Bachelor Thesis

How strong is the influence of Corruption on Innovation, especially in post-communist EU Member States? - A Comparative Analysis

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ABBREVIATIONS

Countries' Names

AT Austria	IS Iceland
BE Belgium	IT Italy
BG Bulgaria	LT Lithuania
CH Switzerland	LU Luxembourg
CY Cyprus	LV Latvia
CZ Czech Republic	MT Malta
DE Germany	NL Netherlands
	NO Norway
DK Denmark	PL Poland
EE Estonia	PT Portugal
ES Spain	RO Romania
FI Finland	RS Serbia
FR France	RU Russia
GR Greece	SE Sweden
HR Croatia	SI Slovenia
HU Hungary	SK Slovakia
IE Ireland	TR Turkey
	UK United Kingdom

CPI	Corruption Perception Index
TII2009	Corruption Perception Index used in the calculation
TI	Transparency International
EU-CEE	EU Central and Eastern Economies
SII	SummaryInnovationIndex

1. ABSTRACT

Corruption is not a topic only concerning developing or underdeveloped countries. It is present in the EU and it has growing tendencies as the current disaster in Greece shows. Nowadays especially the former east block states which accessed the EU in 2004 and 2007 are fighting against corruption on all possible levels of governance. But until now these transition economies are not effective enough to fight against corruption. What is alarming, is that the Corruption perception index (CPI) measured by Transparency International (TI) is even increasing since the accession of the transition economies to the EU (TI, 2010). The declining degree of accountability in public administration of these new Member States might be caused by the growing opportunities for abusing stated funds or other illicit profit-making offered by the EU.

On the other hand these funds (ERDF, Cohesion, ESF) from the EU, are supporting EU cohesion especially in integrating the EU10 countries. As a consequence they should play an important role in economic convergence to the old Member States. However, we must ask the question if this money is responsibly invested? According to the information of the European Innovation Scoreboard (EIS) the progress of the transition economies in the field of innovation is still rather low some voices even from the scientific point of view state that innovation in some regions of EU-CEE is just a tool to fraudulently obtain money from the EU. "The Polish system of regional policy is (…) almost exclusively focused on the absorption of the European Union funds" (Grosse, 2006: 62).

These kinds of statements are strongly burdening to the coherent trust of the (core) EU States among each other. To find out what are the real reasons for low improvement in the sector of innovation in EU transition economies it is necessary to analyse possible obstacles to innovation. This research will conduct exactly this analysis while it is dedicated to a rather sensitive topic: the topic of corruption and its relation to innovation. So I will ask the question if there is a scientifically significant relationship between the factors corruption and innovation. We will do a direct comparison of quantitative data of innovation and corruption for a realistic overview to reveal the influence of corruption on innovation. But we also know the limitations of the figures. Both fields of research are not yet discovered scientifically as related topics. Even though it seems to be logical that a corrupt society damps the possibilities for innovators not only from the economic side but also from the governmental part of society, the factor of corruption is not yet officially considered as an obstacle to innovation. We will see that there is really a connection between the level of innovation and corruption and that new member states in general suffer more from the influence of corruption to innovation. But also some mediterranean states are highly affected by high corruption and low innovation rates.

This research might help to pave the way for more attention to the indicator 'corruption' in the context of innovation e.g. in implementation as parameter in EU's EIS. Moreover it identifies that a country's past or its long-established structures must be taken into account when EU actors try to solve problems like low innovation in the post-communist, new member states.

2. INTRODUCTION

2.1 EXPLAINING THE RELEVANCE OF THE TOPIC

Concerning the increase of the perceived corruption in Transition Economies since their accession to the EU (TI, 2010), it is necessary to ask on which fields of life corruption has impact. When I dealt with the topic of regional Innovation during my stay abroad in Krakow I found out that no official regional innovation programme considers the topic of corruption worth mentioning, even though corruption is seen as a big problem concerning economic growth. I looked at the local, national and European analyses and reports related to innovation and none of them considered corruption as a factor influencing innovation. But from my economic reasoning I derive that corruption has big impact on economy. And economic indicators are mainly used to measure innovation. Now I am asking why innovation and corruption is never brought into relation.

Is this subject too sensitive? Or do local and national officials in the new member states not want to convey the picture of a corrupt economy in front of the European Union observers? Or is it the other way round: The European Union does not want to have too much attention on the topic of corruption in relation with the New Member States? Maybe just not to threaten the feeling of solidarity and inner coherence in the Union which is necessary for the financially support of weaker economies. On the other hand I am convinced that hushing up the topic of corruption and its influence on the conversion of regions and nations in Central and Eastern Europe is a political disaster. There might be a situation in the future when the placation will be revealed. And those situations are obviously more detrimental for the reputation of the New Member States than an honest approach towards a problem. We can now observe on the example of Greece that an enormous loss of trust is following such a moment of revelation. Anyway it would be a stabilising brick in the wall to scientifically state that corruption is not influencing innovation in the Central and Eastern European Countries. So the EC citizens will have a kind of prove that their money going to the European funds is not wasted but building a better common future.

Another explanation why no official innovation report is listing corruption as a factor influencing innovation is rather simple and not filled with emotionalism: the data does simply not give any reason to connect these fields. But as long as nobody conducted research on this topic the 'emotional school of thinking' will not stop spreading a negative image of EU's innovation efforts – or at least the once that are financially supported by the Union. Of course there is also the possibility that the data gives a significant relation of corruption and innovation in the sense that corruption is innovation. This would provide the basis for further action-planning research to diminish the impact of corruption on innovation as much as possible. But it is generally known that reduction of corruption-related problems is already processing extensively in transition economies. So the findings would give further support for the programmes and institutions fighting against corruption.

2.2 DESCRIBING THE STRUCTURE OF THE THESIS

To find out about the relation between innovation and corruption in the New Member States we ask the empirical research question: **How strong is the influence of Corruption on Innovation, especially in post-communist member states of the EU?** We will focus on the role of post-communism in the relation of the variables innovation and corruption. This relationship is not necessarily defined as a causal relation.

To answer this relational question literature from the field of innovation and corruption needs to be reviewed. Existing theory provides definition for the analysed concepts, as well as a general abstract framework for establishing the hypothesis: **There is a scientifically significant, positive relationship between the indicators of corruption and innovation. This means the higher the corruption index (which indicates low perceived corruption) more innovation is present**.
Nevertheless, no theory connects the topic of innovation and corruption explicitly. The hypothesis is consequently implicitly derived from other existing theory.
Additionally, the methodology of research discusses how the hypothesis is actually tested. The main data sources used in the analysis are the Corruption Perception Index (CPI) by Transparency International (TI) and European Innovation System (EIS) data collected in the Summary Innovation Index (SII), both from 2009. A close look at the operationalisation of the variable is provided on the basis of the information published by TI and EIS methodology reports mainly. Threats to validity and reliability and other problems like data availability conclude the research methodology chapter. Moreover, reflections on the case selection will be part of the methodological explication. Since the thesis is limited we cannot take alternative measurements for corruption and innovation into account.

The core of the thesis namely the statistical analysis of the data and its interpretation is conducted in the next step. By means of SPSS and Excel outputs of the correlated TI and EIS data graphic and verbal description shows the relationship of innovation and corruption in the EU10 countries in various ways. The data will be analysed according to the methods extracted mainly from "Stats, Data and Models" written by De Veaux, Velleman and Bock as we deal with statistical analyses.
Finally, the hypothesis can be answered and the strength of the relation can be defined in mathematical terms that provides basis for interpretation. Also parts of the theory will be employed.
To conclude, the results of the statistical analysis are applied to the research question. Not every single state will be analysed, but we aim at constructing groups according to the theory of families of nations. Finally, reflections on political implications of the results of this thesis are provided. These reflections should set political actors' thinking for future creation of innovation strategies established at the European level. Many possibilities for follow up studies to this work will be pointed out, but first of all it is worth elaborating on the empirical research conducted by this thesis.

3. THEORY

3.1 DEFINING CORRUPTION

In general everyone knows what is meant by corruption. However, defining the concepts leads to serious difficulties, since the question arises if corruption should be defined in legal, social or economic terms. Consequently a philosophical approach might help to access to the term corruption. Plato, Aristotle, Thucydides and Machiavelli looked at corruption as a threat to "moral health of whole societies" (see Dobel 1978 and Euben 1978). This normative approach is concerned about societal systems as a whole. Whereas nowadays interpretations of corruption refer rather to actions of individuals which abuse public power for private gains (Heidenheimer, 1989a).

"[Corruption] largely dependents on culture, [...] actual social climate and active social groups" (Gallup Hungary, 1999). Hence the idea that there might be a difference between post-communist systems and western democracies in the EU concerning corruption perception is a logical consequence of the scientific knowledge about corruption.

Going back to the most popular definitions in modern times one should quote Nye who define corruption on the basis of individual action as follows:

"Behaviour which deviates from the normal duties of a public role because of private-regarding (family, close private clique), pecuniary or status gains; or violates rules against the exercise of certain types of private-regarding influence. This includes such behaviour as bribery (use of reward to pervert the judgment of a person in a position of trust); nepotism (bestowal of patronage by reason of ascriptive relationship rather than merit); and misappropriation (illegal appropriation of public resources for private regarding uses)" (1967).

This definition summarises all kinds of action perceived as corrupt acts in current literature in a very direct and narrow way. Some scholars consider this view as dangerous, since it might be too narrow and does not include the moral aspect and the consequences for a political system like the classical philosophical approaches.

One of the critics of the narrow approach is Dennis Thompson. He adds to the notion of narrowly defined 'conventional corruption' the idea of 'mediated corruption'. The reasoning behind this term expresses the concept that "corrupt acts are mediated by the political process" (Thompson, 1993). Consequently is more than an economic crime, it's a political crime, a crime on democracy. With this connection between the modern narrow definition of corruption which focuses on the individual's wrongdoing and the reanimation of the classical broader view, Thompson created the neo-classical school of perceptions of corruption. Many contemporary scholars are basing their definitions on Thompson's 'two-level approach'.

To get closer to the answer of our research question "How strong is the influence of Corruption on Innovation, especially in new EU Member States?" it is sensible to have a closer look at theories and deliberations about corruption in post-communist states, since eight of the ten new member states are former communistic states.

CORRUPTION IN POST-COMMUNIST STATES

"Corruption is particularly problematic for developing and transition economies" (Johnston, 1998). Now we need to ask why these countries are more vulnerable to corruption.

