THE EVALUATION OF THE NATIONAL COMPETITIVENESS: ANALYSIS OF EXISTING MEANS

Giedrė Staskevičiūtė1, Rima Tamošiūnienė2

Vilnius Gediminas Technical University, Sauletekio ave. 11, LT-12230 Vilnius, Lithuania
E-mail: 1 giedres@vgtu.lt; 2 rimtam@vgtu.lt

Abstract. The interests why some countries are richer than others and, therefore, more competitive arose already in XVI century, when mercantilists’ ideas were popular. Today, under conditions of economic integration and globalization importance of national competitiveness rapidly increasing. Countries’ policy makers pay attention to competitiveness gaining and its maintenance. Thus, national competitiveness takes important place in development strategies. But before forming national development strategy the current competitiveness conditions should be estimated. According to fact, that till today there is no generally accepted national competitiveness evaluation method, many different means are used. This article reviews and systematizes these means, analyzes the advantages and disadvantages of them.

Keywords: competitiveness of a country; national competitiveness; evaluation of competitiveness; theoretical model of competitiveness; composite indices.

1. Introduction

According to globalization and integration processes’ impact to the world, the national competitiveness becomes very important for every country. Countries facing with new challenges search for strategic decisions, which would help to consolidate and maintain competitiveness. In order to guaranty the efficiency of the strategic decisions and to get desirable results in the future, these decisions should be taking soundly. Thus, especially important task falls to national competitiveness evaluation.

Though the interests why some countries are more competitive than others arose already in XVI century, the biggest interest and discussions about national competitiveness and its importance started about 30 years ago. Competitiveness in national level in many different aspects during this period analyzed many researchers from Lithuania (e.g. Ginevičius 2004; Rutkauskas 2008; Ginevičius, Podvezko 2009; Snieška, Bruneckienė 2009) and other countries (e.g. Rugman 1991; Moon et al. 1998; Porter 1998; Cho et al. 2005; Berger, Bristow 2009). However, still there is no one accredited theory, definition and evaluation methodology of national competitiveness.

The main purpose of this article is to review the potential of national competitiveness estimation means, to distinguish the methodical principles and identify the main limitations.

The object is national competitiveness’ evaluation, as the base for strategic decisions formation.

Methods of the research: logical comparable analysis, synthesis.

2. The importance of national competitiveness evaluation

Under conditions of globalization and its’ sequences not just to the whole world economy but also to the every single country, as separate economic entity, the importance to analyze country’s competitive position in the international market arose. Evaluation of competitiveness became an important instrument for balancing the development process of the economy. For countries, especially for developing ones, the evaluation is important tool for policy creation – comparing the results with more developed countries shows for developing countries the right directions of development process.

The evaluation of national competitiveness serves as important tool not only for policy decision makers but also for academics for empirical research. In summary, national competitiveness is important because it lets:

– to view countrys’ position among other countries;
– to evaluate country’s changes across the time;
– to inform policymakers, investors and other interested subjects about country’s situation;
– to assess country’s progress towards international commitments.

Every country is unique according to many aspects, so to find one, for all countries suitable strategy enabling to reach success, ensure competitiveness is impossible. Thus, it is very important for countries to estimate the present competitiveness, to compare with other countries, to identify
existing weaknesses and strengths and to format individual efficient competitiveness strategy.

3. The potential of national competitiveness evaluation means

The increased importance of national competitiveness has influenced a demand for means by which national performance can be evaluated. The oldest and most established is per capita Gross Domestic Product (GDP), growth in which is usually interpreted as a sign of progress, particularly when accompanied by falling rates of unemployment. Also GDP is widely recognised as deficient in this regard (Lall 2001; Wilson 2008) because it fails to account for the large amount of welfare-enhancing non-market activity that characterises all economies and counts market production positively even when it implies negative impacts on welfare.

While GDP has remained the benchmark measure of economic progress, due to its simplicity, ease of calculability and comparability, there is strong movement towards the development of measures that provide a more meaningful and robust basis for the analysis of economic performance. Increasingly significant have been arguments that GDP does not reflect true well-being or welfare, determined as it is by other socio-economic factors in addition to income, and that it cannot capture the interdependence between economic activity and the environmental resources on which it depends (Wilson 2008).

