62	14	3.5	-0.74	3
3.3	3	3.93	77	16	4	0.17	3
6.7	4	3.83	58	13	3.6	-0.35	6
8.3	3	3.39	34	9	7.4	1.06	1.5
6.7	4	2.31	70	10	2.7	-0.84	2.5
3.3	4	2.61	88	11	1.9	-1.37	3.5
6.7	5	2.31	56	9	0	-0.62	6
8.3	3	2.77	37	11	7.1	1.2	1.5
3.3	3	3.49	55	7	3.7	0.22	2.5
5	4	1.89	71	9	1	-1.49	4.5
6.7	3	3.47	53	11	4.1	0.71	1.5
5	4	3.73	87	19	2.3	-0.4	5
3.3	3	2.78	38	9	4.8	-0.09	1.5
6.7	3	3.12	58	13	3.6	-0.61	4.5

The five practising entrepreneurs who agreed to contribute time to this research were unfamiliar with MCDA. Hence our exercise started with an explanation of the theory and motivation for the use of this method. We then presented the structure of the model, asked them to imagine themselves in the position of having to select a country to venture into, and proceeded to elicit their value functions and weights. In reality, the interaction between decision modeller and decision-maker would start at an earlier point by including the decisionmaker in the development of the hierarchical criteria structure and in the selection of alternatives. Instead, the criteria and countries were pre-selected to save the interviewees' time and to create a means of comparison.

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*In reality, the interaction between decision modeller and decisionmaker would start at an earlier point*

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Once the modelling phase was completed, we proceeded to develop value functions for each selected criteria (see [Appendix A](#)). This step was performed interactively with each practising entrepreneur to evaluate the applicability of value function elicitation in practice. A few of the decisionmakers exhibited some initial discomfort with the procedure, but as the evaluations proceeded, understood the implicit assumptions and felt more at ease with the questions. Others felt comfortable with the procedure right upfront. The assessment of the 17 value functions varied among the five entrepreneurs between 40 and 75 minutes. For all but the cultural perspective, value functions were obtained by each entrepreneur directly adjusting the value function displayed on the computer screen.

In addition to the five practising entrepreneurs, a “benchmark” subject serves as a proxy for the current state of entrepreneurial theory, where the preferences of this fictitious entrepreneur reflect the absence of criteria weighting.<sup>18</sup> This subject was modelled by assuming that all measures (sub-criteria) had a weight equal to  $1/17$ . An implication of the equal-weight-for-all-measures assumption is that the more measures are under a perspective, the higher the weight of that perspective (higher level criteria weights are computed as the sums of sub-criteria weights). This fictitious “benchmark” entrepreneur possesses linear value functions by construction.<sup>19</sup>

Representative value functions for the criterion “labour regulations” appear in [Figure 2](#). Notice how each one of the interviewed entrepreneurs perceives incremental changes on the levels of this criterion differently. G.O. feels that the benefit he would derive from selecting a country with a level of “labour regulation” of, say,  $z_i + \Delta$  instead of selecting a country with a level of “labour regulation” of  $z_i$  would depend only on  $\Delta$ , yielding a linear relation. E.P., by contrast, is indifferent among countries with no or relatively low “labour regulations” (low values on the horizontal axis); as regulations increase, however, his comfort level with the country decreases in a linear fashion. B.A. and M.D. values are both represented by interesting – but somewhat similar – curves. Both entrepreneurs seem to want a happy medium. They value a movement away from too many regulations – an impediment for business – just as much as a move from too little, which could potentially lead to abusive labour practices.

The assessment of value functions for the cultural measures had to proceed in a different fashion, as these aspects were evaluated solely in terms of a finite number of categorical labels. A continuous value function would not be appropriate to represent the discrete nature of these measures. The assessment method selected consisted of direct assessment of the value within the  $[0,1]$  interval that the decisionmaker would associate with each label.

Weights of the various criteria were obtained by asking each entrepreneur questions about their preferences, employing the swing-weight method. This process was conducted in a “bottom-up” fashion, with questions about the measure being asked first. For each of the perspectives (cultural, economic, legal and political), each entrepreneur was asked to imagine a hypothetical country that