Ce Shen and John Williamson approach this question in their cross-national Analysis "Corruption, Democracy, Economic Freedom and State Strength". They investigate determinants of perceived corruption by means of qualitative data of 91 countries. Two indicators serve as proxies of corruption, namely the Corruption Perception Index 2004 (Transparency International) and the composed by the World Bank.

Shen's and Williamson's results show "many developing and transition nations have very different historical, cultural, and social backgrounds than do the western industrial nations" (Shen&Williamson, 2005). Transition countries did not have the chance to establish democratic structures which are mature enough to fight corruption effectively. Especially weak legal structures like "lack of power to monitor the actions of high-ranking government officials and economic elites, incomplete laws and a lack of transparency" (Shen&Williamson, 2005) lead to corrupt governments. The analysis concludes that only a strong government can cope with corruption problems in post-communist countries.

Another scholar who faced the reasons for vulnerability to corruption of post-communist systems is R. Theobald. His study on "Corruption, Development and Underdevelopment" (1990) looked at the last years of the communistic regimes in Central and Eastern Europe. As Shen and Williamson Theobald already recognized, the importance of an efficient legal system is the main factor for failure of corruption control. Similar to that, Theobald inferred from his findings that "societies with strong extended family or clan-based loyalties tend to have high levels of corruption" (1990). Even twenty years after the fall of the iron curtain a sceptical view towards government is ponderable among many people from transition economies. One phenomenon of mistrust is that every homeowner in bigger cities who can effort it hires private security services for protecting their property, instead of relying on the public security system. There are many of those examples observable in post-communist countries. The statement which is underlined by this example is that the atmosphere between government and the normal population still suffers from distrustfulness and suspicion in post-communist states. These unsettled feelings are serving as hotbeds for corruptive actions.

Typology of Post-Communist Corruption

I. Low-level administrative corruption
- Bribery of public officials to bend rules
- Deliberate over-regulation, obfuscation, disorganization
- Using licensing and inspection powers for extortion

II. Self-serving asset stripping by officials
- Diverting public resources for civil servant spoils
- Mismanagement and profiteering from public resources
- Profiteering from privatization
- Malpractice in public procurement
- Nepotism, clientelism, and "selling" of jobs

III. "State capture" by corrupt networks
- De facto takeover of public institutions for private business or criminal activity
- Forming collusive networks to limit political competition
- Undermining free elections through slush funds, hidden advertising, etc.
- Misuse of legislative power
- Corruption of the judicial process
- Misuse of auditing, investigatory, and oversight powers
- Using kompromat for political blackmail and coercion
- Corruption of and in the media

by Rasma Karklins, 2002

FIGURE 1 TYPOLOGY OF POST-COMMUNIST CORRUPTION

The typology of post-communist corruption (Figure 1) is a very ingenious tool to demonstrate the various forms of corruption in Post-communist countries. In addition, it separates the different types of corruption sharply and provides a simple overview for defining post-communist corruption.

Rasma Karklins' study "Capitalism, Corruption and Something Else" (2002) is based on data of Transparency International, but mainly gives qualitative contributions to the debate on post-communist corruption. As many other scholars Karklins identifies corruption as "the chief obstacle to democratic and economic process in the post-communist region" (2002). It is stressed that corruption causes direct costs for transition economies. "People at large pay a cost in terms of poor public safety, services, judicial enforcement of contracts and laws, and democratic representation" (Karklins, 2002). Corruption puts economic and political development in chains, at the same time it triggers anger, distrust and cynicism among people.

THE SIMPLE, BUT EFFECTIVE CONCEPT OF CORRUPTION BY TRANSPARENCY INTERNATIONAL

As we have seen there are many different ways to define and sub-divide the different forms of corruption. But this thesis needs to apply a clear concept of corruption. A review of many studies showed that the vast majority of scholars rely on the simple but applicable definition of Transparency International and their Corruption Perception Index (CPI) as a measurement instrument. An even more obvious reason to select CPI is that we employ this data for the following analysis. Transparency International defines corruption as *"the abuse of public power for private gain at the expense of public good"* (TI, 2010).

Many scholars are complaining that the terms 'public power', 'private gain' and 'public good' are not further specified. But no matter how one scholar defines the sub-terms, another scholar is arguing that the definition is either too broad or to narrow. So we apply the simple definition of Transparency International, even though it leaves many questions unanswered.

Now that we defined the concept of corruption and obtained an overview of the 'state of art' concerning scientific findings on corruption and especially post-communist corruption, we want to deal with theory related to our second variable: innovation.

3.2 INNOVATION - A FREQUENTLY-ANALYSED CONCEPT

SCHUMPETER'S DEFINITION OF INNOVATION

When one outlines the theory of innovation it is inevitable to discuss the ideas of Schumpeter, the father of research on innovation and economic trends. Even though these ideas were generated in the first half of the twentieth century they are always discussed anew at times of vast economic upheavals.

Schumpeter (1911) developed five events which he considers as innovative actions (figure 2) and further defines innovation as the application of new ideas to reality. R&D activity only is not seen as innovation by Schumpeter, but as invention. The innovation term is only employed correctly if the invention is diffused across all layers of the market by an entrepreneur. Moreover it is also important to Schumpeter that the term innovation is only used in the context of

1) Introduction of new products

2) Introduction of new methods of production

3) Opening of new markets

4) Development of new sources of supply for raw materials or other inputs

5) Creation of new market structures in an industry

FIGURE 2 SCHUMPETER'S DEFINITION OF INNOVATION

dynamical processes (Freudenberger&Mensch, 1975). Schumpeter even goes beyond the economic level when he describes innovation. The political and the socio-cultural level can also be involved in dynamic processes of innovation. One very obvious example for a political innovation is the establishment of the European Union. Up to today it is unique in the world and it influenced the international political system to a large extent.

THE NEO-CLASSICAL DEVELOPMENT OF INNOVATION THEORY

Many theories on innovation were derived from Schumpeter's ideas. In the 1950s industrial innovation processes were seen as "a linear progression from scientific discovery through technological development in firms to the marketplace" (Rothwell, 1994). Thus technological development was considered as the main driver for innovation; this theory is called 'technology push'. In the late 1960s the 'market-pull' or 'need-pull' model of innovation became more popular according to the works of Schmookler (1966), Myer and Marquis (1969). So we observe a shift of perception of causes for innovation from the supply side (R&D) to the demand or market-oriented side.
In the 1980s theorists began to criticise the linear view on innovation and developed theories like 'social shaping of technology' by MacKenzie and Wajcman, Pinch and Bijker's 'social construction of technology' and Callon and Latour's 'actor-network theory'. All these views on innovation pay a lot of attention to the social circumstances next to the economic environment. More actors than just the inventor, the businessman and the consumer are taken into consideration. These new considerations were further developed to more systematic concepts which were directly applicable to improve innovation structures. A new era of thinking about innovation was born: the era of National Innovation Systems.

NATIONAL INNOVATION SYSTEMS (NIS)

Since innovation is understood as a complex interactive learning process with actors far beyond the researcher and the entrepreneur, there is a need for systemic approach, which integrates institutions to create, store, and transfer the knowledge, skills and artefacts (OECD, 1999).

NIS's are defined by various scientists since the late 1980's with the help of the following three quotations:

"... network of institutions in the public- and private-sectors whose activities and interactions initiate, import, modify and diffuse new technologies" (Freeman, 1987)

"... elements and relations which interact in the production, diffusion and use of new, and economically useful knowledge [...] and are either located within or rooted inside the borders of a nation state" (Lundvall, 1992)

NIS include "... all important economic, social, political, organizational, institutional and other factors that influence the development, diffusion and use of innovations" (Edquist, 1997)

Of course not all relevant definitions can be quoted at this point, since there are many scientists dealing with NIS. However, all of them overlap in certain points. First, all definitions declare institutions and

organisations as common components of NIS. C. Edquist describes the relationship between the elements institutions and organisations as strongly influencing each other and adds "there is a complicated two-way relationship of mutual embedding between institutions and organisations, and this relationship influences innovation processes and thereby also both the performance and change of systems of innovation" (Edquist& Johnson, 1997). This concept is a clear contrast to the old linear view on innovation, because the innovation flows do not stream in one direction but are interlinking different concepts and actors. This leads to the next common point of all definitions of National Innovation Systems, namely the actors. In general one can say that the specific characteristic of NIS is that all actors are linked. They are the action-oriented agents in the game of creating organisations and institutions for innovation. To disabstract the term agent the triple Helix approach created by Etzkowitz (2002) to the actors of NIS gives a clear concrete picture of innovation system connections (Figure 3).

The "triple helix" is a spiral model of innovation (Etzkowitz, 2002) which assumes that the academic, industrial, and governmental spheres influence themselves as well as each other (figure 3). A dynamic level of functioning should be reached in order to induce 'tri-lateral networks' and 'hybrid organisations' of development.

The second component of the triple helix approach is Research and Development (R&D), here called academia. This part is pivotal for further development on all levels, nevertheless according to the theory it is only effective in combination with government and industry.

The third part necessary for a successful and innovative structure is the government. It gives the framework for developments providing rules on taxation, corporate governance, tariffs and competition. The government is not primary interested in profit but is primarily responsible for the welfare of the society as a whole.

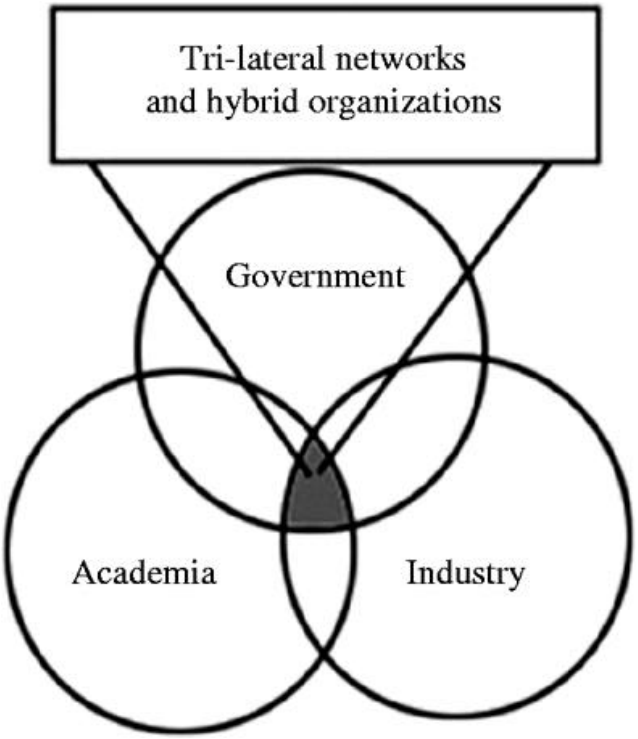

FIGURE 3 TRIPLE HELIX- INTERCONNECTION OF ACTORS

Triple Helix as created by Etzkowitz delivers a clear picture of actors of National Innovation System as indicated in figure 4 However, the element which is actually linking this system according to all definitions is knowledge and the aim to change knowledge into concrete products, which foster economic growth.