It should be noted that the evaluation of the national competitiveness in this case capturing both – measurement and analysis, which are themselves fundamentally inter-dependent. Measures provide a foundation for analysis of the factors that determine the measured performance.

There is no generally accepted classification of means used for national competitiveness evaluation. The analysis of scientific and practice literature showed that national competitiveness can be evaluated using wide range of theoretical models, creating and analyzing composite indices or analyzing separate indicators of competitiveness. Authors of the article the means of the national competitiveness evaluation according to the evaluation purpose classifying into two groups – “identifying methods” and “ranking methods” (Fig. 1).

---

**Means for National Competitiveness Evaluation**

<table>
<thead>
<tr>
<th>Identifying methods</th>
<th>Ranking methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special theoretical models (e.g. “Diamond” model, “Double diamond” model, “Nine-factor” model)</td>
<td>Composite indices (e.g. Global competitiveness index).</td>
</tr>
<tr>
<td>Other theoretical methods (e.g. SWOT analysis, PEST analysis, Logical framework)</td>
<td>Single core indicators (e.g. per capita Gross Domestic Product)</td>
</tr>
</tbody>
</table>

Fig. 1. Means for the national competitiveness evaluation

3.1. Theoretical methods

Most comprehensive and well known methods used for the national competitiveness estimation are following models: “Diamond” model (Porter 1990), “Double diamond” model (Rugman 1991) and “Nine-factor” model (Cho 1994).

A key turning point in analysis of competitiveness is Porters’ work. He defines the competitiveness of a location as the productivity that companies located there can achieve. M. Porter uses this definition of competitiveness to understand the drivers of sustainable economic prosperity at a given location (Ketels 2006).

Porter’s “Diamond” model consists of four components (Fig. 2) that interact and collectively determine a country’s international competitiveness. The first component is local demand conditions. The presence of very sophisticated and demanding buyers spurs the development of strong competitive advantages that can be applied in international markets. Factor conditions (natural resources, education and infrastructure) are the second component. The mere presence of these factors, however, is not enough. Countries must continually upgrade and improve factors so that specialized advantage is created. To have successful industries, countries must also have the third component, internationally competitive suppliers and related industries. Finally, the fourth
component, competitive strategy, structure and rivalry, also helps create competitive advantage. Tough competition at home creates strong international competitors. Besides the diamond components, government and chance both have an effect, but they act through the other components and do not directly create competitive advantage. For competitive advantage, all four components must be present, as strategies based on fewer components can easily be matched by other countries (Grein, Craig 1996; Moon et al. 1998).

**Fig. 2.** The “Diamond” model (Porter 1998)

Since its first application the diamond approach has been commended and criticized (Rugman 1991; Dunning 1993; Cho 1994; Brouthers, Brouthers 1997; Moon et al. 1998). One of main disadvantage of Porter’s work is his exclusive focus on the ‘home base’ concept. M. Porter fails to incorporate the effects of multinational activities in his model. In this single home-based diamond approach, a firm’s capabilities to tap into the location advantages of other nations are viewed as very limited. Also, it was identified that “Diamond” model is not relevant in small economies because their domestic variables are very limited.

According to Dunning (1993) the principle of the diamond itself may hold good – but its geographical constituency has to be established on very different criteria. To solve this problem, the “Double diamond” model has been proposed whereby multinational activity is formally incorporated into the model (Moon et al. 1998) (Fig. 3).

**Fig. 3.** The “Double diamond” model (Moon et al. 1998)

Firms from small countries target resources and markets not just in a domestic context, but also in a global context. Therefore, a nation’s competitiveness depends partly upon the domestic diamond and partly upon the ‘international’ diamond relevant to its firms. In the generalized double diamond the outside one represents a global diamond and the inside one a domestic diamond. The size of the global diamond is fixed within a foreseeable period, but the size of the domestic diamond varies according to the country size and its competitiveness. The diamond of dotted lines, between these two diamonds, is an international diamond which represents the nation’s competitiveness as determined by both domestic and international parameters. The difference between the international diamond and the domestic diamond thus represents international or multinational activities. The multinational activities include both outbound and inbound foreign direct investment (Moon et al. 1998; Jin, Moon 2006).