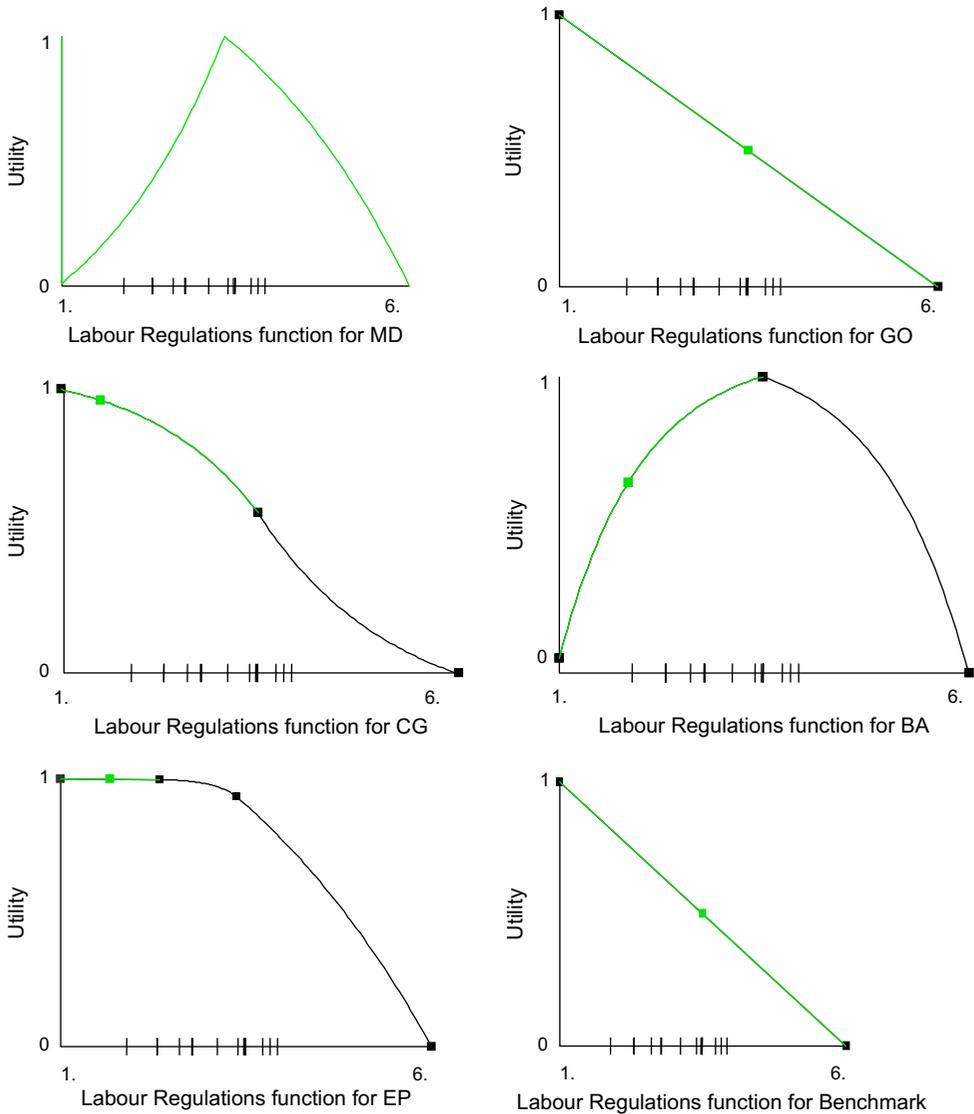


Figure 2. Value functions for “labour regulations”

had the lowest possible ratings in every measure of that perspective. If he could choose only one measure in which to improve this country from lowest to highest possible rating, which measure would this be? This measure was given a value of 100. He was then asked to choose a second-best measure, and assess the importance of its improvement from worst to best as a percentage of the first measure’s maximum “swing”. The questioning was repeated until weights for all measures of a perspective had been elicited, and then proceeded with the next of the four perspectives. The swing-weight method was quite intuitive to our decisionmakers at the measure level, but for some more difficult at the perspective level. In spite of this, the questioning was conducted in less than 20 minutes in all cases. Resulting weights are in Table 4.

### Country Rankings and Sensitivity Analysis

The objective of the current article is to offer MCDA as a means to help decisionmakers narrow the set of alternatives (countries) based on their own value system. Because decisions made ad hoc may

**Table 4. Weights (in %)**

Measure (Sub-Criterion)	Entrepreneur M.D.	Entrepreneur G.O.	Entrepreneur C.G.	Entrepreneur B.A.	Entrepreneur E.P.	“Benchmark” Entrepreneur
Language	2.5	6.8	1.1	4.0	3.5	5.9
Local Customs	7.5	13.5	2.7	8.0	2.8	5.9
Access to Financial Capital	1.2	4.5	4.3	2.0	5.7	5.9
Ease of Profit Repatriation	2.4	5.6	8.6	9.4	4.3	5.9
Financial Security	4.9	5.1	5.2	9.9	5.7	5.9
GDP Growth Rate	3.6	3.4	3.5	4.9	5.0	5.9
Purchasing Power Parity	0.6	5.3	6.0	4.9	3.6	5.9
Difficulty to Own and Operate Property	7.3	5.1	2.6	4.9	7.1	5.9
Business Law	8.7	8.1	5.1	14.3	6.8	5.9
Lack of Crime	7.8	4.8	10.1	12.9	5.1	5.9
Env., Workplace and Product Safety Reg.	3.5	2.8	4.0	2.9	4.3	5.9
Labour Regulations	3.5	1.6	5.1	2.9	6.4	5.9
Risks for Intellectual Property	6.5	7.3	4.0	7.1	8.6	5.9
Bureaucracy	5.4	7.7	11.8	0.3	7.8	5.9
Lack of Corruption	10.2	8.6	8.3	3.7	9.8	5.9
Government Stability	10.8	8.1	9.4	4.7	6.8	5.9
Lack of Human Rights and Political Freedom	13.6	1.7	8.3	3.3	6.8	5.9
<i>Perspective</i>						
Cultural	10	20	4	12	7	12
Economical	20	29	30	36	31	35
Legal	30	25	28	40	31	29
Political	40	26	38	12	31	24

be biased and not truly reflect one’s value system, the aim is not to offer an “optimal answer” to contrast with the country a decisionmaker actually selects; testing how often the MCDA approach “hits it right” is not the purpose of this research. Instead, it is to investigate how much more robust – and defensible – decisions that result from this process are than those made “from the gut”. The robustness of the country selection decision is tested by conducting sensitivity analysis. This analysis demonstrates under what conditions (for instance when changes occur to a measure or a weight) a selected country is outranked by another. The results of this application underscore the importance of not only performing sensitivity analysis, but of discussing its results with key decisionmakers. The preferences articulated by the decisionmaker are influenced by the modelling and structuring of the problem (e.g. by the way questions about weights are asked), and by the fact that decisionmakers are not always consistent or rational.<sup>20</sup> By involving the decisionmaker in a sensitivity analysis, the MCDA modeller brings these issues to the surface, and allows for a potential re-evaluation of previously-assessed preferences.

Figure 3 shows, for each practitioner, the country rankings resulting from the aggregate value function utilised in this exercise. The juxtaposition of the rankings for the various subjects

highlights some important issues. Contrasting the results obtained with the rankings of the “benchmark” entrepreneur reveals markedly different country rankings resulting from the introduction of the concept of criteria weights. The ranking differences resulting from individual preferences should also be noted.