KNOWLEDGE – THE COUNTER-REACTIVE SOURCE

The most popular scientist dealing with NISs is Bengt-Åke Lundvall, a Danish professor who criticised the neo-classical, linear approach to innovation harshly. The reason for this is that he did not acknowledge supply and demand as the most influential driving force of innovation, but knowledge. As a consequence Lundvall emphasised the role of learning in national innovation. According to him "learning is predominantly an interactive and therefore, a socially embedded process which cannot be understood

without taking into consideration its institutional and cultural context" (1992). Knowledge is seen as a source of innovation which needs to be systematically raised with well-conceptualised policies. It is a source increasing in its value while it is applied – this does not mean that knowledge is a never-ending source, but it counter-reacts compared to classical, consumable sources.

NIS AS A GENERATOR FOR POLITICAL ACTION

The National Innovation System as a theoretical concept is scientifically well-developed and encouraged many policy makers to build up innovative structures. Various programmes were launched for the purpose to connect governmental, business and R&D actions at regional, national and European level. The most popular organisation dealing with the analysis of National Innovation Systems is OECD. The OECD is convinced of the systematic approach that the national structures of innovation provide new insight to the economic performance of its member states. The reason why such analyses are sensible is "interactions among the actors involved in technology development are as important as investments in research and development. And they are keys to translate the inputs into outputs. The study 'National Innovation Systems' directs attention to the linkages or web of interaction within the overall innovation system" (OECD, 1997). Political awareness of the importance for structuring innovation is the main aim of the analyses.

Similar purposes are followed by the European Innovation Scoreboard (EIS) by conducting research on the European level. Since this piece of work is the basis for the comparative analysis of this thesis we will discuss the content of the EIS approach in detail in the methodology part of this paper.

INNOVATION IN POST-COMMUNIST EU-COUNTRIES

Since the accession to the EU the new European member states launched programmes on various levels of governance to foster innovation. But the preconditions for implementation of innovative structures were "very different from the ones in the EU15 with regard to history, institutional set up, priority setting [and] interactions between actors" (Bucar&Stare, 2009). The main reason for poor or no implementation of innovative actions is missing governance mechanisms according to Bucar and Stare (2009).

The European Commission proposed the "third generation of innovation policy" as a resort for the implementation problems (EC, 2002). This concept conveys the idea that innovation has to be optimised in all sectors and components of the innovation system by structured coordination and integration. This means that not only horizontal structures of government needs to be involved in innovation systems, but also the vertical structures like R&D and entrepreneurs need to start weaving an active innovation structure, as well.

It is to conclude that no special programmes dealing with post-communistic or new member state structures has ever been launched which might be a huge obstacle to proper implementation of innovation structures.

3.3 INTERIM RESULT

Now we know how the concepts of Corruption and Innovation are defined. Still, we are far away from answering the research question. The obvious reason for that is: there is no theory which has ever dealt explicitly with the influence of corruption on innovation. However both concepts laid out in the theory section give a hint for finding a solution for our question. Corruption and innovation theories tell us that

they are highly dependent on societal circumstances, like mentality which includes traits of history or political system.
In this case the theory of *families of nations by* Francis G. Castles (1993) might serve as a bridge to overcome the gap between the concepts corruption and innovation. We do not want to go into detail regarding the theory of families of nation, but just look at the aspects that might help to explain differences in influence of corruption on innovation in Europe.

3.4 CLUSTERING EUROPE – THE FAMILIES OF NATIONS THEORY

'Policy similarities between groups and their differences from other groups may be attributable as much to history and culture and their transmission and diffusion amongst nations as to the immediate impact of the economic, political and social variables that figure almost exclusively in the contemporary public policy literature' (Castles, 1993).
Castles' statement reveals neglected explanatory aspects, namely history and culture, and at the same time he criticises current literature approach to the explication of policy outcomes. The vast majority of current literature is rigidly fixed on analysing policy outcomes from the economic, political and social point of view. Hence Castles' new perspective for reasons of political action go far beyond the 'superficial' reasons often taken into consideration when observing societal phenomena as the concept of families of nations demands dissection of cultural roots.
Esping-Andersen applied the families of nation's theory to his concept of welfare regimes. He described the clusters or families he formed as "similar in terms of social history as well as geography and welfare institutions" (Esping-Andersen, 1996). The typology of Esping-Andersen clusters the western European states into three families: liberal (Angelo-Saxon countries), corporatist-conservative (German-speaking countries) and social democratic (Scandinavian countries) (1990). The Mediterranean or southern model was established in a later phase by Bonoli (1997) and Ferrera (1996). In 1996 Esping-Andersen rejected the idea of a new, 'post-communist' or central eastern European welfare model, because similar structures of these countries are only of transitional nature. At that time experts expected the transitional phase to be overcome in 2005 (Deacon, 1993). Contrarily to that, Pierson (1994) relates to the strength of path-dependency in post-communist countries in Europe and prognoses that post-communist countries will form a regime on their own for a long time in the future. We will see which forecast can be verified in this analysis, of course only with regard to the limited scope of indicators measuring corruption and innovation.

3.5 BUILDING THE HYPOTHESIS

The definitions of the concept of innovation and corruption, as well as the idea of families of nations will be applied in our analyses. The state of art of both theoretical backgrounds shows that innovation and corruption has never been explicitly investigated in a connected way. Unfortunately the puzzle of theories we looked at does not deliver sound direction for a science-based relationship between innovation and corruption. Nether can we find a special concept for post-communist EU countries which have to cope with the consequences of their past in fighting corrupt structures to make innovation flourish. Anyhow, there is a hint that corruption is an obstacle to economic development especially in post-communist states (Johnston, 1998). If innovation is considered as a feature of economic development we can conclude that: **corruption hampers innovation in post-communist countries of**

the EU more than in other parts of Europe. To verify or falsify this hypothesis a close look at the measurement of our concepts needs to be taken in the methodology section.

4. METHODOLOGY

In this part of the thesis it will be explained in detail how the hypothesis will be tested. Now that the concepts employed in the hypothesis are explained by theory it is important to outline how they are will be measured. Additionally, we will describe how the correlation that will show a relationship between the indicators of innovation and corruption will be drawn with the help of statistical analysis. At that point the question of validity and reliability arises, as well.
But before we enter the critical, problematic parts of the methodology section a simple explanation for case selection is provided.

4.1 CASE SELECTION

The focus of this thesis concentrates on the cases of EU member states which have a communistic past. These countries are:
Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, Slovenia, Bulgaria, Romania. The simple reason for this selection is that the vast majority of literature shows that these regions have a high level of corruption which origins in post-communistic structures. Now the question we follow is if these structures are decreasing innovative action. Since the literature does not give any answer to this question we try to investigate the relation between corruption and innovation in post-communist new member states by comparing them with other member countries of the European Union. These countries are mentioned as an object of comparison, but they are not further analysed in detail, as a result of the limited capacities of a bachelor thesis. Consequently, we deal with a cross-national comparison study.

4.2 RESEARCH QUESTION AND SUB-QUESTIONS

According to the advice of experienced researchers it is important that the research question, as the heart of every study is not too broad and not too narrow (Punch, 1998; Creswell, 1994). Since we talk about a relationship between the variables corruption and innovation focussing on the political area of new European Member States with a communistic past I decided for the following research question:
How strong is the influence of Corruption on Innovation, especially in post-communist EU Member States?
It is an exploratory question as we explore a relationship or problem on a preliminary stage and enter new scientific territory.
According to Babbie's "The practise of social research" (2009) exploratory studies are most typically done for three purposes:

1. To satisfy the researchers curiosity and desire for better understanding
2. To test the feasability of undertaking a more extensive study
3. To develop the methods to be employed in any subsequent study

FIGURE 5 PURPOSES OF EXPLORATORY RESEARCH QUESTIONS

These arguments are appropriate to a large extent to this thesis. But at the same time the quantitative data analysis supports the idea of a descriptive design, because the data just describes the situation. Anyhow, Babbie supports the idea that "a given study can have more than one purpose" – namely exploratory *and* descriptive elements included in a single research question (2009).
The research question reflects the idea that corruption influences innovation. A causal direction is not indicated by this formulation for two purposes: On the one hand there are scholars who argue that corruption can have positive effects on economic structures. Even though we do not elaborate on that position in this thesis, we do not want to exclude its existence by prejudging a negative relation between corruption and innovation. The second reason for not explicitly asking "What negative influences are caused by corruption on innovation?" is simply that we do not claim a direct causal relationship between the variables. There might be a cause-effect relationship, but this thesis cannot prove it in a scientifically justified way. At this point the research question and thus also the thesis is mainly limited to the descriptive level.

The following subquestions are touching upon aspects which are of high significance for the thesis, but too broad to be mentioned in the main research question:
1. "How do post-communist member states perform differently in innovation correlated to corruption in comparison to the other member states?"
2. "Do the post-communist European member States fit into the clusters established by the families of nation theory?
3. "Is it sensible to take corruption as a future instrument for measuring innovation?"
4. "What kind of third factors will influence the results of my research?"

To answer all research questions the variables mentioned in that question need to be properly operationalized which is done in the next section.

4.3 Data Collection and Operationalisation

Operationalizing the applied concepts is highly important to conduct quantitative research, as it is the process which transforms observation into statistically applicable values. Since the indices of perceived corruption (CPI) and the summary innovation index (SII) are already operationalised by Transparency International and the European Innovation Scoreboard we now need to retrace their methodology process.

Operationalisation of the CPI

The corruption perception index (CPI) measures the perceived level of public-sector corruption in 180 countries on a scale from 0 (very high perceived corruption) to 10 (very low perceived corruption). An overview of its 2009 results is provided in figure seven.
For the generalisation of the CPI 2009 data from the previous two years are involved (2008 and 2009). The calculation is based on data provided by 13 sources from 10 independent institutions. All sources measure the perceived frequency and size of bribes in public and political spheres. The evaluation of the data is done by two groups: country experts and business leaders. African Development Bank, Asian Development Bank, Bertelsmann Foundation, Economist Intelligence Unit, Freedom House,

Global Insight and the World Bank base their evaluation on the opinion of country experts. IMD, Political and Economical Risk Consultancy and the World Economic Forum give resident business leaders the task of evaluating the countries' situation concerning corruption. Sources which have different distribution systems are standardised.
To see how the indices coincide with each other every standardized result is correlated to all of the other results which also deal with the same country. This correlation shows that most of the indices tend to have similar results, which makes them more reliable (TI, Methodology, 2009).

