Variety of Future-Orientation: The Case of G-19 Countries

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Abstract

Our study is focusing on future-orientation (innovativeness) of the group of G-19-countries, using an empirical indicator approach. This group is an economic, financial and political forum which consists of 19 major economies, advanced and developing ones, allocated in Asia, Europe, Euroasia, North and South America, the Middle East and Oceanics. If you add the European Union you get the G-20-group, which is the main economic council of wealthy nations nowadays. The 19 member countries of the G-20-group together account for about 77% of world GDP, 60% of world trade and 62% of the world population (Vestergaard, 2011).

A country's future-orientation has different meanings in its process of development, depending on the model used for explaining, targeting and executing economic development. An empirical indicator study of future-orientation for a group of countries has to choose the right development model. This model builds up the conceptual frame of the study.

The literature knows a variety of growth or development models (Porter and Stern, 2004). In political practice, too, different models play a crucial role. Concerning their theoretical background, however, two main classes can be emphasized:

1. Neo-Classical (catching-up) development models (type 1)
2. Schumpeterian (technology-driven) development models (type 2)

The models of type 2 can be differentiated into the (Hanusch and Pyka, 2007a)

(a) Traditional Schumpeterian model, where innovation is the driving force in the growth process and risk taking entrepreneurs (Schumpeter Mark I) or corporate innovation management (Schumpeter Mark II) enhance technological progress as an endogenous, quantitative phenomenon.
(b) Neo-Schumpeterian model (NSE) which builds on the traditional one, improved by stressing also qualitative growth factors and processes, relying on formal or informal networks, collaborations between firms, governments, universities, research institutions, etc. (eco-system model).
(c) Model of Comprehensive Neo-Schumpeterian Economics (CNSE) which is based on NSE but enlarged by the idea of institutional co-evolution in the process of development, stressing besides the real sector also the financial and public sphere of a socio-economic system as the crucial elements of future-oriented dynamics (Hanusch and Pyka, 2007b).

In this study we will employ CNSE as development model and the analytical framework for our investigation. Based on this concept the main goals of our study are the following:

a) To focus on the variety (diversity) of future-orientation (innovativeness) in the group of G-19-Countries;
b) To investigate whether there exist patterns of similarities or dissimilarities, using an indicator analysis;
c) To show how these patterns look like, applying cluster analysis and
d) To draw some conclusions from the pattern analysis concerning future-orientation in the development process of the G-19-Countries.

On the basis of CNSE, the future-orientation will be described and characterized in total by about 60 indicators, focusing on the (private) real sector, the public and financial sector. This approach implies a concept of future-orientation characterized and ruled by co-evolutionary processes in a kind of eco-system (Wallace, 2013) in which the three institutional pillars have to fulfill a proper role based on Schumpeterian norms and rules.

We will see that CNSE is able to provide the conceptual framework for studying and picturing the future-orientation of economies like the G-19 Countries. For these countries the developmental situation and its specific features is figured out by means of quantitative research, using an indicator based approach and applying cluster analysis. Dependant on data availability the indicator sets comprise different years and periods ranging from 2007 to 2012.

Key Words:
Development Models, Growth Paths and Institutional Settings, Comprehensive Neo-Schumpeterian Economics, Indicator-Analysis, East-Asian Future-Orientation, Innovativeness Ranking, Cluster Performance

1. Introduction

Our study is focusing on future-orientation (innovativeness) of the group of G-19-countries, using an empirical indicator approach. This group is an economic, financial and political forum which consists of 19 major economies, advanced and developing ones, allocated in Asia, Europe, Euroasia, North and South America, the Middle East and Oceanics. If you add the European Union you get the G-20-group, which is the main economic council of wealthy nations nowadays. The 19 member countries of the G-20-group together account for about 77% of world GDP, 60% of world trade and 62% of the world population (Vestergaard, 2011).

To meet these goals we employ Comprehensive Neo-Schumpeterian Economics (CNSE) as an analytical framework (Hanusch and Pyka, 2007a). This approach is based (a) on the principle of innovation as a competitive driving force and as the engine of development; (b) the notion of future-orientation penetrating all spheres of socio-economic life in developed as well as in developing countries.
Future-orientation gets its relevance and can be observed in three institutional domains of economic, political and social conduct, namely industry (real sector), finance and the public (social) sector. In such a three pillar context a fundamental cause and effect chain of innovation processes takes place, stimulating growth and development within each realm (evolution) as well as between these interdependent pillars (co-evolution).

We will see, that CNSE is able to provide the conceptual framework for studying and picturing the economic catch-up and development processes as well as their future-oriented features for countries such as France, United Kingdom, Germany, Russia and Italy representing Europe. Argentina, Brazil, Mexico, United States and Canada representing America. China, Australia, Japan, Turkey, Indonesia, Korea, Saudi Arabia standing for Asia and South Africa representing the African continent. For these nineteen countries, the developmental situation and its specifics will be figured out by means of quantitative research, using an indicator based approach and applying cluster analysis.

On the basis of CNSE the future-orientation will be described and characterized in total by about sixty indicators, focusing on the (private) real sector, the public and the financial sector. The indicators reflect many different activities in the various countries related to innovation and future-orientation. Dependent on data availability, the indicator sets comprise different years mainly in the period between 2007 and 2012.