Each entrepreneur observed the implications of changes in key model parameters on their decisions. For each entrepreneur the weights attributed to each measure were varied and the effect of this variation on the ranking of alternatives was examined. The graphs of Figure 4 help visualise the weight variation that would result in an alteration of the original order. The vertical line marks the current weight and associated ranking. Figure 4 shows two measures for which M.D. assigned relatively extreme weights. A very low weight was assigned to “access to financial capital” and a significant weight to “lack of human rights and political freedom”. Note that for both measures Germany and Japan remain on the top ranks even for large weight variations, while the ordering of other countries is more sensitive to variations in weights. For example, consider the “access to financial capital” measure, currently assigned a weight of 1.2 per cent. As the relative importance of this measure increases to around 5 per cent, a rank reversal between Poland and South Africa occurs. Even more dramatic are the effects of changes in the weight of this measure on the attractiveness of Iran as a potential new market. As the weight to “access to financial capital” increases, Iran moves from one of the least attractive new markets to as high as the preferred one. Rank reversals similarly occur by either increasing or decreasing the importance of the measure “lack of human rights and political freedom”.

During the course of the sensitivity analysis, M.D. expressed surprise at the significantly different rankings of Poland and Russia. It is precisely this type of reaction that makes us advocate the use of MCDA. The software package (Logical Decisions 5.1; also see Appendix A) produces graphs such as the one shown in Figure 5, which may be used to examine the scores of these two countries in detail. The ensuing discussion aided M.D. in understanding the implications of his expressed preferences. Figure 5 demonstrates to him that the relatively high weight placed on “lack of human rights and political freedom” sways the country rankings in favour of Poland.

Another entrepreneur, B.A., was surprised by his low ranking for Mexico, which resulted from the low utility allocated to that country with respect to legal perspective. He was also surprised

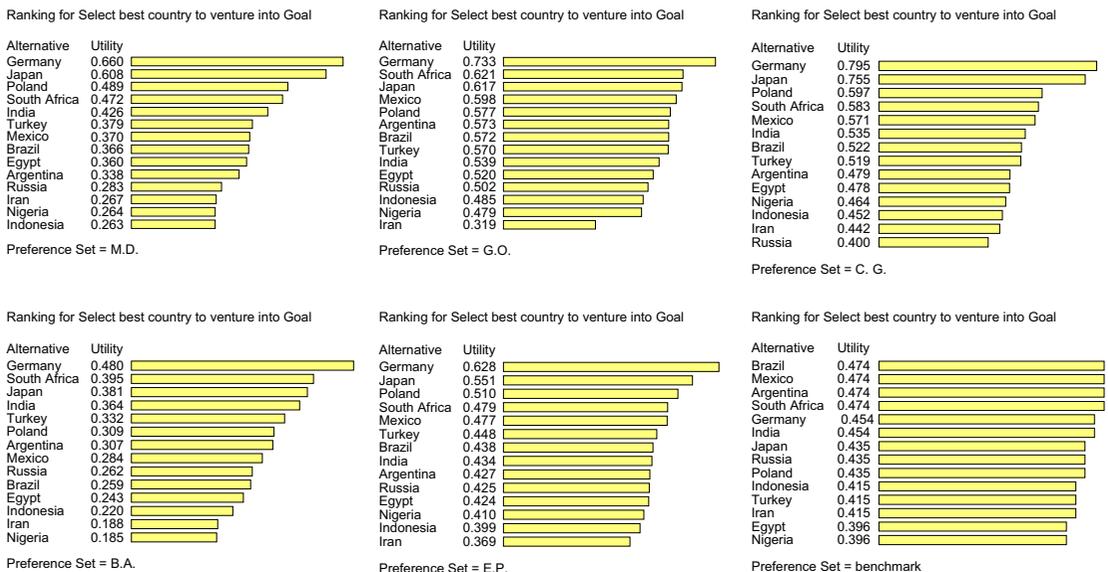


Figure 3. Country rankings

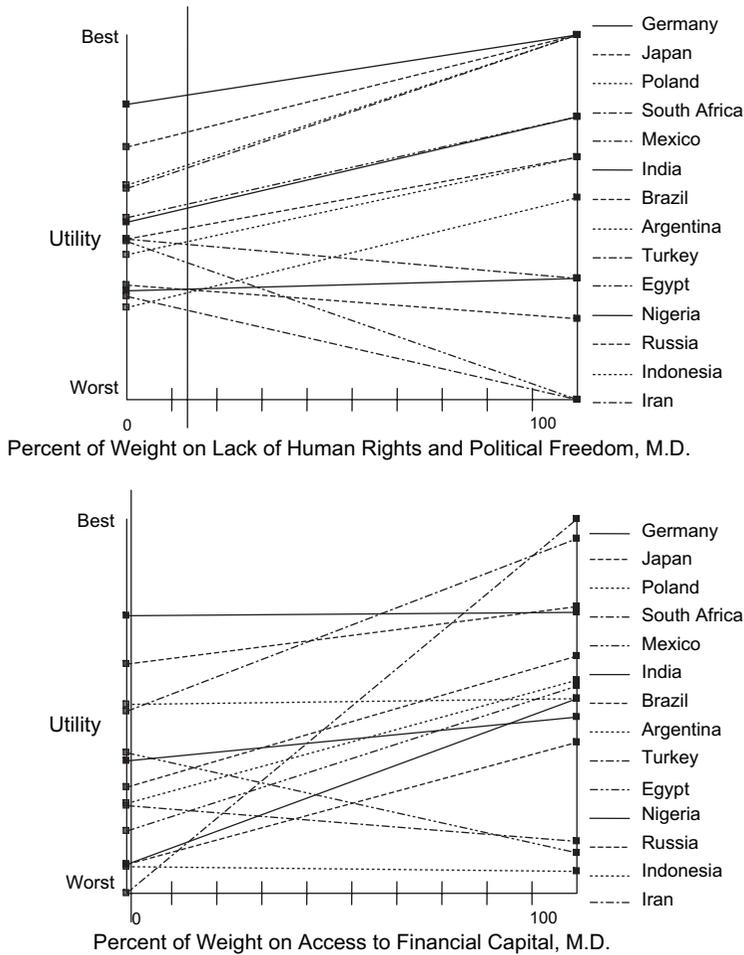


Figure 4. Sensitivity graphs for representative measures for M.D. (countries are listed in descending order of their rankings for the current measure weight)