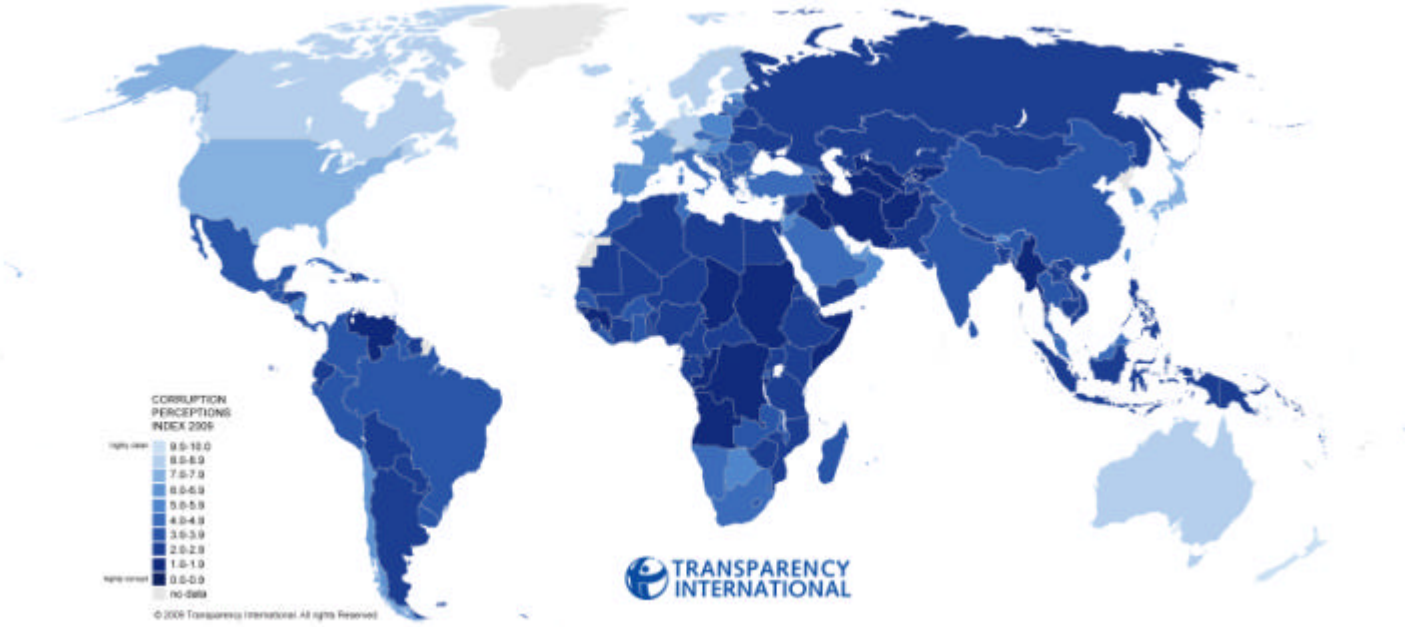

FIGURE 6 CPI 2009 WOLDWIDE OVERVIEW

All of sources used for the TI index employ a homogenous definition of corruption. It summarises existent data of all scientifically acknowledged sources. Therefore looking for alternative data sources is pointless. All scholars that deal with quantitative analyses of corruption trust the CPI, because it comprises all reliable sources. Still, there are limitations to the data provided by Transparency International which will be discovered in the next section.

LIMITATIONS OF THE CPI

First, when defining corruption we always have to face the problem that this phenomenon is perceived by some respondents in a very broad sense; whereas others define corruption in narrow terms. As discussed in the theory part the differences in definition seem to depend on cultural roots of societies. Supposing that corruption definition depends on culture may lead to the conclusion that a ranking of perceived corruption is senseless, since it tries to standardize results which are not comparable due to differences in definition. On the other hand there is no other tool that makes corruption measurable.
Second, the fact that we only deal with *perceived* corruption makes it hard to examine on 'real' corruption. But as a matter of fact real corruption is a hidden action which cannot be observed directly. The few witnesses with direct knowledge often have a strong interest in keeping their first-hand information secretly. On top of that, even perceived corruption has the same effects as 'real' corruption.
The third crucial point of criticism is that the CPI does not distinguish high-level corruption and low-level corruption. So the measurable effect we derive from the CPI cannot tell us if corruption is well-organized

or poorly-organized, for example. Those kinds of simplifications are always problematic when an index is created.
Other problems arises form the statistical or methodological point of view. For example, "the sources used in the CPI changes almost yearly, changes in the value of the CPI may result not from a change in the level of corruption, but from changes due to the fact that each source uses a different methodology" (Thompson&Shah, 2005). Next to the changing methodology of the CPI's components there is even a bigger point of criticism: It happens that some sources are omitted, while new sources enter the cadre of components. This is surely influencing the available data, and thus also the result of the CPI.
Another problem is that some countries have coverage of four sources contributing to the CPI and others have eight. The more sources we take into considerations the more reliable is the result, at least form the statistical point of view. Even though there is a minimum of three sources per country set by TI a CPI with eight basic sources has a higher reliability than a country with less.
The correlation of all results of studies and surveys provides security that the data show similar tendencies in cases when the coefficient is high, which is the case for most observed calculations. Anyway, some sources do not show strong association of the correlation coefficient. TI confesses to have no explanation for that phenomenon (TI Methodology, 2009).
No matter how solid the methodology of the CPI is designed, the limitations and problems mentioned above cannot be avoided.

OPERATIONALISATION OF THE SII

The summary innovation index (SII) is developed yearly since 2001 by the European Innovation Scoreboard (EIS) as a part of the programme ProInno Europe which is an initiative of the Directorate General for Enterprise and Industry of the European Commission. The index provides a comparative assessment of all EU member states, Switzerland, Iceland, Norway, Turkey, Serbia and Croatia. The research is conducted by Maastricht Economic and Social Research and Training Centre on Innovation and Technology (UNU-MERIT).

The index is composed of 30 indicators which measure different characteristics causing innovation on a scale from 0 (no innovation) to 1 (maximum innovation). The indicators are summarized in 3 blocks: Enablers, Firm activity and outputs.
The first block, enablers captures the main drivers to innovation which are external to the firm. This part comprises the categories human resources and finance and support. Measurement of the availability of highly-educated and skilled people is as important as the financial provision for innovative project and the support of political governance for innovative actions.
Firm activity, the second block, describes the activities of single firms to support innovative progress. It is measured by firm investments, linkages&entrepreneurship and throughputs of intellectual property rights and technology balance of payment flows.
The categories 'innovators' and 'economic effects' are components of the third block, outputs. The outputs of innovators are concretely measured by numbers of firms that have introduced innovations onto the market or within their organisations, covering technological and non-technological innovations. Economic effects are operationalised by looking at employment, export and sales changes caused by innovative action (EIS, 2009).

The data which is processed in figure 6 for calculating the SII is mainly taken from Eurostat and other internationally recognized sources. It contains most recent data from the years 2007 and 2008 (EIS, 2009). Unfortunately 2009 data is not available yet.

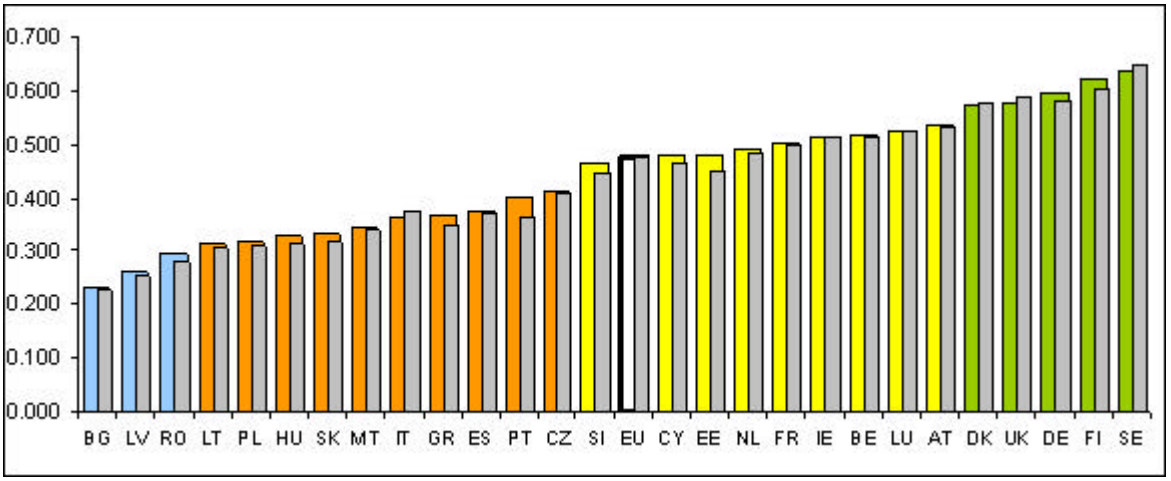

FIGURE 7 SUMMARY INNOVATION PERFORMANCE EU27 MEMBER STATES (2009 SII)

The SII 2009 is based on the same methodological principles as the SII 2008. Therefore we look at the 2008-methodology report.

The process of calculating the SII is explained in detail in "Rethinking the European Innovation Scoreboard: A New Methodology for 2008-2010" a document published by the initiative ProInno (Hollanders&vanCruysen, 2008). The most important step in the calculations is re-scaling of data. Especially data which is not given in percent or without any limitation needs to be transformed. Moreover, outliers are eliminated if they exceed three standard deviations above or below the mean. For the final index, the SII, data availability of at least 70% per category is required. This might have led to exclusion of some factors. Nevertheless, internal validity is strengthened by cutting of the categories which have too much missing data.

LIMITATIONS TO THE SII

Like any other index the SII is also limited by validity and reliability threats and other problems which confound the overall result.

Many critical thinkers approached the SII. All of them mentioned the same point of criticism at first: the lack of a model which explains innovation in terms of inputs, throughputs and outputs. It is not explained in a model why exactly these criteria are chosen and how they are related (Rammer, 2005; Arundel et al, 2005; Frietsch, 2005; Schibany et al., 2008).

The EIS justifies its ignorance of this criticism, because "the aim of the EIS is to measure innovation performance, and for measuring such performance we do not need a detailed model fully explaining the innovation process" (Hollanders&vanCruysen, 2008).