In the generalized double diamond model, national competitiveness is defined as the capability of firms engaged in value added activities in a specific industry in a particular country to sustain this value added over long periods of time in spite of international competition.

More comprehensive and more dynamic than Porter’s original “Diamond” model is the “Nine-factor” model proposed by Cho (1994) (Fig. 4). This framework includes four groups of human factors in addition to the four physical factors of the original diamond model in explaining a nation’s competitiveness. Therefore, it is more comprehensive in explaining different types of nations, in particular, where the roles of different groups of people are important for their economic development. Second, it is more dynamic. The human factors and physical factors interact in order to spur a nation’s development. This model embodies Porter’s notion that “national prosperity is created, not inherited.” In some ways, it does more so than Porter’s diamond in that people are the major spur behind obtaining national competitiveness by arranging and combining the physical factors in a productive way. In addition, government officials are endogenous.
factors in this new model and thus have direct influence on national competitiveness, while the government factor is an outside variable in Porter’s original model.

![Diagram of the “Nine-factor” model (Cho 1994)](image)

**Fig. 4. The “Nine-factor” model (Cho 1994)**

Human factors include workers, politicians and bureaucrats, entrepreneurs and professionals (including scientists and managers). Physical factors include factor conditions, demand conditions, related and supporting industries and business context. Chance event, an external factor, is added to these eight internal factors to make a new paradigm.

To estimate national competitiveness well known strategic planning and management methods are used. Strategic planning methods proves the importance of measurement of present competitiveness and identification of the unique competitiveness factors of a nation in the strategic planning process. One of the most popular strategic planning methods is SWOT analysis. Using this method the main strengths, weaknesses, opportunities, and threats of the country can be identified.

### 3.2. Composite indices

Composite Indices – given mathematical function-model, composed using a set of individual indicators from complex different fields (Rukšėnaitė 2009). According to Nardo *et al.* (2005), Saisana, Tarantola (2005) and Freudenberg (2003) the composite indices are artificially made-up instruments of quantitative and qualitative measurement of particular spheres. The composite indices are used to measure multidimensional concepts, such as competitiveness, which cannot be captured by a single indicator. As with single indicators of national competitiveness, composite indices facilitate international comparisons or the study of a single country’s development over time (Thiessen 1997, Bandura 2005). Thus, one of the general objectives of indices is the ranking of countries or regions according to some aggregated dimensions.

There are many different composite indices – the number of them close on 200 (Bandura 2008) found 178; Berger and Bristow (2009) – 190, of which 102 are focused on the national level. Most well known reports presenting countries ranking using indices are:

- The Global Competitiveness Report (World Economic Forum);
- World Competitiveness Yearbook (International Institute for Management Development).

The IMD published reports since 1989, but was separated into the IMD and the WEF in 1995. These two institutes have published separate reports since 1996 (Cho, Moon 2005).

Composite indices enable to integrate amounts of information into single figure, which is easier to interpret and understood for the interested audience. These indices facilitate the task of ranking countries on complex issues in a benchmarking exercise. Rankings can guide the interest to specific areas and it can be guides for a political controlling of administrations by the public. Through the measurements by composite indices the issues of countries performance and progress comes to the centre of the policy arena (Saisana and Tarantola 2002; OECD 2003; Nardo *et al.* 2005; Wilson 2008). Despite these advantages composite indices have some strong disadvantages (Table 1).

Most of the indices used in practice for competitiveness evaluation do not have strong theoretical background. Thus, without a rigorous theoretical explanation, it is not clear why some factors are important and others not. Other problem is with data. Statistics may be unavailable because certain behaviour cannot be measured or no one has attempted to measure it. The data available may not be comparable across countries or exist only for a few countries. The indicators may be unreliable measures of the behaviour or not match the analytical concepts in question.

Because there is no single definitive set of indicators for any given purpose, the selection of data to incorporate in a composite index can be quite subjective. Different indicators of varying quality could be chosen to monitor progress in the same performance or policy area. Due to a scarcity of full sets of comparable quantitative data, qualitative data from surveys or policy reviews are often used in composite indices. The tendency to include “soft” qualitative data is another source of unreliability with regard to composites.
Individual indicators are sometimes selected in an arbitrary manner with little attention paid to the interrelationships between them. This can lead to indices which overwhelm, confuse and mislead decision-makers and the general public. Some analysts characterise this environment as “indicator rich but information poor”. The underlying nature of the data needs to be carefully analysed before the construction of a composite index.