by his high ranking for Turkey. A bar diagram of utilities, shown in Figure 6a, explains why these two countries fared the way they did. It is interesting to note that the contribution of “GDP growth rate” and “level of crime” are extremely high not simply because of the weight placed on these criteria, but because the combination of weight, country ratings and shape of the utility curves for these criteria. “GDP growth rate”, for instance, has a relatively low weight of 5 per cent. However, Mexico and Turkey lay at very different points on B.A.’s pronouncedly S-shaped utility curve, as exhibited by Figure 6b.

The experiment with each practising entrepreneur concluded with a short debriefing. M.D. felt that the questioning was manageable and objective, and that it could be applied to a real country selection decision process. Of course, in a real scenario the involvement of the decisionmaker would have to start at an earlier phase (M.D. would have structured the model slightly differently, particularly the representation of the cultural measures). The process of weight elicitation stimulated him to think in new ways about the four perspectives of the analysis (cultural, economic, legal and political). For example, he pondered the relative importance of environmental factors that a firm can affect through its operations, versus those that require a change on the part of the firm.

C.G. commented that the approach was valuable because it could help structure one’s decision process and, as a result, help decisionmakers think about their decisions. E.P. argued that this

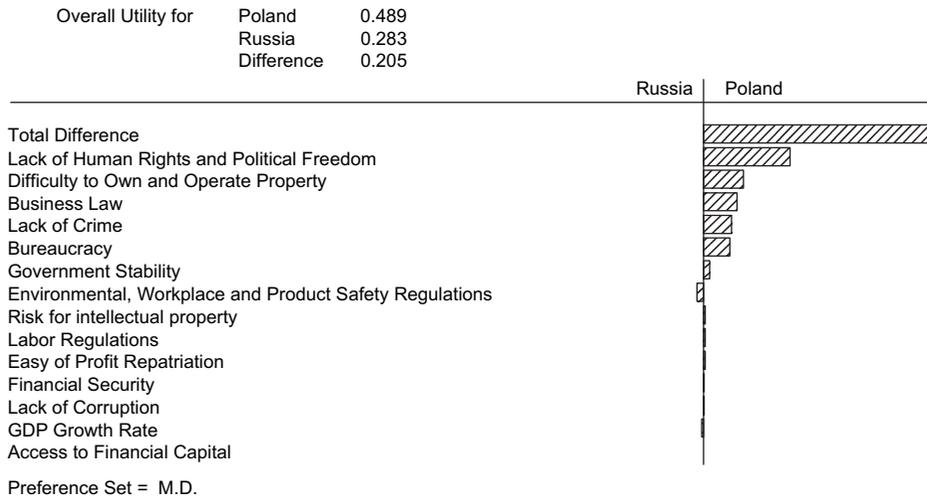


Figure 5. Detailed analysis of two countries for M.D.: Russia and Poland

exercise educated him on his decisionmaking capabilities and increased his awareness of which one of his values were affecting his decisions. He added that the methodology could substantiate his group decisions because it standardises the language one can use with a group of decisionmakers. He also appreciated the flexibility of the methodology in that it can allocate zero weight to some criteria that may not be relevant.

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*The methodology could substantiate group decisions because it standardises the language one can use with a group of decisionmakers*

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B.A.'s business focused on providing capital to start-ups and, as a result, he exhibited a utility function for the criterion "access to financial capital" that was inverted as compared with that of our other entrepreneurs (low access to financial capital translated in the highest utility). B.A. commented that, as a provider of capital, he possesses due diligence checklists where he separates the "must" from the "would be nice to have". Consequently, he would have preferred thresholds for the criteria's values as opposed to a continuum (note that it is possible to incorporate such thresholds in a MCDA approach). Furthermore, he commented that he would have thought that the economic perspective is the most important to his business, but going through our decision-making process made him realise that it is, instead, the legal perspective.

Last, G.O. perceived that there was more value in using this methodology for established firms wishing to expand. For many entrepreneurs and their start-ups, in his opinion, country selections are based on personal aspects such as the country of origin of a spouse (G.O.'s personal situation). He also maintained that entrepreneurs are likely to dislike to be told not to expand or start their new venture in the country they have already selected. He saw another role for MCDA in starting a business in an already selected country — as a way to evaluate potential problems.

Sensitivity analysis on the weights of the criteria helped each entrepreneur understand the implications of his preferences. Such analysis can do more, and in particular help select a mode of entry. For instance, a country that did not fare well, due to a low rating in a cultural perspective criterion, could remain under consideration for an alternate entry mode such as a joint venture. For the