In the methodology report Hollanders and van Cruysen criticise themselves by saying that many aspects like socio-economic situation or non-technological and non-R&D activities which influence innovation are not included in the calculation (Hollanders&vanCruysen, 2008). This thesis even goes beyond the mentioned point of criticism, by saying that we also need to take into consideration the factors that are an obstacle to innovation. Corruption is just one of these barriers to innovation. Many other factors might also be tested in this context, like mentality aspects or administrative barriers.

Corruption already touches upon many possible barriers, but we need to keep in mind that it is just one of many missing factors which retard innovation.
Furthermore we have a 'high-tech bias' which threatens internal validity, as the single categories tend to measure well-observed sectors like high-tech industries (Hollanders&vanCruysen, 2008). Innovation in other sectors is often not easily countable and thus overlooked.
The problem of multicolliniarity is also often mentioned by scholars (Schibany&Streicher, 2008; Rammer, 2005). This means that many factors measured to create the SII influence each other. It is not possible to separate their effects.
This is just an excerpt of the frequently-mentioned limitations of the SII. A long and detailed list of further problems and limitations can be found in annex 2 of "Rethinking the European Innovation Scoreboard: A New Methodology for 2008-2010" written by the EIS experts Hollanders and van Cruysen.

HOW TO ANALYSE THE INFLUENCE OF CORRUPTION ON INNOVATION?

As we have well-developed quantitative data as a basis for our analysis provided by EIS and TI, it is possilble to apply statistical tools of association to the independent variable corruption and the dependent variable innovation. Guiding instructions for the analysis are extracted form "Stats, Data and Models" written by De Veaux, Velleman and Bock (2008).
First of all a regression model will to be calculated which can graphically picture the strength and direction of the association. Moreover the regression equation is calculated and its helps to visualise the distribution.

De Veaux et al. (2008) state that three conditions must be fulfilled before calculating the correlation:
1. **Quantitative variable condition**: the data must be clearly quantitative and not nominal or ordinal.
2. **Straight Enough Condition**: the scatterplot must give a linear impression, as an association can be calculated for every pair of variables, but to measure correlation only linear relationships can be taken into account.
3. **Outlier condition**: outliers can adulterate the correlation dramatically. Since they have the power to make a weak correlation look strong and vice versa. So outliers can not be accepted.

FIGURE 8 CORRELATION CONDITIONS

If these conditions are fulfilled will be seen later in the analysis part with the help of a scatter plot and analytical logic.

To go more into detail it is also interesting to look for clusters in Europe which have similar values with regard to their CPIs and SIIs. Clusters can be created in many ways. We will go for Excel tabulation. These clusters will be applied to the Theory of families of nations.
The results of the regression analysis and the clustering will be used to create a new regression model. This will provide more specific results for certain groups of nations. Moreover a close look at the SII will reveal which components of this index are contributing the most to the establishment of a tool for measuring innovation. Are there variables which do not contribute a lot? Which variables are the most important ones? Would corruption as a variable strengthen the conclusiveness of the index? To find this out a multiple-regression model will be created in SPSS. To exclude at least some third or confounding

variables we provide analyses of the effect of GDP per capita, GDP growth, deficit of the household in % of GDP, total loan deficit in % of the GDP, growth inflation consumer prices on innovation. This shows if other factors are more influential on innovation than the ones the EIS already looked at. These are the basic mechanisms to answer the research question and its sub-questions.

LIMITATIONS TO THE ASSOCIATION OF INNOVATION AND CORRUPTION DATA

The main problem we have to face in this analysis is the influence of third factors. We take it for granted that there are other factors than corruption which influence innovation. Only a very small number of them can be analysed due to two reasons:

First, the capacity of this Bachelor thesis is limited. Second, if we look at too many confounding factors the risk of multicolliniearity is increasing. Multicolliniearity is very likely to occur if we analyse data sets which follow the same purpose, namely expressing the state of economy. Achen, an expert on the field of social research warn that "control variables do not give more meaning to the initial relationship" (2002). He created the so-called 'ART'-theory (a Rule of Three), which claims that no model should be tested on more than three control variables (Achen, 2002). So we keep the investigations on confound variables limited, but still we do not apply the rule of three in a very strict manner.

Third factors also might disturb the cause-and-effect logic of the analysis. I already mentioned in the introduction that we cannot guarantee a direct causal relationship of corruption on innovation since the effects of corruption which we cannot describe in this thesis in detail might be the cause for a low innovation index. So actually the direct consequences of corruption need to be measured, like low trust in an economic structure or complication of administrative procedures as a variable, for example. Of course this is included in the CPI, but our analysis does not reveal *which* aspects of corruption decrease innovation rates.

Another problematic point in the thesis is the 'restriction of range', as it may lead to a threat of statistical conclusion validity according to Shadish, Cook, & Campbell (2002). The small numbers of cases we analyse make the results sensitive to outliers, for example. So we need to keep in mind that the calculations we conduct could be influenced by this threat.

Moreover many minor threats to validity and reliability may arise which we do not address at this point.

To apply the knowledge we generated up to this point a statistical analysis of the described data will follow in the next section.

5. DATA ANALYSIS

After looking at the concepts and methodology established by many different scholars who deal with innovation and corruption as separate constructs, it is time to bring the data of innovation and corruption together. A first simple overview can be seen in the scatter plot below:

5.1 REGRESSION OF SII AND TII

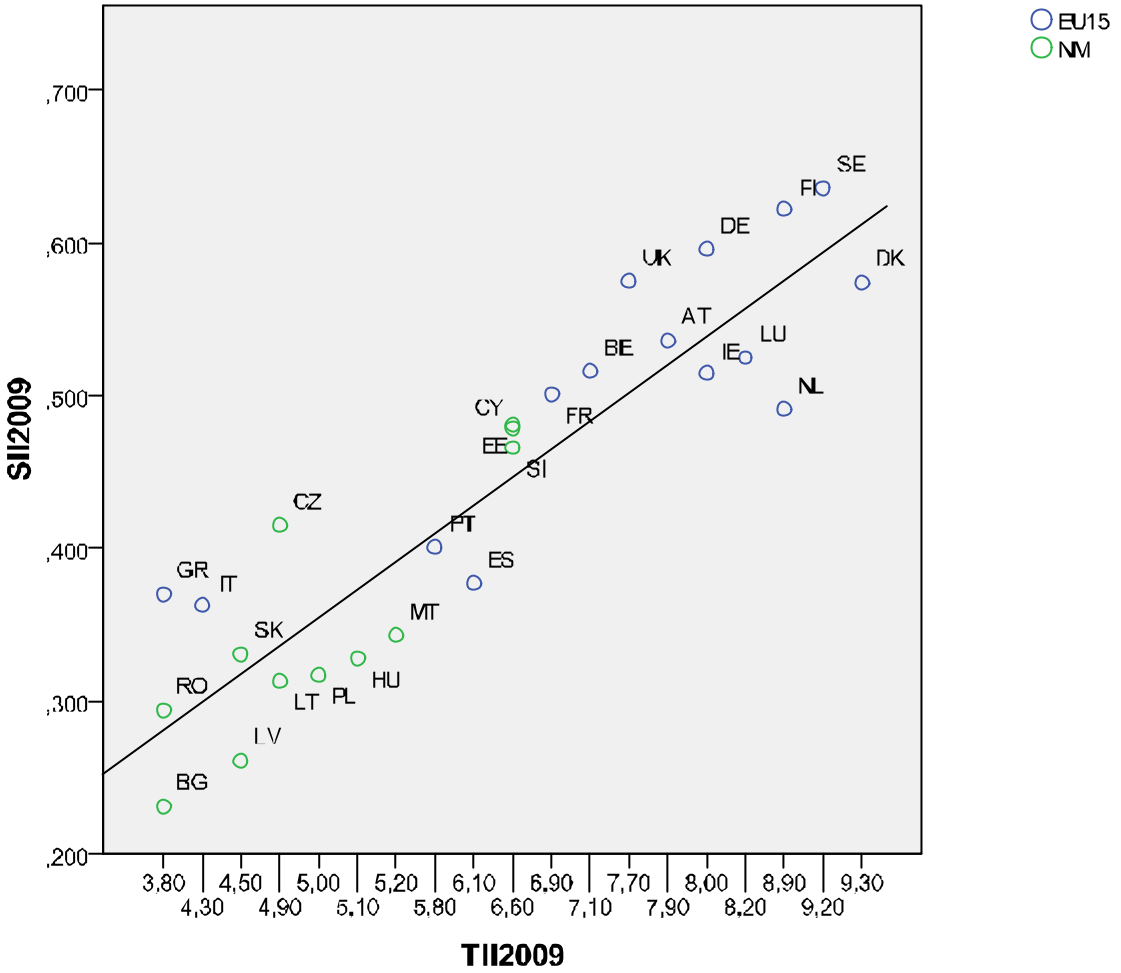

FIGURE 9 TII2009 AND SII 2009 BY COUNTRY

At the first glance we can obviously see that the datasets plotted against each other must be related, because drawing a straight line through it is possible. Hence they fulfil the straight enough condition (DeVeaux, Velleman, & Bock 2008). We cannot see any outliers from the cloud which is the criterion for the second condition, the outlier condition. The third condition, the quantitative, variables condition cannot be investigated by looking at the scatter plot. But it is clear that the numbers we see on the axes are a quantitative tool of measurement. Nevertheless, this condition leaves room for some doubt, because the scale we apply is artificially created, of cause. This means we do not have a natural scale unit, but we created quantitative data from qualitative criteria. The creation of in index generates some problems which are discussed in the methodology part already.

In conclusion we consider the conditions as fulfilled to a large extent. So we can go on analysing the data by calculating a regression equation:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,061	,033		1,849	,076
	TII2009	,059	,005	,921	11,856	,000

a. Dependent Variable: SII2009

CALCULATION 1 REGRESSION OF TII TO SII

The equation for creating the correlation is according to the SPSS output:

SII = 0,061 + 0,059 x TII2009

The B-factor in the SPSS output shows that for each point of increase in the TII2009 the SII index is increasing 0,059 points (Calculation 1). This means the visible impression is also supported from the mathematical viewpoint, namely that a positive relationship is given between the indices of corruption and innovation. Moreover we would like to know if the variable of corruption is a contributively factor for innovation. Therefore a model summary is created (Calculation 2) via SPSS which tells us that R^2 equals 0,849. This has the meaning that about 84,3% of the dependent variable, innovation is explained by corruption as the independent variable. This is a high percentage value which brings us to the conclusion that corruption is very useful for explaining the extent of innovation in the countries we analyse.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,921[a]	,849	,843	,045922

CALCULATION 2 MODEL SUMMARY REGRESSION OF TII TO SII

5.2 RANKING AND CLUSTERING

A second step towards organising the data is to rank and to form clusters. First we wanted to divide the data into EU15 and EU 10, but the figures showed immediately, that this makes not much sense. The main reason for this is that a group of old member states is lagging far behind the rest of the highly developed EU15 states.