Exhaustive analysis of the data is one of the elements let to ensure the quality of composite indices. Other elements are:

− created theoretical framework,
− information availability,
− individual indicators and variable chosen,
− direction of each indicator (i.e. the bigger the better or vise versa),
− relative importance of these indicators (weights attached which are one of the main sources of technical uncertainty of the results provided; methodological discussion and sensitivity analysis are necessary to tackle this uncertainty by making it explicit).

The calculation of the indices must be based on a sound theoretical base, because it is not possible to measure correctly object, which is badly understood and defined (Nardo et al. 2005). But most of the authors do not mark theoretical framework as a separate stage in indices calculation process. Furthermore, authors present different content of composite indices calculation process. According to different authors (McGranahan et al. 1972; Booysen 2002; Freudenberg 2003; Nardo et al. 2005; Viassone 2008; Snieška, Bruneckienė 2009) presented indices cal-

### Table 1. Limitations of the measurement by indices

<table>
<thead>
<tr>
<th>Disadvantages</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weak theoretical basis</td>
<td>• Sometimes weight of different criteria is without theoretical proofs (Judrupa and Šenfelde 2008);</td>
</tr>
<tr>
<td></td>
<td>• The soft data are used even in the case, when the hard data is available, and this choice is not explained (Judrupa and Šenfelde 2008);</td>
</tr>
<tr>
<td></td>
<td>• May lend themselves to instrumental use (e.g. be built to support the desired policy), if the various stages (e.g. selection of indicators,</td>
</tr>
<tr>
<td></td>
<td>choice of model, weights) are not transparent and based on sound statistical or conceptual principles (Nardo et al. 2005).</td>
</tr>
<tr>
<td>Wrong data</td>
<td>• To evaluate the indices, very often old statistical data is used and to evaluate definite index very different statistical sources are used</td>
</tr>
<tr>
<td></td>
<td>(Judrupa and Šenfelde 2008);</td>
</tr>
<tr>
<td></td>
<td>• Disregard for unique characteristics – Unique characteristics of a national economy, such as geography, culture and demography, affect</td>
</tr>
<tr>
<td></td>
<td>productivity differently in different countries. These characteristics are not reflected by the indices’ (Hawkins 2006);</td>
</tr>
<tr>
<td></td>
<td>• There is a rather high divergence between the hard and soft data results’ (Rouvinen 2001).</td>
</tr>
<tr>
<td>Subjectivity</td>
<td>• Rankings give the feeling of a objective view, whilst they are build on subjective judgments (Saisana and Tarantolo 2002);</td>
</tr>
<tr>
<td></td>
<td>• Most of the indices are very subjective, the soft data is about 50% of all data (Judrupa and Šenfelde 2008);</td>
</tr>
<tr>
<td></td>
<td>• The selection of indicators and weights could be the target of political challenge (Nardo et al. 2005).</td>
</tr>
<tr>
<td></td>
<td>• Ranking strengths lie in the factors that cannot be quantitatively measured, but are captured by the surveys’ (Rouvinen 2001);</td>
</tr>
<tr>
<td></td>
<td>• Non-representative opinions of not enough respondents do not provide solid foundations for economic analysis’ (Rouvinen 2001);</td>
</tr>
<tr>
<td>Lost information</td>
<td>• Many information are lost in the aggregation process (Saisana and Tarantolo 2002);</td>
</tr>
<tr>
<td></td>
<td>• The loss of much potentially useful information in the consolidation into a headline figure (Wilson 2008);</td>
</tr>
<tr>
<td></td>
<td>• May lead wrong policies, if dimensions of performance that are difficult to measure are ignored (Nardo et al. 2005).</td>
</tr>
<tr>
<td>Wrong interpretation</td>
<td>• Rankings may be too simplistic and too condensed (Saisana and Tarantolo 2002);</td>
</tr>
<tr>
<td></td>
<td>• May send misleading policy messages, if they are poorly constructed or misinterpreted (Nardo et al. 2005);</td>
</tr>
<tr>
<td></td>
<td>• May invite drawing simplistic policy conclusions, if not used in combination with the indicators (Nardo et al. 2005);</td>
</tr>
<tr>
<td></td>
<td>• Indices can be misleading, particularly when they are used to rank country performance on complex economic phenomena and even more so when</td>
</tr>
<tr>
<td></td>
<td>country rankings are compared over time (OECD 2003);</td>
</tr>
<tr>
<td></td>
<td>• They have many methodological difficulties which must be confronted and can be easily manipulated to produce desired outcomes (OECD 2003)</td>
</tr>
<tr>
<td></td>
<td>• The sensitivity of the results to different weighting and aggregation techniques, and continuing problems of missing data, composite</td>
</tr>
<tr>
<td></td>
<td>indicators can result in distorted findings on country performance and incorrect policy prescriptions (OECD 2003).</td>
</tr>
</tbody>
</table>