In the following we will proceed as follows:
At first we will give an overview of growth and development models, which exist in the literature, using the institutional setting in an economy and the characteristics of the growth or development path as categorizing criteria. The variety of models discussed gives us the basis for deciding which one shall be applied as the analytical frame for our indicator analysis. We will come to the conclusion that Comprehensive Neo-Schumpeterian Economics (CNSE) is the right analytical

framework and will shortly characterize this approach. The next section incorporates the main part of our study, namely the indicator-based empirical investigation of future-orientation of G-19 countries, using the framework of CNSE. The results of the study are shown and discussed in section 5. At the end of our paper some concluding remarks will be drawn.

2. Variety of Growth and Development Models: An Overview

2.1. General Remarks

The economic literature knows a number of different growth and development models. A variety of such models is also practiced around the world, in advanced or highly developed countries as well as in emerging or less developed economies. The growth models can be differentiated and characterized by using specific criteria. In order to get a comprehensive overview we use three categories for grouping: (a) economic growth elements; (b) growth or development paths; (c) institutional settings.

In such a context two main approaches in today`s growth or development theory can be emphasized:

(a) Neo-classical growth theory and (b) Schumpeterian growth theory
Additionally, in the last decade a third approach is getting more and more intellectual and political importance which might be called (c) theory of smart growth.

The neoclassical approach goes back to the work of Solow in the 1950s. In the following decades it was developed step by step based on several theoretical principles, such as individual rationality, profit and utility maximizing behavior, exogenous technological progress, a continuous growth process ending in a long-term stable equilibrium.

Following Porter and Stern (2004) this traditional neoclassical approach can be divided into two variants, (a) factor induced and driven growth (model 1) and (b) investment forced growth (model 2). A third variant called „endogenous growth theory“ doesn‘t rely on technological progress as an exogenous variable anymore. Its relevance however is limited mainly to academia.

Model 1 (M 1) mainly relies on labor intensive production, intensive use of given natural resources, export of manufactured goods (especially in a globalised world), import of technologies (exogenous technological progress) via goods with high technological ingredients , direct foreign investment and imitation.

Model 2 (M 2) is based on cheap production of standardized products and services with a comparative advantage, investment in infrastructure, easy capital access and an industry oriented economic policy. Technology is also imported (exogenous), via licenses, joint ventures, direct foreign investment and imitation.

Schumpeterian growth and development models gained their importance in literature and political practice in the last three decades or so. They can be differentiated in a (a) traditional Schumpeterian approach (model 3) and a (b) Neo-Schumpeterian approach (model 4). The latter tries to advance the traditional model 3.

Model 3 (M 3) goes back to Schumpeter's famous book "Theory of Economic Development", (1912) and his later published book "Capitalism, Socialism and Democracy", (1942). It reveals the role of innovations as driving force in the development process, risk taking entrepreneurs (Schumpeter Mark I, 1912), corporate innovation management (Schumpeter Mark II, 1942), technological progress as an endogenous process and growth characterized mainly as a quantitative phenomenon.

Model 4 (M4) builds up on model 3, improved by stressing also qualitative growth factors and processes, emphasizing knowledge-based formal or informal networks, collaborations between firms, governments, universities and research institutions (Saviotti and Pyka, 2004). In the literature you may also find the denotations network (cluster) model, Silicon valley model, Eco-system model. M4 is especially designed for modern, advanced economies generating products and services on a high technological standard. These economies are characterized for instance by sophisticated institutions, highly developed capability and incentive systems and corporate strategies oriented to cope with global competition.

Recently, some authors have it also applied to less developed economies in the southern hemisphere, revealing important obstacles for structural change and knowledge based development. They stress, for instance, the lack of learning by solving opportunities, technological asymmetries and the weak policy orientation towards innovation (e. g. Arocena and Sutz, 2005; Chimoli, 2005; Katz, 2007).

It is also important to note that there exists a rising strand of literature in Development Economics focusing on knowledge based models, e.g. World Bank (1999), Nonaka and Takeuchi (1995), Juma et al. (2001).

In its development strategy planned for the decade 2010 to 2020 the EU Commission has recently published a new concept called „smart growth" (EU Commission, 2010). It is based on innovations in the technological, social (political), ecological field and the respective quantitative and/ or qualitative growth aspects induced by merging of globalization with IT, new forms of producing and distribution social (common) goods and services and sustainability as an extraordinary element of long term growth. The „smart growth" model incorporates and stresses a number of features and elements similar to those of „Comprehensive Neo-Schumpeterian Economics" (CNSE), an approach developed by Hanusch and Pyka (2007a).

2.2. Institutional setting

The described development models have two common features. They are oriented towards the future and thus have to cope with a lack of information or even uncertainty concerning coming events. And, they are based on a certain institutional setting which can be pictured for advanced as well as developing economies focusing on three main socio-economic pillars: The real (industrial) sector, the financial sector and the public sector. These three pillars build together an institutional architecture in which the development process of a society takes place.

Typical for the catch-up models M1 and M2 is a high institutional integration of the three pillars following closely a fundamental development strategy or development plan (see figure 1).