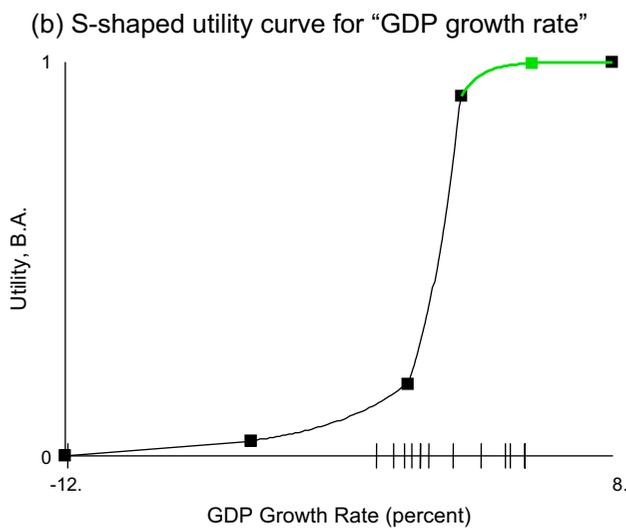
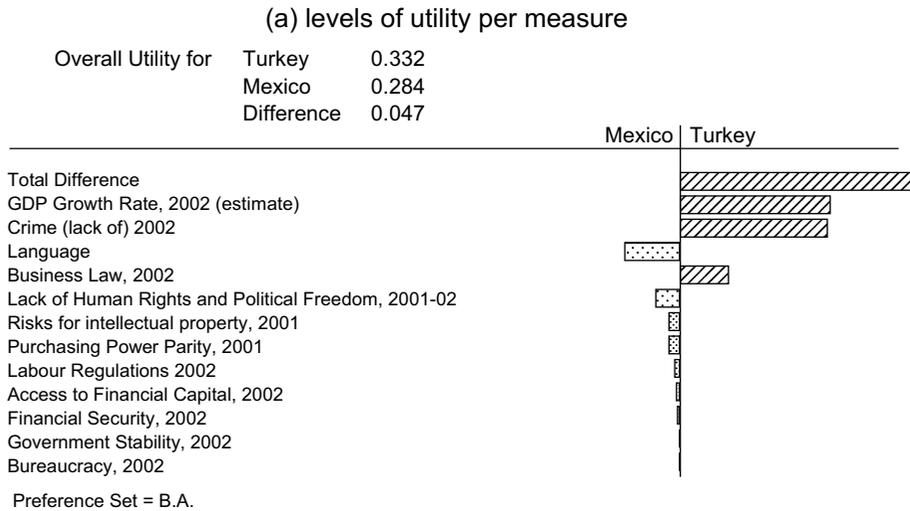


Figure 6. Comparing Mexico and Turkey for B.A.

entrepreneur with a technology transfer business, variations in PPP were relatively unimportant. This exemplified how decisionmakers in each particular industry would have distinct preferences regarding weights and value functions. Insights such as these greatly improve the quality of the decisionmaking process, confirming the proposition that MCDA can provide a positive contribution to decisionmakers.

## Discussion

The model offered in this article is general enough to serve any industry, and applies a commercially available package with published data with the vision of making the approach appealing to the business world. For an entrepreneur, the country selection process better reflects the complexities of real business environments in that more facets of the problem can be considered simultaneously and a non-equal weighting of performance-related constructs can be used yielding a more accurate preference function. As a result, decisions can be better explained and defended.

Although not explicitly shown, the methodology permits the incorporation of other types of criteria, including “on-off” criteria, criterion thresholds, and probabilistic criteria. For instance, “on-off” criteria could be “belonging to technology cluster” and “availability of technologically savvy labour”. Countries that do not meet minimum requirement on such a criterion can be eliminated from further analysis. However, the same criteria could be modelled instead with a scale that reflects “degrees of belonging to the cluster” or “size of the technologically savvy labour pool”. A criterion with a threshold would be, for instance, market size. It is possible to establish a minimum market size below which a country would be eliminated from further analysis. A probabilistic criterion would account, for instance, for the need to follow a big customer (without knowing with certainty where such customer will be in the future) and be stated as “likelihood of customer ABC having a significant presence in the country”. For each country under consideration there would be a (subjective) probability of this event, and such probability would be incorporated in the model.

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*Countries that do not meet minimum requirement on such a criterion can be eliminated from further analysis*

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Weight elicitation has the drawback of vulnerability to cognitive biases. In contrast with the situation where the decisionmaker makes “gut” decisions alone, when he or she engages in a systematic process led by an experienced decision analyst, the cognitive and motivational biases that tend to occur in weight elicitation may be overcome. Indeed, the sensitivity analysis, which is an inherent part of good MCDA practice, serves as a safeguard that reduces the impact of cognitive biases. Furthermore, experienced decisionmakers tend to overlook established objectives and instead rely on intuition and various heuristics when undertaking the selection process.<sup>21</sup> Heuristics are “rules of thumb” that while not “bad” per se, are susceptible to various sources of cognitive biases.<sup>22</sup> Experienced entrepreneurs, the ones most likely to use intuitive decisionmaking, could benefit from a structured process such as the one proposed here to minimise cognitive biases. Inexperienced ones, on the other hand, would benefit from using a MCDA approach by understanding it as a learning tool. The process of model building will encourage these less seasoned individuals to evaluate priorities carefully, engage in systematic rating and examine results through sensitivity analysis.

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**Lessons for executives**

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Important to...	because...
introduce the concept of criteria weights	<ul style="list-style-type: none"> <li>• it better captures an executive’s preferences</li> <li>• it produces markedly different rankings</li> <li>• it stimulates executives to think in fresh new ways about the perspectives of the analysis (e.g. cultural, economic, legal and political)</li> </ul>
Perform sensitivity analysis	<ul style="list-style-type: none"> <li>• executives can observe the implications on their decisions from changes in the criteria weights</li> <li>• there are variations in results among various stakeholders</li> <li>• it allows for a discussion that aids executives in understanding the implications of their expressed preferences</li> </ul>
consider simultaneously more facets of the problem	<ul style="list-style-type: none"> <li>• problems are typically complex and executives need tools that can manage complexity</li> </ul>

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As highlighted above in the lessons for executives, this work speaks to those in a position to influence the country selection process and, also, it speaks to academics. The country selection process with MCDA can better reflect the complexities of real business environments in that more facets of the problem can be considered simultaneously and a non-equal weighting of performance-related constructs can be used yielding to a more accurate preference function. As a result, country selection decisions can be better explained and defended. Moreover, we presented the background of MCDA and communicated the basic mechanics of how the decision model exposes the trade-offs and provides a clearer picture of the consequences of each choice. Scholars involved in executive education in the fields of international entrepreneurship and strategic planning are thus provided with discussions that may enhance their course reading list. The criteria and published indices used should also be of interest to this audience.