We sorted the data according to their SII and CPI in descending order. With the help of this method we can directly identify the 'top-ranking-countries' and the 'low-ranking-countries'. Unfortunately the CPI and SII data do not match perfectly, so that we chose the SII as the dominant factor. This means the SII is completely listed in descending order, then following the CPI's order.

TABLE 1 shows the clustering of all analysed countries into four groups. The first group (blue) consists of old member states only. The second cluster comprises four new member states, indicated in brown. Estonia, Cyprus and Slovenia are catching up clearly to the old member states in terms of innovation and perceived corruption. Also the Czech Republic belongs to this group of 'newcomers', because of its high innovation rank, but the CPI still shows that this country is close to the edge of falling down to the third cluster.

The third block of countries (green) consists completely of Mediterranean states, namely Portugal, Spain, Greece, Italy and Malta. The fact that Malta is ranking last among that cluster is not a surprise since it is the only new member state among this group. But Greece with its very low CPI of 3,8 is close to lose its rank in this group. Therefore it is indicated in red.

The 'slow-developing'- new member states group (grey) include seven post-communistic member states. In terms of innovativeness they rank clearly behind, but some CPIs give hope for future development. Poland and Hungary, for example have a CPI of 5 resp. 5,1. If causality between corruption and innovation is expected than we can predict an innovation increase for the future. But this needs to be investigated in a separate study in detail.

ISO 3166 2-ciffry		NM 0=NO 1=YES	Cluster	SII 2009	CPI 2009
SE	Sweden	0	1	0,636	9,2
FI	Finland	0	1	0,622	8,9
DE	Germany	0	1	0,596	8
UK	United Kingdom	0	1	0,575	7,7
DK	Denmark	0	1	0,574	9,3
AT	Austria	0	1	0,536	7,9
LU	Luxembourg	0	1	0,525	8,2
BE	Belgium	0	1	0,516	7,1
IE	Ireland	0	1	0,515	8
FR	France	0	1	0,501	6,9
NL	Netherlands	0	1	0,491	8,9
EE	Estonia	1	2	0,481	6,6
CY	Cyprus	1	2	0,479	6,6
SI	Slovenia	1	2	0,466	6,6
CZ	Czech Republic	1	2	0,415	4,9
PT	Portugal	0	3	0,401	5,8
ES	Spain	0	3	0,377	6,1
GR	Greece	0	3	0,370	3,8
IT	Italy	0	3	0,363	4,3
MT	Malta	1	3	0,343	5,2
SK	Slovakia	1	4	0,331	4,5
HU	Hungary	1	4	0,328	5,1
PL	Poland	1	4	0,317	5
LT	Lithuania	1	4	0,313	4,9
RO	Romania	1	4	0,294	3,8
LV	Latvia	1	4	0,261	4,5
BG	Bulgaria	1	4	0,231	3,8

TABLE 1 CLUSTERING

5.3 PROOF OF INEQUALITY OF THE CLUSTERS

Ranks

	Cluster	N	Mean Rank
SII2009	I Main Old MS	11	22,00
	II Catching-up new MS	4	14,50
	III Mediterranean	5	10,00
	IV slow-developing new MS	7	4,00
	Total	27	

Test Statistics[a,b]	
	SII2009
Chi-Square	23,571
df	3
Asymp. Sig.	,000

a. Kruskal Wallis Test

b. Grouping Variable: Cluster

CALCULATION 3 KRUSKAL WALLIS TEST DEMONSTRATES DIFFERENCES IN CLUSTERS

The Kruskal-Wallis test (Calculation 3) gives the opportunity to compare the mean ranks of the different clusters, main old MS, catching-up new MS, Mediterranean and slow-developing new member states. The mean rank of the created groups must be significantly different from each other to build a single cluster. The test provides a scientific legitimation for the formation of our clusters established before. If this is the case we can reject the null-hypothesis which states: the means of the clusters are not significantly different from each other. Whereas the alternative hypothesis says that the means are scientifically different. Now we look at the Chi-Square result of 23,571 and notice that this value with 3 degrees of freedom in fact rejects the null-hypothesis. This has the consequence that the clusters built are scientifically legitimate, because of their means that differ significantly from each another.

5.4 APPLYING THE CLUSTERS TO REGRESSION

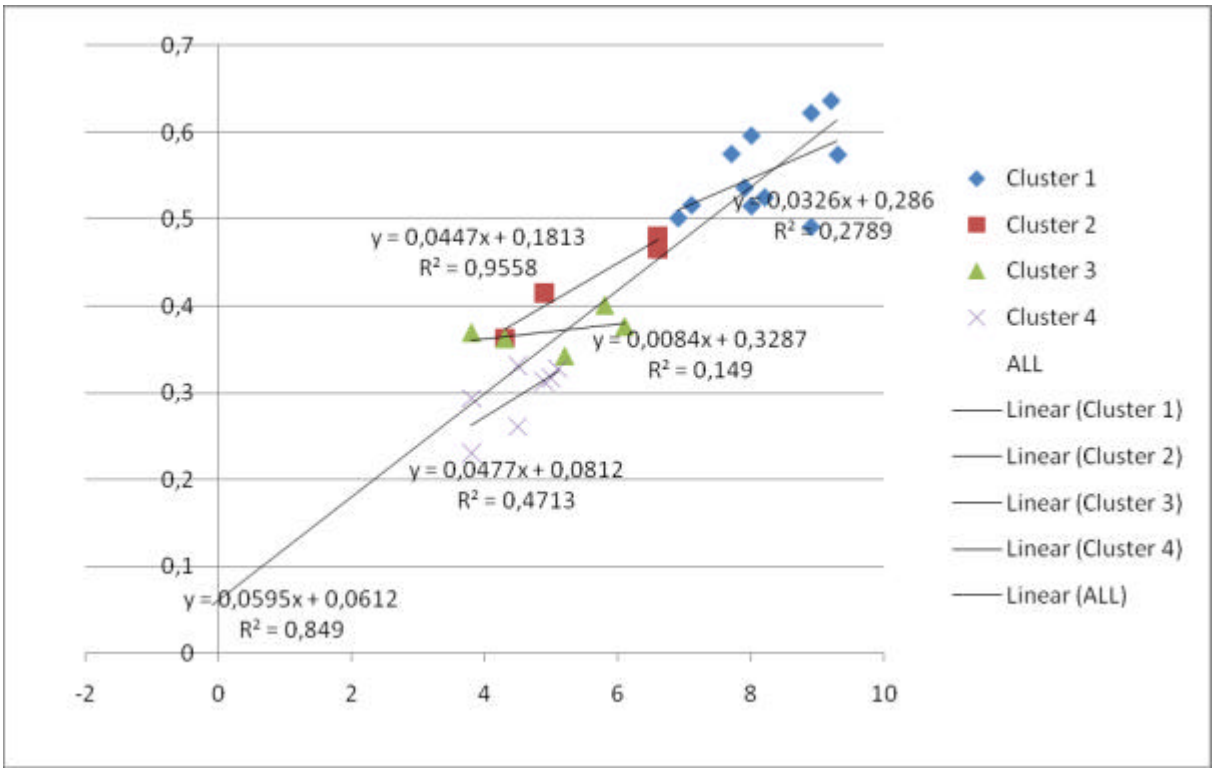

FIGURE 10 APPLYING THE CLUSTERS TO REGRESSION

Up to this point we analysed the regression of the values innovation and corruption and created clusters which rank the countries according to their performance. The application of that findings in one plot provides an interesting result:

The groups we identified seem have a different sensitivity for the influence of corruption on innovation. The most striking finding is that the post-communistic member states, cluster 2 and cluster 4 react more sensitively to the variable corruption than the clusters 1 and 3, which contain old member states, with the exception of Malta. This result demontrates clearly that the post-communist states' innovation index is stronger influenced by the level of corruption than the non-post-communist member states clusters. This result is statistically supported by the b1-value of every regression equation. In cluster 2 and 4 the b1-value equals 0,0447, whereas the b1-values in the groups dominated by old member states have lower b1-values, which leads to a moderate increase of the regression line.

Due to the low number of cases we analyse in this thesis it is not advisable to interpret these regression line in too much detail since statistical conclustion validity is in danger due to a the threat of a small amount of analysed units (Shadish et al., 2002).

5.5 Re-Modelling The Innovation Index SII2009

The aim of the remodelation of the SII-model is to reduce the number of included factors, but keeping the level of conclusiveness high. At the same time the new model will include the factor of corruption in form of the TI index 2009.

The orginal SII2009 is calculated by appling 30 factors. When typing the data into SPSS, the programme automatically excludes four factors: 1.2.3 Private credit (relative to GDP), 2.3.2 Community trademarks per million population, 3.2.2 Employment in knowledge-intensive services (% of workforce) and 3.1.3 b Reduced use of materials and energy (% of firms). The reason for this is that their influence

on the overall result of the SII equals 0% (calculation 4, annex). This means we can eliminate these four factors. Even Hollanders and van Cruysen critisize the meaningless of some factors in their methodology report (2008). The remaining 26 factors have still a R^2 of 1,0, so 100% of the original conclusiveness is conserved.

To create a 'slimmer' model for innovation we look at the variables which contribute the most to the final result of the SII2009.
From the remaining 26 factors the 10 most important factors are found in the firm activities section indicated in green, in the output part five very useful variables can be found (yellow) and Enablers contribute with one important factor to the new model, coloured in blue (table 2, annex). The contributiveness of the single factor can be recognised by looking at the Beta-factor. This factor of standardised coefficients shows how strong a regression model is changed by the single factor.