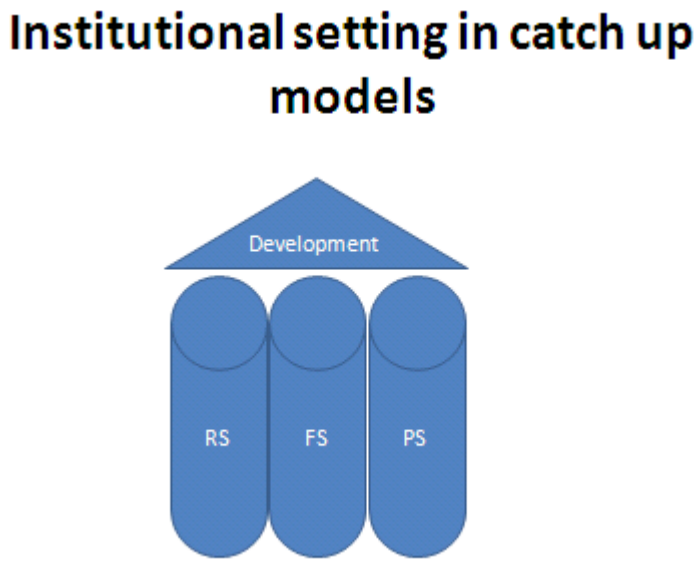


Figure 1

The pillar closeness and the integrative development strategy gives an emerging country some special opportunities. For instance, the pillars can work together very closely or even intimately to climb up on the development ladder. They can protect each other against unforeseen events (uncertainty) by assuming full responsibility for each other's activities. This close dependence is normally guided and controlled by the public sector, that means it is dominated by the state or government. Unfortunately, it has also some severely dangerous effects, namely pushing back individual freedom, limiting personal creativity, inducing centralistic (bureaucratic) structures and facilitating fraud or even corruption.

Concerning growth model M3 and M4 a quite different institutional setting can be stated, as illustrated in figure 2.

Institutional setting in Schumpeterian development models

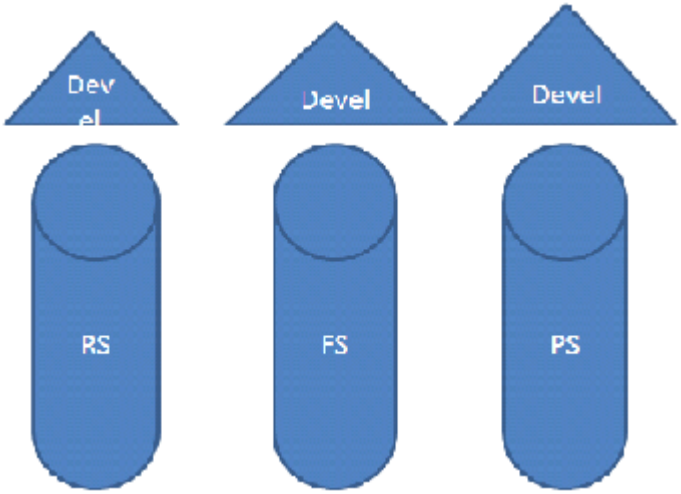


Figure 2

In this institutional setting each of the pillars has a highly elaborated or evolved autonomy. Each one undergoes an liberalized development. The co-evolutionary process only works poorly and in a fairly disembodied manner. Each of the pillar institutions follows its own future-oriented course of development, directed by a special, pillar-specific behavior of its actors. In normal times it is the standard maximizing behavior. In times of high success or a boom, however, the behavior of actors may undergo drastic shifts, changing from normal rational profit seeking in the real or financial sector and vote or sympathy seeking in the public sector into an irrational short term oriented behavior of exaggeration. This shows up in each of the pillars, respectively, in greed, overoptimistic speculation or popular vote hunting and an increased public budget or sovereign debt accumulation. All that may cause a so-called “Schumpeterian Crisis” (Hanusch, 2010). Then, accordingly, each of the pillars will also have to cope with its own specific uncertainty arising under such atomistic institutional circumstances.

The protective measures against uncertainty will also be limited to each single pillar and, in most cases, will be far too ineffective for hindering or fighting a major crisis situation. In such a case, contagion effects may occur, spilling from one pillar to the other and frightening the whole socio-economic system.

An institutional setting like the one just described is not untypical for advanced economies, embedded in a capitalistic system which follows the Schumpeterian ideas and is closely related to the development models M3 and M4. Economic history shows important examples for such scenarios, for instance “The Great Depression” in the late 1920’s in the USA or the “Grand Contraction” just having turned into reality recently in the USA and Europe.

2.3. Growth or Development Path

Future-orientation and uncertainty are ubiquitous phenomena characteristic of each of the three pillars and are also intrinsically interrelated. An improved understanding of the development

process can only be expected when the co-evolutionary dimensions of the three pillars are taken into account. For this purpose Hanusch and Pyka (2007a) developed the so called "Neo-Schumpeterian Corridor" (NSC), shown in figure 3.