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### Lessons for academics

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Teaching and researching applications of mathematical models for strategic business decisions can be valuable. Yet, there are not enough studies in the management literature on the technical tools or processes that can benefit strategic business decisions.

When multiple criteria must be taken into consideration, the use of MCDA methodologies has proven valuable because it helps to

- model the preferences of decisionmakers
  - eliminate potentially inferior courses of action
  - predict how decisions will be made
  - arrive at more defensible decisions
- 

The framework presented in this article can also be refined. The choice of indices to assess the performance of the 14 countries that were studied may be challenged. Some of the selected indices might have violated the assumption of non-redundancy. In particular the indices used as surrogates for the “difficulty to own and operate property” measure (Table 2, criterion 6) and the “environmental, workplace and product safety regulations” measure (Table 2, criterion 9) include in their composition multiple aspects, some of which may have overlapped. In spite of these shortcomings, the selected indices were, from the array of published indices available, the most adequate to represent the set of measures included in our hierarchy of criteria.

This work has concentrated on deterministic evaluations of the performance of various countries under the criteria selected. A natural extension would be to include uncertainty in this analysis. The World Bank Institute Worldwide Governance Research Indicators Dataset is given as point estimates with a margin of error, which can be incorporated in the analysis. Similarly, the subjectivity associated with the assessment of the two cultural measures can be better incorporated in the model with the use of a discrete probability distribution over the possible descriptive labels for those measures. For example, one could account for the uncertainty that is inherent to the language measure by introducing a discrete probability distribution over the labels “fluent”, “basic notions”, “easy to learn” and “difficult to learn”. The introduction of this treatment would permit us to assign, e.g., a probability  $p$  that Russian would be “easy to learn” and  $1-p$  that it would be “difficult to learn”.

The cultural perspective is only measured by language and local customs. Although these two measures are useful indicators, other cultural elements could be considered. However, the literature review on FDI and country selection reveals that a cultural perspective is rather rarely used (Table 1). Reynolds, in his 1998 work where he attempts to understand the usefulness of intercultural

comparative techniques in selecting countries in which to retail, argues that “cultural values are somewhat remote from the analysis, because of the sheer difficulty of assembling even the most simple of comparable data sets.”<sup>23</sup>

In the international management literature, transaction-cost economics and resource-based theory have been used to explain why firms create subsidiaries overseas.<sup>24</sup> This literature shows that firms decide to go for FDI on the basis of their particular capabilities and/or resources. These firms must thus establish the extent to which their capabilities (and resources) are non-location-bound (i.e. transferable abroad) and the extent to which their resources are usable, different and richer than those of local and international competitors in the targeted country. That is, how are these resources “firm specific advantages” and how will they enable the firm to succeed overseas? Clearly, the answer lies on the host country’s characteristics and, as a result, the decision-aid proposed here can be very useful. However, valuing resources depends on a country-industry analysis of the competitive forces in the targeted market. Therefore, the comprehensiveness of the illustration offered in this article could be enhanced, and better contribute to the literature on multinational enterprises, with the addition of a “strategic perspective” that would incorporate resource-based criteria. This extension could also improve the understanding of the circumstances under which other entry modes (e.g. joint ventures or alliances) may be preferable routes for expansion.

Business venturing decisions are rarely made by a single individual: a group of stakeholders is usually involved in the decision. This application illustrates the strength of the methodology in being able to discuss and debrief the weighting process between people and, as a result, come up with a single set of preferences for a group of stakeholders. A facilitator can help stakeholders understand the reasons for any differences of opinion on the structure of the model (alternatives, criteria, preferences) and clarify areas of disagreement. Once consensus is reached, the method can be applied with the entire group synthesised by one “imaginary” decisionmaker. This careful evaluation of priorities and critical examination of ranking through sensitivity analysis should appeal to the business world.

## Appendix A: MCDA Modeller’s Road Map

*Criteria Identification.* The decisionmaker possesses a hierarchy of criteria, or value tree, with which alternatives are evaluated. MCDA modellers interact with decisionmakers to reveal these criteria, which may be measurable on a numerical scale or quantifiable on a categorical scale (e.g. low, medium, high). The set of criteria must be non-redundant and judgmentally independent (trade-offs between two criteria cannot depend on the level of a third criterion). It must also be sufficiently complete as a collection, but as simple and concise as possible, and compatible with the time and effort that decisionmakers are willing to allocate when working with the decision modeller. Researchers differ on the merits of a bottom-up versus top-down approach to building the set of criteria. The latter begins with an overall goal (e.g. selecting the best country), expands that overall goal into perspective (e.g. economic) and further breaks each perspective into more detailed sub-criteria (e.g. GDP growth rate) until a measurable criterion emerges. These sub-criteria are often referred to as “measures”; the terminologies is used interchangeably in this article. The bottom-up approach is alternative focused and starts with evaluating the pros and cons of each alternative. In our application we follow the lead of respected scholars, including Hobbs and Meier who argue in their 2000 book that it leads to better decisions, and opt to use the top-down approach, structuring criteria as a value tree.<sup>25</sup>

*Listing of Alternatives.* Decisionmakers may be confronted with a set of alternatives too large to manage, may develop a set of alternatives that is not comprehensive, or may list overlapping alternatives. Decision modellers use pre-screening methods to eliminate clearly inferior alternatives from the start and therefore limit the number of alternatives to a manageable amount. Techniques that help the development of a comprehensive list of alternatives have been discussed by several MCDA researchers.<sup>26</sup> Most multiple criteria software packages, including the one employed here,