Now, the new model consists of only 10 factors and explains the SII2009 for R^2 = 0,976 compared to 1,0 with the full data set. The new constellation of factors reveals two more redundant, factors, namely SMEs introducing marketing or organisational innovations (% of SMEs) and innovative SMEs collaborating with others (% of SMEs) (calculation 5, annex). Their standardized Beta is very low.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	TII2009	,053	,005	,814	9,740	,000
	rec_CP2.1.2ITexpenditures	,058	,030	,159	1,897	,072
	rec_CP3.2.3Mediumtechandhightechmanufacturing	,066	,031	,148	2,130	,045
	rec_CP3.1.2SMEsintroducingmarketingororganisational	,050	,025	,144	2,031	,055
	rec_CP3.1.3aReducedlabourcosts	,053	,030	,121	1,759	,093
	(Constant)	,010	,034		,291	,774

CALCULATION 6 REDUCING FACTORS AND INTRODUCING TII2009

Further revealing redundant factors was also the purpose of the next calculation. Even though it might not be sensible to reduce the SII factors to the lowest possible level, the reduction to only five factors

including corruption in form of the TII2009 shows that it is statistically possible to minimise the input variables drastically without loosing much of its conclusiveness.
Calculation 6 delivers the evidence that TI2009 is a very influential factor of all the chosen factors with a standard beta of 0,814. Our new model has R^2 of 0,93 which means that about 93% of the dependent variable SII2009/innovation is explained by the five factors we have chosen.
The new regression equation according to this model is:

Innovation = 0.01 +
0.053 x TII2009 +
0.058 x ITexpenditures +
0.066 x Mediumtechandhightechmanufacturing +
0.05 x SMEsintroducingmarketingororganisationalinnovations +
0.053 x Reducedlabourcosts +
0.033 x Standarderror

To conclude, the SII model was sharply reduced form 30 factors to five factors in this section. Now the question arises if it is really sensible to exclude so many of the original factors. In statistical terms we got evidence that the re-modulation does not harm the conclusiveness of the model strongly. However, reality is more complex than a mathematical model can ever be. Therefore we do not recommend reducing the number of factors to the lowest statistically possible level, but we postulate at least for a statistical test if the variables give any input to the final result. Moreover this thesis provides evidence that it is worth looking at the factor corruption as a tool of measurement for innovation in future analyses, like the European Innovation Scoreboards SII or even other scientific projects which aim at measuring innovation.
Before a final statement about the influence of corruption on innovation can be uttered, third factors which could destroy our findings' meaning need to be analysed.

5.6 Third factors Applied to the SII2009 Model

To take care of the question "What kind of third factors could influence the results of the research?" we think about some main descriptive factors for economic growth as possible confounders. Of course many factors even outside the economic sphere could be taken into consideration. But this exceeds the limits of our thesis.

First a multi-regression of the years 2007, 2008, 2009 for the factors GDP per capita, GDP growth, deficit of the household in % of GDP, total loan deficit in % of the GDP, growth inflation consumer prices was done. No factor showed any significance towards the SII2009. We used the different years as a time lack could be supposed or that extreme changes in the crisis 2008 and following years could harm our result.
Thereafter a regression of the third factors towards the SII for the year 2009 was done. The figure below shows the numerical results, with a poor explaining factor R^2 for each of the analysed factors.

We also put the factor of corruption (TII2009) into account, just as a tool of comparison. There we see the big difference between the contributions of the different factors to the SII. While the TII2009 contributes about 85% to the final result, factors like the GDP deficit or inflation in consumer prices only explain about 11% resp. 26% of the SII2009. These poor results are also graphically illustrated in the annex (figure 10 – 14, annex).

To sum up our short third factor analysis it is to state that general economic measurements which we used are not explaining the factor innovation properly. These factors do not alternatively explain the innovation and therefore do not need to be considered as confounding variables for the SII2009.

	R Square
TII2009	0,849
DefizitOfGDP2009_p[a]	0,106
LoanOfStateOfGDP2009[a]	0,009
[tsieb010] 2009 BIP per capita[a]	0,223
GDP_increase 2009[a]	0,260
Inflation consumer Prices 2009	0,262

CALCULATION 7 REGRESSION THIRD FACTORS AND SII2009

SUMMARIZING THE DATA ANALYSIS FINDINGS

The correlation we found between the variables of corruption and innovation show clearly that here must be a strong relation between these factors. Moreover we identified corruption as a well-suited factor for explaining or measure innovation. Our clustering showed that different groups of states in the EU have a different sensibility to corruption in relation to innovation. Especially the post-communist states showed in the regression model, that their vulnerability to corruption is higher compared to the other EU states. The analysis of the single factors of the SII revealed some meaningless factors for measuring innovation. We created a new model which also works with the Corruption Perception Index. The introduction of this factor showed that corruption is a sensible factor to take into consideration when measuring innovation. The analysis of the third factors showed that none of the general economic tools of measurements we statistically related to innovation in form of the SII2009 can contribute to explain innovation and is also not correlated scientifically.

Of course we need to take into account that we work only with statistical models. These models tend to generalise and categorise the complex reality and are therefore vulnerable to misinterpretation. The results found are only shortly investigated and leave plenty of room for further research. Especially the analysis of post-communistic states' corruption and their innovation rates require further in-depth analysis.

Now that the quantitative procedure of this thesis is finalised the qualitative application of the theory of families of nations will follow.

IS THE 'FAMILIES OF NATIONS'-THEORY VALID FOR THE CONCEPTS OF CORRUPTION AND INNOVATION IN EUROPE?

As found out by means of the applications of the clusters to the regression model some 'families' or groups of nations react more sensitive to corruption depending on their innovation levels than others. Since we do not exactly deal with the groups formed by the original families of nation's theory, it is unfortunately not possible to transfer our finding directly to the theory. Anyway, what we can derive some meaningful statement from the application of the thesis. The first and most important result is that

Esping-Andersen was right in his prediction that the former communist states will develop in different directions and with different pace after the transitional period is over. This prediction fits to our separation of the post-communist EU member into two clusters: the catching up countries and the slow developing countries. At the same time our findings reject Pierson's idea to claimed path-dependency in transition economies in Europe as strong enough to create a single family of nation for this group.
Next, we can confirm the existence of a strong Mediterranean group as developed by Bonoli (1997) and Ferrera (1996). Since there is a clear difference in terms of corruption and innovation effects on this family of nations. The low innovation rate is a criterion of separating them sharply from the other old member states. Also in terms of corruption vulnerability the Mediterranean family of nations ranks in between the catching-up countries and the slow-developing nations. Both of these surrounding groups are post-communistic and separate the Mediterranean states strictly from the 'old member state family'. All in all the theory of families of nations supports our finding about the clusters we created according to the states' relation of innovation and corruption.

6. CONCLUSION

ANSWERING THE RESEARCH QUESTION AND SUBQUESTIONS

According to the results of our comparative data analysis we can state for sure that corruption has a clearly negative impact on innovation in the new member states of the EU. The role of post-communistic structures cannot be clearly identified with the help of a data analysis, but we can state that it is striking that post-communist countries are obviously more affected by the problem of corruption and its negative consequences for innovation compared to the old member states. Nevertheless we cannot draw a clear line between the results of old and new member states concerning their vulnerability to corruption and the negative influence on innovation. The reason for this is simply that the Mediterranean states, especially Greece and Italy also suffer from low innovation potential and high corruption level. That statement already give an answer to our subquestion: "How do post-communist New Member States perform differently in innovation correlated to corruption in comparison to the other Member States?"
These results are not revolutionary, but they support our hypothesis which says 'there is a positive relationship between the indicators of corruption and innovation. This means the higher the corruption index (which indicates low perceived corruption) more innovation is present.' Nevertheless, the thesis gives scientific evidence about the relation of innovation and corruption in Europe and creates a basis for further research on this field. The fact that a lot of questions concerning causal relations between the variables are not answered yet is also part of the exploratory approach of this paper.
Moreover we applied the theory of 'families of nation' to our clusters of nations. The main result form this application of theory with regard to our research question is that the 'families of nation' clustering fits to the empirical reality we look at to a large extent. Even though this theory is not precise concerning the question if the new member states form a single homogenous group, the families of nation concept gives some explanation for the conspicuous values of the Mediterranean states. However, to draw a concrete statement about the reasons for this phenomenon further research is required.
A more precise answer can be concluded for the third sub-question: "Is it sensible to take corruption as a future instrument for measuring innovation?" At this point we can clearly affirm the question, because

the analysis of SII components showed that corruption as an indicator for measuring innovation increases the quality of the conclusiveness of the SII. Taking Corruption into account as a new component for measuring innovation is the most applicable and directly useful result from my analysis. It explores a new dimension for measuring innovation. Hence we recommend to not only focus on the drivers of innovation, but also to look at the barriers of innovation. None of the institutes, for example the OECD and its research we look at during the establishment of this thesis, investigated barriers to innovation to create an index for measuring it. Corruption seems to be a feasible component to create such an new generation of indices. But other barriers to innovation can for sure be found and analysed in a similar way as corruption. The cognition of the power of barriers to innovation for measuring it opens a range of new possibilities to create or enrich indices of innovation with new, reliable variables. Coming back to the European Scoreboard's index, the SII, we identified that the power to draw scientific conclusions is strengthened by taking corruption into the cadre of variables, even though we cut the number of factors down from 30 to finally a 2-factor+TII2009 model.

The last subquestion we posed was: "What kind of third factors will influence the results of my research?" Of cause, every factor could have been tested as a possible confound to our relationship. To find out about at least some third variables we correlated very general economic factors, but none of them seem to be correlated to innovation. At this point a more extensive analysis of third factors is required, as they are not easily identifiable. Many variables were already included in the SII. A lot of possible alternative variables are logically bound to at least one of the components of the SII. Here we face the problem of multicollinearity and its confounding effects to our results.

All in all, the main question is answered by our comparative analysis, but this study leaves many questions open due to its exploratory character. So it's obvious to suggest further research at this point.

FURTHER RESEARCH

Our quantitative analysis showed that there is a significant relationship between corruption and innovation. Nevertheless, this research does not answer the important question: *how* does corruption influence innovation? Moreover the causal effect structures are not yet developed, which means we do not know why post-communistic structures are more vulnerable to corruption and hence have low innovation. These are very basic questions, which needs to be answered to have an explanatory input for creating further measurement tools. Bound to this aspect it is possible to create a theoretical basis which provides an answer to the question if the post-communistic states are one family of nation or must be sub-divided in many families? If there is a model which sheds light on the reasons for the high level of corruption and the low level of innovation in the new post-communistic member states, it would be possible to create special innovation strategies and action plans for overcoming these barriers to innovation. At the moment the innovation strategies in the new member states are conceptualised for western states mainly. This might be a reason for their ineffectiveness. A tailor-made solution will surely yield more success than the old systems.

Another central point with is not resolved, but touched upon in this thesis is the investigation of alternative factors which could influence the relationship of corruption and innovation significantly. Even though we took some factors of general economics into consideration a closer look at third factors is needed to exclude misinterpretations completely.

As already mentioned before we strongly recommend looking at other obstacles towards innovation next to corruption which are significant for influencing innovation. This research might improve and specify

the SII enormously. Also other institutions next to the European Scoreboard should try to identify barriers to innovation to improve their indices.
All these suggestions for further research also point out the limits of this thesis. Many aspects could not be investigated, even though they are very interesting and helpful to give more detailed answers to our questions. Of course the analysis of data is always bound to the limitations of the data sources. These limitations are already listed in the methodology part.