The Neo-Schumpeterian Corridor

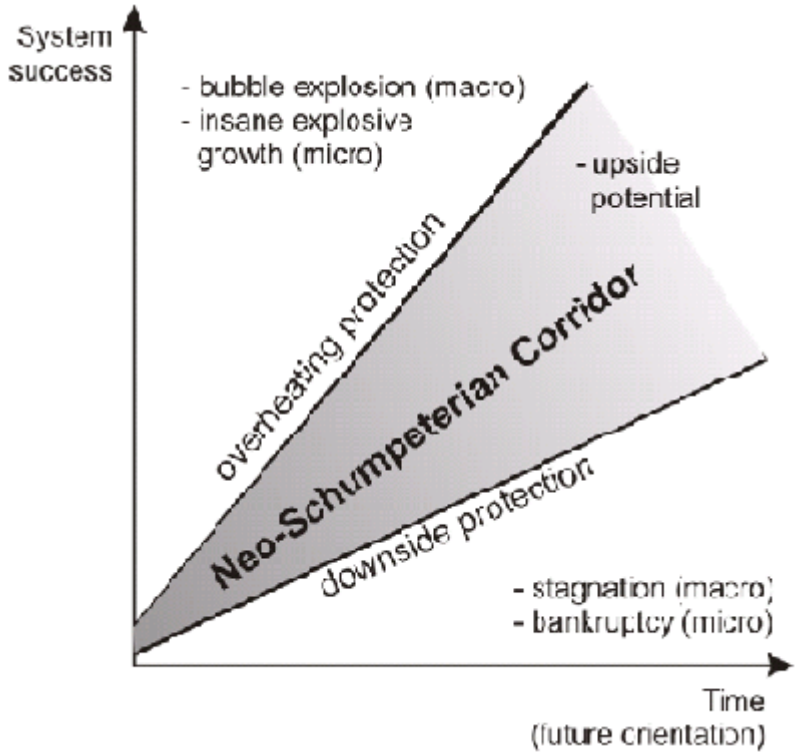


Figure 3

Such a corridor is designed in a future-oriented way and represents an open space for development which runs acute-angled between two axes representing time and economic success (growth). Within this corridor economic entities, companies as well as economies, can move freely and can choose a success-based and promising position dependent on their specific preconditions.

The NSC also shows that a profound development process only takes place in a narrow corridor between the extremes of uncontrolled growth and exploding bubbles, on the one hand, and stationary, it is zero growth or stagnancy on the other hand.

A typical growth path for emerging countries in a Neo-Schumpeterian Corridor of development looks like follows (figure 4):

Growth path of catch up models in Neo-Schumpeterian Corridor

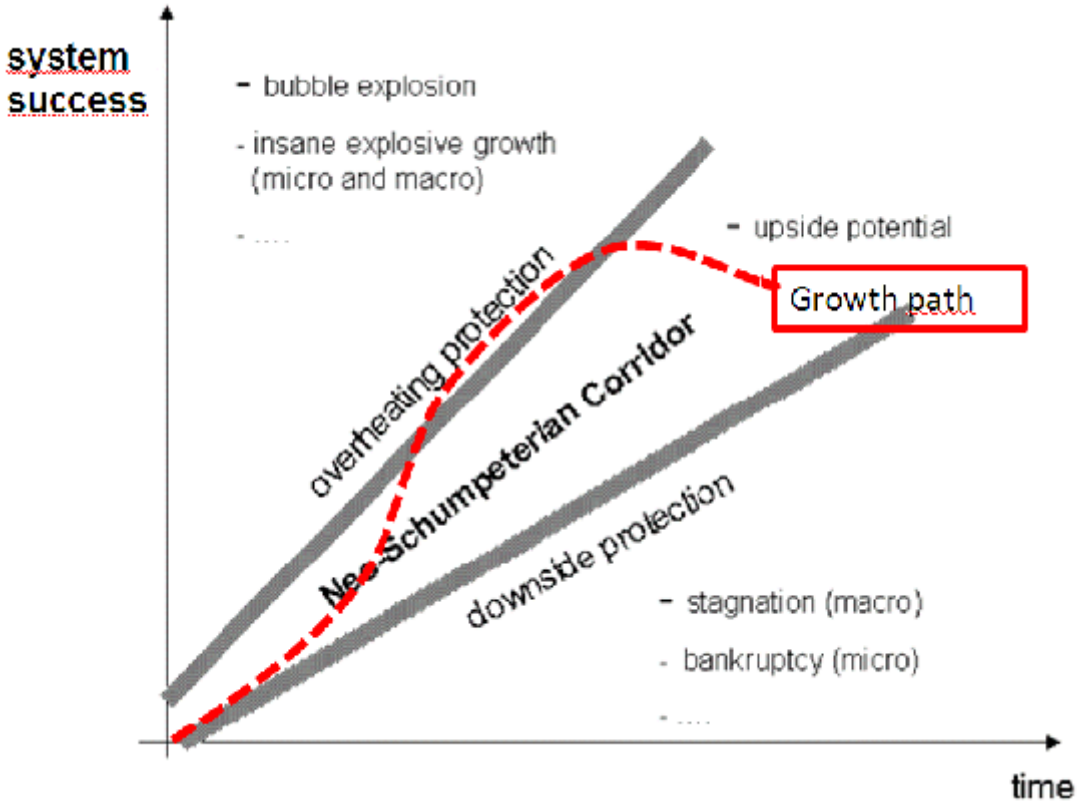


Figure 4

At the beginning of the development process high growth rates occur which will diminish in time if nothing is changed in the institutional setting and/or the potential factors of the development process. This growth path also represents the development process inherent in so-called catch up models. These models more or less, comprise features which we described in the development models M1 and M2. That means, catch up models reach sooner or later a natural limit of growth which, however, won't be the stationary equilibrium growth path praised in neoclassical theory. On the contrary, if nothing new happens in these models growth will expire and development will end in stagnation.

So, for emerging countries the greatest challenge in their development process is to find ways and means to transform their one-dimensional catch up path into a growth path of higher complexity, including processes not only of catching up and falling back but also of forging ahead and leap-frogging.

Such a growth path (figure 5) isn't characterized anymore by continuously diminishing growth but by punctuated equilibria determined by structural changes and even a system transformation, caused by disruptive innovations. These may have their origins in the technological, social (political) or financial field.