*About most well known reports, which present countries ranking using indices – The Global Competitiveness Report (World Economic Forum) and World Competitiveness Yearbook (International Institute for Management Development)*
calculation processes most important stages are identified (Fig. 5).

![Fig. 5. Process of indices calculation](image)

A sound theoretical framework is the starting point in constructing composite indices. The framework should clearly define the phenomenon to be measured and its sub-components, select individual indicators and weights that reflect their relative importance and the dimensions of the overall composite. Ideally, this process would be based on what is desirable to measure and not which indicators are available.

The essential in constructing credible indices is transparency. This requires (Nardo et al. 2005):

- Defining the concept. The definition should give the reader a clear sense of what is being measured by the composite indicator.
- Determining sub-groups. Multi-dimensional concepts can be divided into several sub-groups. These sub-groups need not be (statistically) independent of each other, and existing linkages should be described theoretically or empirically to the extent possible.
- Identifying the selection criteria for the underlying indicators. The selection criteria should work as a guide for whether an indicator should be included or not in the overall composite index. It should be as precise as possible and describe the phenomenon that is being measured, i.e., input, output or process. Too often composite indicators include both input and output measures.

After theoretical framework creation the next step is selection of variables. Here arise biggest challenges – what variables to include and how to aggregate them into a composite index. The strengths and weaknesses of composite indices derive largely from the quality of the underlying variables. Ideally, variables should be selected on the basis of their analytical soundness, measurability, relevance to the object being measured, and relationship to each other. But by their nature, composite indices can mask data problems rather than present statistical issues transparently.

Variables choices regarding two issues are required (Diener, Suh 1997). In the first instance, the number and nature of the variables that will make up part of the composite index need to be determined. Secondly, the specific variables employed in estimating each of the component indices need to be selected. Such selection is generally based on theory, empirical analysis, pragmatism or intuitive appeal, or some combination thereof.

The next important step after variables are known is normalization of data (otherwise scaling, standardization). Normalization is required prior to any data aggregation as the indicators in a data set often have different measurement units. Variables need to be put on a common basis to avoid problems in mixing measurement units (e.g., firms, people, money). They must be adjusted on dimensions such as size/population/income and smoothed through time against cyclical variability. Variables are normalized to avoid having extreme values dominate and also to partially correct for data quality problems. Special methods can be used to standardize or normalize variables (Freudenberg 2003, Jacobs et al. 2004): ranking, standardization, re-scaling, distance to a reference country, categorical scales, etc.

Nardo et al. (2005) before data normalization suggests to do the multivariate analysis and to input missing data. Last-mentioned process, according authors, could be dangerous while multivariate analysis is helpful in assessing the suitability of the data set and will provide an understanding of the implications of the methodological choices, e.g., weighting and aggregation, during the construction phase of the composite indicator. Information can be grouped and analysed along at least two dimensions of the dataset: sub-indicators and countries.