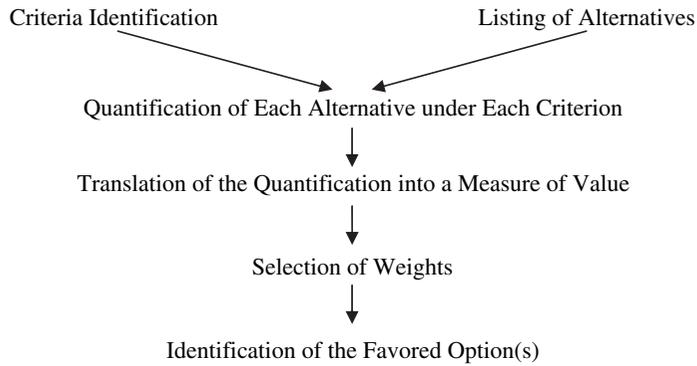
can handle only a set of alternatives that are independent of each other. Overlapping should therefore be avoided.

*Quantification of Each Alternative under Each Criterion.* The assessment of the performance – or score – of an alternative on each criterion can be an undisputable, measurable quantity, or a subjective, qualitative evaluation. This quantification is generally performed jointly by MCDA modellers and experts in the subject matter. For value measurement models, performance is assessed on an interval scale of measurement containing minimum and maximum reference points. When the performance of an alternative is assessed in terms of a subjective description (e.g. good or bad), this description is later converted into a numerical value, in relation to the specified reference points. Certain methodologies permit the consideration of a probability distribution of scores as an alternative to a deterministic assessment.

*Translation of the Quantification into a Measure of Value.* Given an alternative  $a \in A$  and a “lowest level” criterion (on a hierarchical structure)  $i$  with  $i \in \{1, \dots, I\}$ , let  $z_{i(a) \in Z_i}$  be a measure of performance of alternative  $a \in A$  with respect to criterion  $i$ , where  $I$  is the number of criteria under which alternatives are evaluated and  $Z_i$  the set of possible scores for criterion  $i$ .  $z_i(a)$  may be defined on a natural cardinal scale, on a constructed ordered categorical scale, or on an ordinal scale. The axioms of MAVT state that there exists a value function  $v(z_i(a))$  (in  $[0,1]$ ) such that  $a$  is preferred to  $a'$  on criterion  $i$  if and only if  $v(z_i(a)) > v(z_i(a'))$ . While the origin and scale of  $v(z_i(a))$  are arbitrary, two reference points  $z_i^0$  and  $z_i^*$  must be defined such that  $v(z_i^0(a)) = 0$  and  $v(z_i^*(a)) = 1$ . These reference points may be local (set to best and worst measures of performance within the set of alternatives  $A$ ) or global (set to best and worst measures of performance expected to occur in realistic situations).<sup>27</sup> The use of a common unit allows the MCDA modeler to aggregate the value functions of each criterion into an overall value function.

*Selection of Weights.* Not all criteria in a MAVT application will carry the same “weight”. This step is the one most often debated.<sup>28</sup> For instance, Belton and Stewart (2002) refer to the assessment and interpretation of the relative importance of each criterion – its weight – as “a matter of heated controversy”. They discuss the difficulties encountered by an MCDA modeller during weight elicitation. The attempts by scholars to address these difficulties may be at the root of the debate. The mathematical interpretation of the weight of a criterion varies with the MCDA method being used. Consequently, a method of elicitation that may yield mathematically correct weights for MAVT cannot be directly applied to elicit weights to be used in another method. Also, when attempting to ask a decisionmaker questions about their preferences as expressed by weights, modellers tend to encounter very little resistance – people think they can accurately express their preferences by weights. However, inconsistencies surface when modellers attempt to use the weights. Stewart favoured the swing-weight approach, where a decisionmaker is asked about the relative importance of an improvement from worst to best level in one criterion relative to all others.<sup>29</sup> In MAVT models, the weight of a criterion directly reflects the relationships between scores in that criterion and scores on all other criteria. Weights and measurement scales are intimately related, and the weight of a higher level criterion is the sum of the cumulative weights of its sub-criteria. Weight determination usually involves interaction between MCDA modellers and decisionmakers, in a process commonly known as weight elicitation. When properly elicited, resulting weights are valid and represent trade-offs that decisionmakers are willing to make.

*Identification of the Favoured Option(s).* Once criteria weights are identified, the MCDA modeller aggregates value functions  $v(z_i(a))$  for each criterion  $i$  in an attempt to sort out the degree of preference that each decision option enjoys. The simplest approach to the aggregation is a weighted sum of the value functions  $v(z_i(a))$ . Although more complicated aggregation procedures are sometimes proposed, the additive function is very intuitive, widely used and mathematically sound provided that criteria are properly defined and the scoring process understood by the decisionmaker.<sup>30</sup> The following flow-chart shows the six steps involved in a MCDA modeller’s road map, whereas the table offers information on MCDA software packages.



MCDA software package	Vendor	Country	Cost	Comment
Equity 3.2	Catalize	UK	£1,600	Portfolio of options
Expert Choice	Expert Choice	US	n/a	
Hiview 2	Catalize	UK	£850	
Logical Decisions 5.1	Logical Decisions	US	\$489	Recently rated “most powerful in its class”
Logical Decisions Portfolio 1.0	Logical Decisions	US	\$1995	Portfolio of options
Macbeth	Macbeth	n/a	E1,750	
OnBalance	Krysalis	UK	\$495	Does not allow uncertainty
Smart-Swaps	Systems Analysis Laboratory	Finland	n/a	Web use only, does not allow uncertainty
Web-HIPRE	100GEN	Finland	n/a	Web use only, does not allow uncertainty
WINPRE	Systems Analysis Laboratory	Finland	n/a	

Information available on the web and in D.T. Maxwell (2004), Decision analysis: Aiding insight VII. *OR/MS Today*, 31(5), 44-55. The authors have not tested all the packages and therefore cannot comment on their relative merits. The listing should not imply endorsement of any of the packages. The authors may have inadvertently omitted other commercially available software packages. The authors have not tested all the packages and therefore cannot comment on their relative merits. The listing should not imply endorsement of any of the packages. The authors may have inadvertently omitted other commercially available software packages.