Growth path of Schumpeterian models in Neo-Schumpeterian Corridor

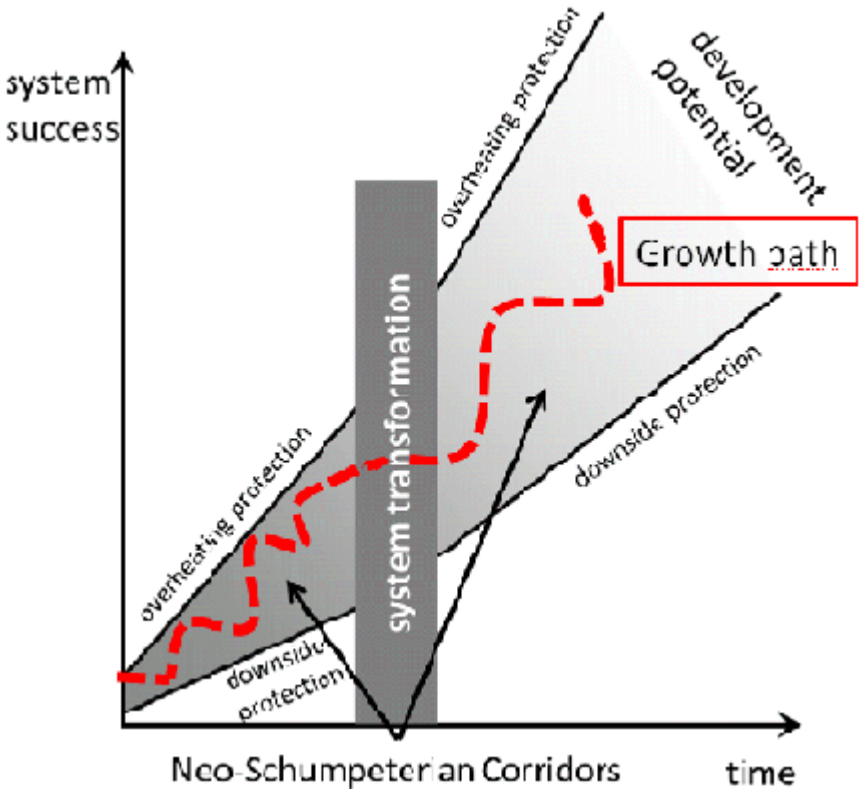


Figure 5

All in all, innovations and, based on that, future-orientation matters for developing countries as well as for advanced ones. Emerging markets which stick too long and too intensively to a catch up development philosophy will get into economic troubles, if they don't prepare permanently their economies for the necessary shift from models M1 and M2 to development processes characterized in the models M3 and M4, the Schumpeterian development models.

It is at this point of reasoning where the intention of our study gets its special relevance.

3. Future-Orientation in the Context of Comprehensive Neo-Schumpeterian Economics (CNSE)

The central aim of our study is to gain new insights and findings of the structural characteristics, the functioning as well as the competitiveness and advancement of nineteen economies belonging to the G-20-group. To meet this target we concentrate on the main element of development, that is future-orientation. But, as we saw, future-orientation has different meanings in the process of

development, depending on the model used for explaining or targeting economic advancement. Specific growth factors or elements play a crucial role as well as the institutional setting realized in an economy. So, if one tries to exercise an empirical study of future-orientation for a certain group of countries, based on indicators, he has, first of all, to choose the right model, which builds up the conceptual frame of the study. This model has to incorporate important growth factors as well as the institutional setting. In our case we choose Comprehensive Neo-Schumpeterian Economics (CNSE), developed by Hanusch and Pyka (2007a) as the analytical background and the frame for the development model used.

How should the institutional setting look like in a CNSE-approach? Should it be a very dependent one as shown in figure 1 or a highly independent, autonomous one, as described in figure 2? The co-evolutionary aspect seems to play a very crucial role in the development process.

So the pillar constellation in CNSE can be characterized by the following figure 6.

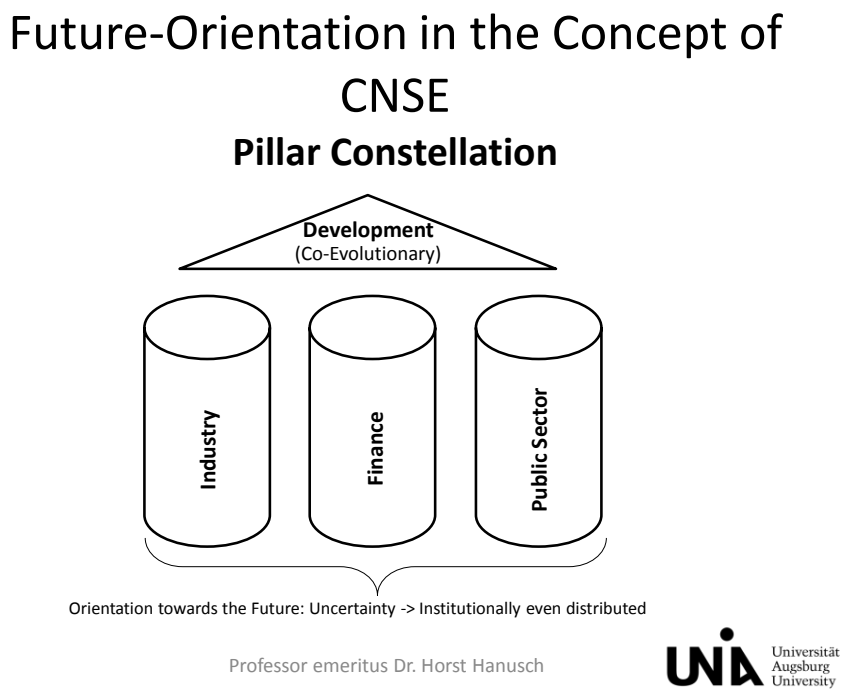


Figure 6

If development takes place in the NSC, it has, on the one side, to analyze each of the institutional pillars in their own respect and work out their potential for development in a normatively theoretical context.