Variables which are aggregated in a composite indicator have first to be weighted – all variables may be given equal weights or they may be given differing weights which reflect the significance, reliability or other characteristics of the underlying data. The weights given to different variables heavily influence the outcomes of the composite indicator. The rank of a country on a given scale can easily change with alternative weighting systems. For this reason, weights ideally should be selected according to an underlying theoretical framework or conceptual rationale for the composite indicator. A stated methodology should be used for determining weights and should be explained transparently.
Large number of weighting techniques exists. Some are derived from statistical models, such as factor analysis, data envelopment analysis and unobserved component models or from participatory methods like budget allocation, analytic hierarchy processes and conjoint analysis. No matter which method is used, weights are essentially value judgments. While some analysts might choose weights based only on statistical methods, others might reward (punish) the components that are deemed more (less) influential depending on expert opinion to better reflect the policy priorities or theoretical factors.

For indices calculation commonly used such aggregation methods as linear, geometric and multi-criteria. The linear aggregation method is useful when all sub-indicators have the same measurement unit and geometric aggregations are better suited if non-comparable and strictly positive sub-indicators are expressed in different ratio-scales. The absence of synergy or conflict across the indicators is useful in applying either linear or geometric aggregation, however difficult to achieve. Furthermore, linear aggregations reward base-indicators proportionally to the weights, while geometric aggregations reward those countries with higher scores.

If one wants to assure that weights remain a measure of importance, other aggregation methods should be used, in particular methods that do not allow compensability. Moreover if different goals are equally legitimate and important, a non-compensatory logic might be necessary. A non-compensatory multi-criteria approach could assure non-compensability by finding a compromise between two or more legitimate goals (Munda, Nardo 2003).

Constructing composite indices several judgment calls have to be made, e.g. on the selection of indicators, data normalization, weights and aggregation methods, etc. The robustness of the composite indices and the underlying policy messages may thus be contested. A combination of uncertainty and sensitivity analyses can help gauge robustness of the composite index and improve transparency.

Very important is proper presentation of created composite indices. Indices must be able to communicate a picture to decision-makers quickly and accurately. Graphical representation should provide clear messages, without obscuring individual data points. On the other hand, visual presentations of composite indices can provide signals extremely delicate from the user perspective, e.g., problematic areas that require policy intervention.

Following consecutive composite indices formation scheme the chances to avoid most of the mention limitations and to construct sound indices increasing. To overcome the key limitations of composite indices also possible using sets of core indicators instead (Wilson 2008). Using sets of core indicators the loss of much potentially useful information in the consolidation into a single figure can be avoided. Providing a core set of key indicators that are presented together facilitates instead a broader analysis of the different dimensions that are considered important for economic progress. A corresponding disadvantage is that sets of indicators are less easy to present in an accessible way, although new techniques are making their presentation friendlier.

4. Conclusions

The evaluation of the national competitiveness as an important instrument serves to policy decision-makers creating country’s policy. The evaluation enabling to view country’s position among other countries, to identify changes across the time and to assess progress towards international commitments.

Till now there is no general accepted classification of national competitiveness evaluation means. According to the purpose of evaluation, the potential of national competitiveness evaluation means, involving both measurement and analysis, can be grouped into “identifying methods”, capturing special and other theoretical models and “ranking methods”, capturing composite indices, single core indicators and the sets of core indicators.

Very first theoretical method for national competitiveness evaluation – “Diamond” model suggested by M. Porter (1990) is criticized by other scientist was not incorporated. Also this model was found out as not relevant in small countries because their domestic variables are very limited. On purpose to eliminate limitations the “Double diamond” model has been proposed whereby multinational activity is formally incorporated into the model. As more comprehensive in explaining different types of nations and more dynamic – the human factors and physical factors interact in order to spur a nation’s development – proposed one more national competitiveness evaluation method – the “Nine-factor” model.

Most often used national competitiveness evaluation tool today is composite index. Using composite indices such organizations like World Economic Forum and International Institute of Management Development present countries rankings. Composite indices are valued for their ability.
to integrate large amounts of information into easily interpretive form. Despite this, most of composite indices have many disadvantages, such as weak theoretical framework, weak reliability because of lost or wrong data, subjectivity and wrong interpretation. All these disadvantages can result in distorted findings and false decisions.

In order to ensure the quality of composite indices, first of all strong theoretical framework should be created. Also necessary information should be available, exhaustive analysis of the data done, correct direction and relative importance of each indicator estimated.

Also sets of core indicators can be used for national competitiveness evaluation as an alternative to composite indices. Sets of indicators are less easy to present in an accessible way, but the loss of information in the integration into a single figure can be avoided.

References