## Appendix B: Description of Published Indices

The majority of indices in this article are recommended by the Foreign Investment Advisory Service of the World Bank Group ([www.fias.net/investment\\_climate.html](http://www.fias.net/investment_climate.html)).

### 1) Economic Freedom of the World Index

This ranks 123 countries. Each component ranges from 0 (worst) to 10 (best). Many of the components are based on data published by the International Monetary Fund (IMF) and the World Economic Forum. Components used in our article are: extension of credit; restrictions in foreign capital market exchange/index of capital controls among 13 IMF categories; impartial courts; and law and order

## 2) International Country Risk Index – Financial

Produced by the PRS Group ([www.prsgroup.com/icrg/sampletable.html](http://www.prsgroup.com/icrg/sampletable.html)), this index assigns a numerical value to a range of risk components, according to a preset weighted scale. The index varies from 0 to 50, with higher value of the index corresponding to lower perceived risk.

## 3) Growth of Real Gross Domestic Product (GDP)

We obtained 2002 GDP growth estimates from the World Bank publication *Global Economic Prospects 2003* ([www.worldbank.org/prospects/gep2003](http://www.worldbank.org/prospects/gep2003)). Average annual growth is given in per cent. This measure varies from a minimum of -11.9 per cent (Argentina) to a maximum of 7.8 per cent (China).

## 4) Purchasing Power Parity (PPP)

PPP is the per capita Gross National Product adjusted by purchasing power. The base for the adjustment is the cost of living in the US. Data used in this article was obtained from the World Development Indicators Database ([www.worldbank.org/data/icp/pppdata.htm](http://www.worldbank.org/data/icp/pppdata.htm)). PPP for the countries for which this database publishes this index varies from 48,080 international dollars (Luxemburg) to 480 international dollars (Sierra Leone).

## 5) Index of Economic Freedom

Published annually by the Heritage Foundation ([www.heritage.org/research/features/index/](http://www.heritage.org/research/features/index/)), it includes 50 variables divided into 10 categories: trade policy, fiscal burden of government, government intervention in the economy, monetary policy, capital flows and foreign investment, banking and finance, wages and prices, property rights, regulation and black market activity. The 10 factors are weighted equally, and we were unable to determine the exact composition of each of the factors, or the weight of each variable in its composition. Hence, the use of this index was limited to measures for which no other index seemed adequate. Components used in our model were: property rights; regulation; and doing business.

## 6) Doing Business

Published by the World Bank Group (<http://www.doingbusiness.org/>), it offers two indices that were used herein. First, an index of labor regulations constructed by examining the detailed provisions in the labor laws as the sum of the employment laws index and the industrial relations law index. This index takes values between 1 and 6, with higher values implying more rigid regulation. It was initially assumed that the “most preferred” level of regulations was 1, and the “least preferred” was 6. These preferences were later adjusted to reflect the preferences of each decision-maker. Second, an index of entry regulations that takes into consideration the cost and time required to complete all the procedures necessary to establish and to legally operate a business in a given country. To make the data comparable across countries, the World Bank documents the procedures for a hypothetical company with certain unchangeable characteristics. “Number of procedures” is one of the measures available. “A procedure is defined as any interaction of the company founder with external parties, including obtaining all the necessary permits and licenses and completing all the required inscriptions, verifications and notification to enable the company to start operation.” The number of procedures for all countries for which data is available varies from 2 to 20.

## 7) Corruption Perception Index (CPI)

Transparency International ([www.transparency.org](http://www.transparency.org)) publishes this index annually. The index is based on 14 polls and surveys from seven independent institutions. A detailed description of the methodology employed to compute the index (in 2001) is available at [www.gwdg.de/~uwww/2001.htm](http://www.gwdg.de/~uwww/2001.htm).

## 8) Freedom House Country Ratings

The Freedom House ([www.freedomhouse.org/ratings/index.htm](http://www.freedomhouse.org/ratings/index.htm)) has been publishing its “Freedom in the World survey” since 1973. The index is measured on a 1 to 7 scale, with 1 representing the highest degree of freedom. The index has two components, political rights and civil liberties. Those two components were averaged to develop the scores for our measure.

## 9) The World Bank Institute Worldwide Governance Research Indicators Dataset

The governance indicators dataset ([info.worldbank.org/governance/kkz2002/mc\\_chart.asp](http://info.worldbank.org/governance/kkz2002/mc_chart.asp)) reflects a “compilation of responses given by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries”. The indicators are given as point estimates on a scale ranging from  $-2.5$  (worst) to  $+2.5$  (best).

## 10) Piracy Rates

Piracy rates are published by the Business Software Alliance (BSA; [www.bsa.org](http://www.bsa.org)). BSA members include Adobe, Apple, Autodesk, Avid, Bentley Systems, Borland, CNC Software/Mastercam, Internet Security Systems, Macromedia, Microsoft, Network Associates and Symantec. Software piracy is measured as the amount of business application software installed without a licence. Values are in percentage. Software piracy rates were assumed to be an adequate proxy for the lack of protection for all types of intellectual property.

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27. In their simplest form, value functions are linear, reflecting a constant satisfaction from improving an alternative by one additional unit of a criterion. However, practitioners in the MCDA field have found that preferences are often better represented by S-shaped functions (Belton and Stewart, 2002).
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