In a normative sense economic progress in the development process is influenced by the idea of harmony and sustainability within the Neo-Schumpeterian Corridor. To achieve economic progress in a co-evolutionary manner the pillars have to fulfill certain proper roles.

The task of the real economy will be to foster at all times through innovation and parallel investments the knowledge-oriented progress and the resulting wealth of a country or a region. To accomplish this task, it needs certain freedoms and the active support of the government.

The financial economy has an even closer, almost symbiotic relationship with the real economy. Its task is not a short-term decoupling from the real economy spurred by speculation, but quite the opposite, namely the medium- and long-term oriented sustainable financial accompaniment and encouragement of innovative and successful companies and sectors.

The governmental and political responsibility lies, above all, in the monitoring of the future-oriented, long-term symbiosis of the real and the financial sectors as well as their co-evolutionary development. For that purpose it has to install an adequate intelligence and control system.

But, monitoring and controlling is only the one side of the same coin. If it is necessary, the government also has to support the co-evolutionary development of the system through specific budgetary and institutional instruments. On the revenue side of the budget, for instance, a growth and progress oriented tax system may be an effective instrument. On the expenditure side investments in education and research seem to be adequate measures.

On the other side it has to show how these pillars are corresponding with the empirical reality in a country.

What does that mean for our indicator analysis?

We have to find the right indicators which correspond with the normative tasks of the three pillars and also mirror the co-evolutionary development process occuring in reality.

In a nutshell, CNSE can be summarized as follows:

CNSE has to offer a consistent normative and empirical concept dealing with dynamic development processes causing qualitative transformation of economies driven by the introduction of novelties in their various and multifaceted forms (technological, institutional, organisational, ecological and social dimensions) and the related co-evolutionary processes. These processes are not restricted to industry only but also include the financial and public sphere of an economy.

This definition will provide the basis and the background for our indicator-based research of the future-orientation of G-19 countries. Our primary task within this frame is to find the right indicators expressing the forces, factors or elements of a CNSE-driven development. This challenge has to be met for each of the three pillars of the socio-economic system. Then, the pattern of similarities or dissimilarities existing between the countries can be detected using cluster analysis.

4. The Indicator Analysis based on CNSE

4.1. Data Set

Our study is grounded on a comprehensive set of indicators for the G-19 countries. In total, about sixty indicators have been collected, reflecting the various G-19 economies related to their

innovativeness and future-orientation. Due to data availability the indicator sets comprise years mainly for the period 2007 to 2012.

To summarize, the data we draw upon are supposed to reflect activities taking place in the three pillars in the sense of CNSE, immediately entailing future-oriented characteristics.

The indicators used, originate from various sources, the most important one being the World Bank, especially its Main Science and Technology Statistics, its Educational Database and its Patents Database. From these three databases, patent statistics, R&D expenditure data as well as several indicators of national education systems and of qualification structures of national workforces have been extracted. Further main data sources are the World Economic Forum and the Marketline Database.

4.2. The indicators for the 3-pillars

The crucial feature of the industrial pillar in a CNSE conception is its orientation towards the future, based on innovation processes. In order to comprise this dimension structurally as well as from a process perspective, the indicators we use for the real sector pillar encompass various patent information with a particular focus on knowledge intensive industries, in order to cover the sectoral composition of the pillar (Biotech, ICT, knowledge-intensive services) as well as processes of cooperation (co-patenting). Furthermore, the international orientation is depicted by a couple of indicators such as FDI and foreign trade.

Also for the monetary pillar we emphasize its future-orientation which accordingly has to be expressed in the selection of indicators. Here, indicators cover the organizational dimension of financial markets (soundness of banks etc.) and their degree of sophistication. Finally, we include the difference between short- and long-term macro-economic interest rates to give some attention to the transmission process between the monetary and the real sphere of an economy.

The future-orientation of the public pillar is divided into five groups of indicators covering public revenues and expenditures, the knowledge and information infrastructure, education and science as well as the institutional framework, governing development. Besides, public expenditures on R&D or expenditures for programs of technology policy are covered by corresponding indicators (GOVERD etc.). Infrastructural information is contained in indicators expressing the quality of internet access etc. Indicators describing the education sector encompass quantitative information (e.g. HERD) as well as qualitative information (e.g. class room size), stemming mainly from the OECD PISA study. The science sector is included by indicators like number of publications etc. Indicators concerning the framework conditions of development include an index of regulatory quality and political stability etc.

4.3. Cluster analysis

The indicator approach will be used in combination with the cluster analysis (see e.g. Jobson, 1992). Target of the cluster analysis is to detect cross-national (dis-) similarities in the structure and composition of a socio-economic system, focusing on future-orientation.

The general rationale behind the cluster analysis as an analytical tool is to test a sample for the degree of structural commonalities between the units of analysis. Its outcome is a categorization of the analyzed units so that the coherence of each group (or cluster) as well as the heterogeneity across different clusters is maximized. To determine the coherence of a certain cluster and to calculate the existing diversity of different clusters, distance values between the units of analysis need to be determined on the basis of the characteristics of each entity. In other words, “cluster analysis is a set of tools for building groups (clusters) from multivariate data objects. The aim is to construct groups with homogeneous properties out of heterogeneous large samples. The group should be as homogeneous as possible and the differences among various groups as large as possible” (Härdle and Simar, 2007).

A sample outline of a cluster analysis could be the following: At the beginning, each country is treated as an individual cluster, and a so called “distance-matrix” is created, according to the used attributes. Subsequently, those clusters of countries which display the least distance to each other are assigned to a new cluster. Again, the distance between the countries is measured and a new “distance-matrix” is created. This sequence is repeated, until only one cluster remains.

In order to determine the ideal or most effective number of clusters, the so-called Hard-method is chosen.

5.Empirical Results

Indicator Set for Real Sector Pillar

Indicator	sample length	Data Source
Technicians in R&D (per million people)	1996-2011	World Bank Database
Ease of doing business index (1=most business-friendly regulations)	2011, 2012	Global Competitiveness Report
Start-up procedures to register a business (number)	2003-2011	World Bank Database
Patent applications, residents	1960-2010	World Bank Database
ICT service exports (% of service exports, BoP)	1986-2011	World Bank Database
New businesses registered (number)	2004-2009	World Bank Database
Efficacy of corporate boards, 1-7 (best)	2006-2012	Global Competitiveness Report
Value chain breadth, 1-7 (best)	2006-2012	Global Competitiveness Report
Capacity for innovation, 1-7 (best)	2006-2012	Global Competitiveness Report
Company spending on R&D, 1-7 (best)	2006-2012	Global Competitiveness Report
Availability of scientists and engineers 1-7 (best)	2006-2012	World Bank Database
PCT patents applications/million pop.	2006-2012	World Bank Database
Cooperation in labor-employer relations 1-7 (best)	2006-2012	Global Competitiveness Report
Availability of latest technologies 1-7 (best)	2006-2012	Global Competitiveness Report
Researchers in R&D (per million people)	1996-2009	World Bank Database
Index of Industrial Production(Absolute)	2007-2011	Marketline Database
Labour Cost Index(Absolute)	2007-2011	Marketline Database
Total Number of Listed Companies(Absolute)	2007-2011	Marketline Database
Brain Drain (aka attract talent)	2009-2013	Global Competitiveness Report
Foreign Direct Investment, Outward	2007-2011	Marketline Database
Internet Users (Absolute Number)	2008-2012	World Bank Database
High Technology Exports (US Dollar)	2008-2012	World Bank Database

Indicator Set for Finance Sector Pillar

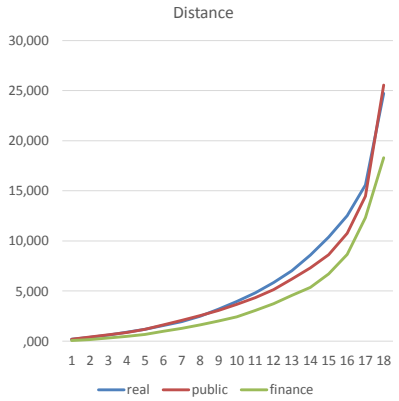
Indicator	sample length	Data Source
Availability of financial services 1-7 (best)	2006-2012	Global Competitiveness Report
Venture capital availability 1-7 (best)	2006-2012	Global Competitiveness Report
Total tax rate (% of commercial profits)	2005-2012	World Bank Database
Lending interest rate (%)	2010-2012	World Bank Database
Balance of Payments, Reserve Assets, Net(Absolute)	2007-2011	Marketline Database
Bank Capital to Asset Ratio(Absolute)	2007-2011	Marketline Database
Central Bank, Assets(Absolute)	2007-2011	Marketline Database
Government 10-Year Bond Rate(Absolute)	2007-2011	Marketline Database
Interest Rate Spread(Absolute)	2007-2011	Marketline Database
Market Capitalization, Total(Absolute)	2007-2011	Marketline Database
Net Domestic Credit (Absolute)	2007-2011	Marketline Database
soundness of banks	2009-2013	Global Competitiveness Report
strength of investor protection	2009-2013	Global Competitiveness Report
venture capital avaiablity	2009-2013	Global Competitiveness Report
ease of access to loans	2009-2013	Global Competitiveness Report
Monetary Gold Reserves(Absolute)	2007-2011	Marketline Database
Stocks traded, total value (current US$)	2008-2012	World Bank Database

Indicator Set for Public Sector Pillar

Indicator	sample length	Data Source
Research and development expenditure (% of GDP)	1996-2011	World Bank Database
Urban population (% of total)	1960-2011	World Bank Database
CO2 emissions (metric tons per capita)	1960-2011	World Bank Database
Quality of scientific research institutions 1-7 (best)	2006-2012	Global Competitiveness Report
University-industry collaboration in R&D 1-7 (best)	2006-2012	Global Competitiveness Report
Gov't procurement of advanced tech products 1-7 (best)	2006-2012	Global Competitiveness Report
Quality of the educational system 1-7 (best)	2006-2012	Global Competitiveness Report
Quality of math and science education 1-7 (best)	2006-2012	Global Competitiveness Report
Quality of management schools, 1-7 (best)	2006-2012	Global Competitiveness Report
Legal rights index 0–10 (best)	2006-2012	Global Competitiveness Report
Strength of auditing and reporting standards, 1-7 (best)	2006-2012	Global Competitiveness Report
Public spending on education, total (% of government expenditure)	1998-2010	World Bank Database
Number of Students in Primary Education(Absolute)	2007-2011	Marketline Database
Number of Students in Secondary Education(Absolute)	2007-2011	Marketline Database
Number of Students in Tertiary Education(Absolute)	2007-2011	Marketline Database
Public Healthcare Expenditure(Absolute)	2007-2011	Marketline Database
Central government debt, total (% of GDP)	2006-2012	World Bank Database
Scientific and technical journal articles	1981,1985-2009	World Bank Database
Quality of railroad infrastructure, 1-7 (best)	2006-2012	Global Competitiveness Report
Quality of port infrastructure, 1-7 (best)	2006-2012	Global Competitiveness Report
Quality of air transport infrastructure, 1-7 (best)	2006-2012	Global Competitiveness Report

Determining the number of clusters

- Method: Elbow rule
  - Identify the step where the distance makes a bigger "jump".
- Number of Clusters
  - Real : 4 clusters
  - Finance : 4 clusters
  - Public : 3 clusters



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Empirical Results

- Real Sector Pillar

France	1	Russia	2	Indonesia	2	India	2
Unitedkingdom	1	Mexico	2	Canada	4	Korea	1
China	2	Italy	2	Japan	3	SaudiArabia	1
Brazil	2	UnitedStates	3	Turkey	2	Australia	4
Germany	1	SouthAfrica	4	Argentina	2		

- Group 1 : France, United Kingdom, Germany, Korea and Saudi Arabia
- Group 2 : Brazil, Russia, India, China, Mexico, Italy, Indonesia, Turkey, Argentina
- Group 3 : United States and Japan
- Group 4 : South Africa, Canada and Australia

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Empirical Results

- Finance Sector Pillar

France	1	Russia	2	Indonesia	2	India	4
Unitedkingdom	1	Mexico	2	Canada	4	Korea	2
China	1	Italy	2	Japan	1	SaudiArabia	4
Brazil	2	UnitedStates	3	Turkey	2	Australia	4
Germany	1	SouthAfrica	4	Argentina	2		

- Group 1 : France, United Kingdom, China, Germany and Japan
- Group 2 : Brazil, Russia, Mexico, Italy, Indonesia, Turkey, Argentina and Korea
- Group 3 : United States
- Group 4 : South Africa, Canada, India, Saudi Arabia and Australia

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Empirical Results

- Public Sector Pillar

France	1	Russia	3	Indonesia	2	India	3
Unitedkingdom	1	Mexico	3	Canada	1	Korea	1
China	2	Italy	3	Japan	1	SaudiArabia	1
Brazil	3	UnitedStates	1	Turkey	3	Australia	1
Germany	1	SouthAfrica	1	Argentina	3		

- Group 1 : France, United Kingdom, Germany, United States, South Africa, Japan, Korea, Saudi Arabia and Australia
- Group 2 : China and Indonesia
- Group 3 : Brazil, Russia, Mexico, Italy, Turkey, Argentina and India

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Conclusions

- There are 3 groups of countries which are in the same cluster for each pillar;
  - France, United Kingdom and Germany
  - Russia, Mexico and Italy
  - Turkey and Argentina
- The **Real Economy Pillar** consists of **4 clusters**
  - Japan and the United States are forming an own cluster. which shows high technology advancement and degree of future orientation.
  - South Africa, Canada and Australia are in the same cluster. These are countries which are characterized by heavily-dependence on primary resources.
  - BRIC countries (Brazil, Russia, India and China) are in same cluster. They form the group of globally most important emerging economies.
  - There exists a cluster of European Countries (France, United Kingdom and Germany) together with Korea and Saudi Arabia.

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Conclusions (cont.)

- The **Finance Economy Pillar** consists of **4 clusters**
  - The United States are forming an own unique cluster. That shows the dominance and importance of this country in a global future-orientated perspective.
  - There exists again a cluster of European Countries (France, United Kingdom and Germany). This time Japan joins this European group.
  - Concerning the BRIC countries, there exists no more a common cluster.
  - China is a member of European Group. Brazil and Russia are forming a new group together with other emerging countries like Indonesia, Turkey, Argentina and Mexico. In this cluster, we also find Korea and Italy.
  - South Africa, Canada and Australia, the natural resource dependent economies, are members of the same cluster, which is completed by India and Saudi Arabia.
- The **Public Sector Pillar** consists of **3 clusters**
  - There exists a large group of countries which belongs to cluster 1.
  - This cluster contains countries from Europe (France, United Kingdom and Germany) , Asia (Japan, Korea and Australia), completed by United States, South Africa and Saudi Arabia. The result may be an astonishing one, because it brings together countries from different economic regions in the world which, in addition, have a quite different status of development. So, one could conclude that the public sector is as important concerning future orientation in advanced economies as it is in emerging ones.
  - China and Indonesia form an own cluster. The public sector there has a special character if one considers its future orientation.
  - In the third group we find BRIC countries (Brazil, Russia and India), completed by other emerging countries(Mexico, Turkey and Argentina). The only advanced country in this group is Italy.

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