POLITICAL IMPLICATIONS

Now that we know that communistic structures are highly vulnerable to corruption than the EU15 and consequently suffer a lot from low innovation it is advisable for policy makers and administrators to face the problems more directly than in past times. There are already a lot of programmes against corruption and for innovation in the EU. However the actions taken are not specified enough for the regions or countries in which they are implemented. Most of the innovation strategies established in the new member states are originally conceptualized for the old member states. Their success is moderate, which might origin from the ignorance of specific problems caused by post-communistic structures. Most evaluations on innovation strategies in the post-communistic countries are palliated. One reason for that might be that the same actors which implement the programme are responsible for its evaluation and of cause, they what to present their programmes as successful as possible. But the pure numbers which we now analysed tell a lot more than the smooth talking about the success or failure of the programmes.

To establish consciousness for the sensitive topic of corruption and its influence on innovation indices like the SII should make corruption part of the range of variables to measure innovation. The attention to the problem will help to change the public opinion in many parts of the new member state, that corruption is not a peccadillo, even not on the low level, but a serious crime which retards the economic progress of their country and leads to a worse future in the long run.

Next to the depiction of the innovation barrier 'corruption' in the new post-communist part of the European Union this thesis produced an interesting discovery: many Mediterranean states also suffer from corruption and low innovation. Some countries especially Greece and Italy even range on similar levels as Romania and Bulgaria. This dramatic finding should change some people's mind concerning the 'underdeveloped' eastern part of the EU, because these countries which are often considered as 'parasitic' with regard to the EU's distribution policy, are not the only ones which suffer from serious structural problems. Also for the Mediterranean structures barriers to innovation must be identified and faced instead of being de-emphasised.
The final finding which is to state at this point is: no matter how uniform and coherent European policies might be, it is stringently advisable to look at the problems the Union's member states and regions on a more individual basis. Since every region and country has its own problems which cannot be solved in a mainstreamed way, but tailor-made solutions must be provided.

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8. ANNEX

Excluded Variables[b]

Model		Beta In	T	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	rec_CP1.2.3Privatecredit	.[a]	.	.	.	,000
	rec_CP2.3.2Communitytrademarks	.[a]	.	.	.	,000
	rec_CP3.1.3bReduceduseofmaterialsandenergy	.[a]	.	.	.	,000
	rec_CP3.2.2Employmentinknowledgeintensiveservices	.[a]	.	.	.	,000

b. Dependent Variable: SII2009

CALCULATION 4 EXCLUDED VARIABLES

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,183	,000		.	.
	rec_CP2.1.1BusinessRDexpenditures	,302	,000	,753	.	.
	rec_CP2.1.2ITexpenditures	,116	,000	,320	.	.
	rec_CP3.1.2SMEsintroducingmarketingororganisational	,109	,000	,315	.	.
	rec_CP3.2.3Mediumtechandhightechmanufacturing	,138	,000	,311	.	.
	rec_CP1.1.3Tertiaryeducation	,088	,000	,251	.	.
	rec_CP3.1.1SMEsintroducingproductorprocessinnovations	,097	,000	,248	.	.
	rec_CP3.2.4Knowledgeintensiveservicesexports	,061	,000	,159	.	.
	rec_CP2.2.4Publicprivatecopublications	,054	,000	,142	.	.
	rec_CP1.2.4Broadbandaccessbyfirms	,057	,000	,127	.	.
	rec_CP3.1.3aReducedlabourcosts	,049	,000	,113	.	.

rec_CP1.1.5Youtheducation	,041	,000	,095	.	.
rec_CP2.1.3NonRDinnovationexpenditures	,047	,000	,089	.	.
rec_CP1.1.2SEandSSHdoctorategraduates	,033	,000	,065	.	.
rec_CP1.1.4Lifelonglearning	,028	,000	,062	.	.
rec_CP2.3.4TechnologyBalanceofPaymentsflows	,032	,000	,053	.	.
rec_CP3.2.6Newtofirmssales	,007	,000	,012	.	.
rec_CP2.2.3FirmrenewalSMEsentriesexits	,004	,000	,010	.	.
rec_CP3.2.5Newtomarketsales	-,034	,000	-,057	.	.
rec_CP2.3.1EPOpatents	-,026	,000	-,075	.	.
rec_CP2.3.3Communitydesigns	-,055	,000	-,095	.	.
rec_CP1.2.1PublicRDexpenditures	-,068	,000	-,152	.	.
rec_CP1.2.2Venturecapital	-,072	,000	-,152	.	.
rec_CP1.1.1SEandSSHgraduates	-,055	,000	-,157	.	.
rec_CP2.2.2InnovativeSMEscollaboratingwithothers	-,085	,000	-,187	.	.
rec_CP3.2.1Employmentinmediumhighhightech	-,164	,000	-,369	.	.
rec_CP2.2.1SMEsinnovatinginhouse	-,106	,000	-,371	.	.

TABLE 2 SELECTION OF IMPORTANT FACTORS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	,024	,039		,610	,550
	CP 2.1.1 Business R&D expenditures	,052	,011	,348	4,827	,000
	CP 2.1.2 IT expenditures	,039	,010	,225	3,721	,002
	CP 3.1.2 SMEs introducing marketing or organisational	,001	,000	,062	1,230	,236

CP 3.2.3 Medium-tech and high-tech manufacturing	,002	,001	,244	3,652	,002
CP 1.1.3 Tertiary education	,003	,001	,228	3,909	,001
rec_CP3.1.1SMEsintroducingproductorprocessinnovations	,206	,035	,528	5,848	,000
rec_CP3.2.4Knowledgeintensiveservicesexports	,042	,017	,110	2,422	,028
rec_CP2.2.2InnovativeSMEscollaboratingwithothers	-,004	,031	-,008	-,124	,903
rec_CP3.2.1Employmentinmediumhighhightech	-,074	,029	-,166	-2,534	,022
rec_CP2.2.1SMEsinnovatinginhouse	-,057	,019	-,199	-2,931	,010

a. Dependent Variable: SII2009

CALCULATION 5 FURTHER REDUCTION OF THE SII MODEL

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	,036	,035		1,019	,322
CP 2.1.1 Business R&D expenditures	,044	,013	,291	3,279	,004
CP 2.1.2 IT expenditures	,034	,010	,195	3,279	,004
CP 3.2.3 Medium-tech and high-tech manufacturing	,002	,001	,234	3,273	,004
CP 1.1.3 Tertiary education	,003	,001	,193	2,922	,010
rec_CP3.1.1SMEsintroducingproductorprocessinnovations	,205	,032	,524	6,342	,000
rec_CP3.2.4Knowledgeintensiveservicesexports	,037	,017	,097	2,216	,041
rec_CP3.2.1Employmentinmediumhighhightech	-,063	,032	-,142	-1,986	,063

rec_CP2.2.1SMEsinnovatinginhouse	-,048	,019	-,167	-2,499	,023
TII2009	,007	,008	,104	,859	,402

CALCULATION 6 INTRODUCTION OF CORRUPTION AS AN SII FACTOR

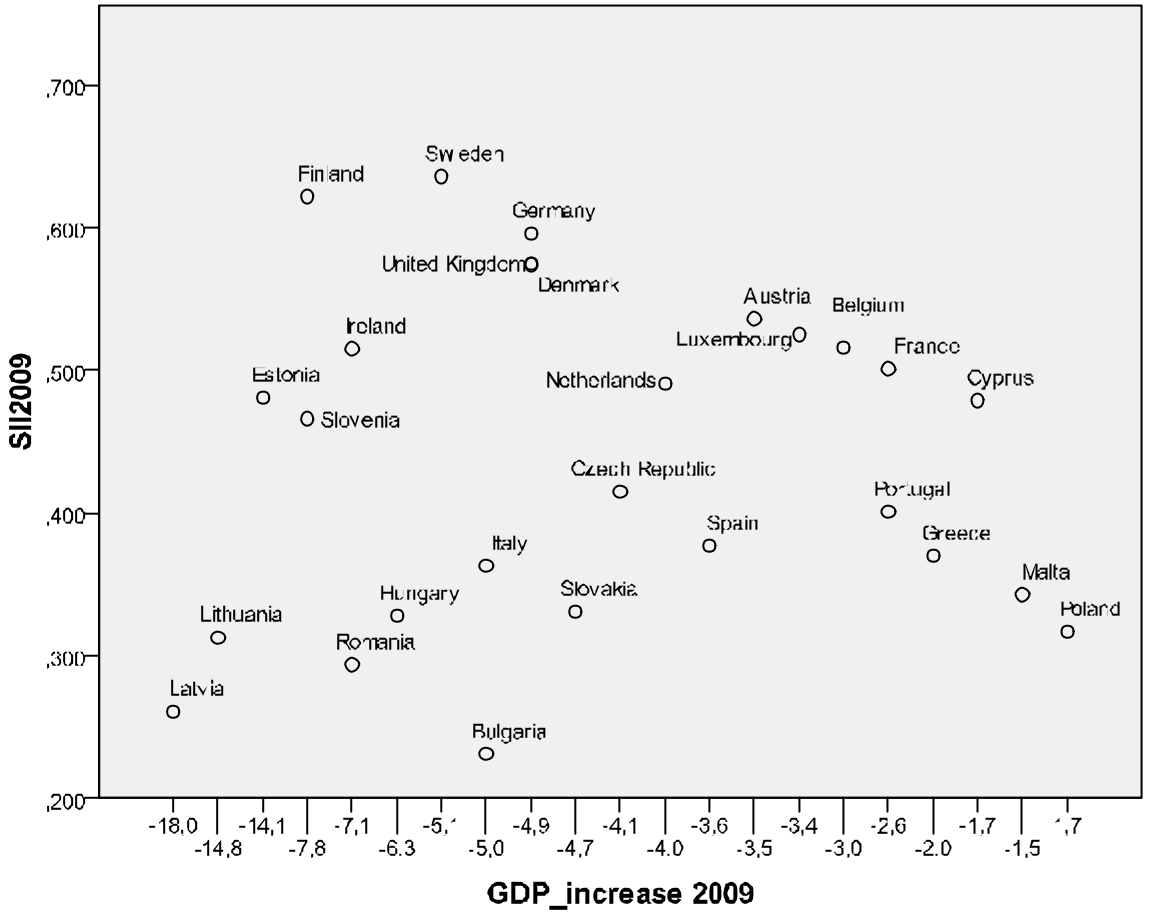

FIGURE 11 THIRD FACTOR GDP

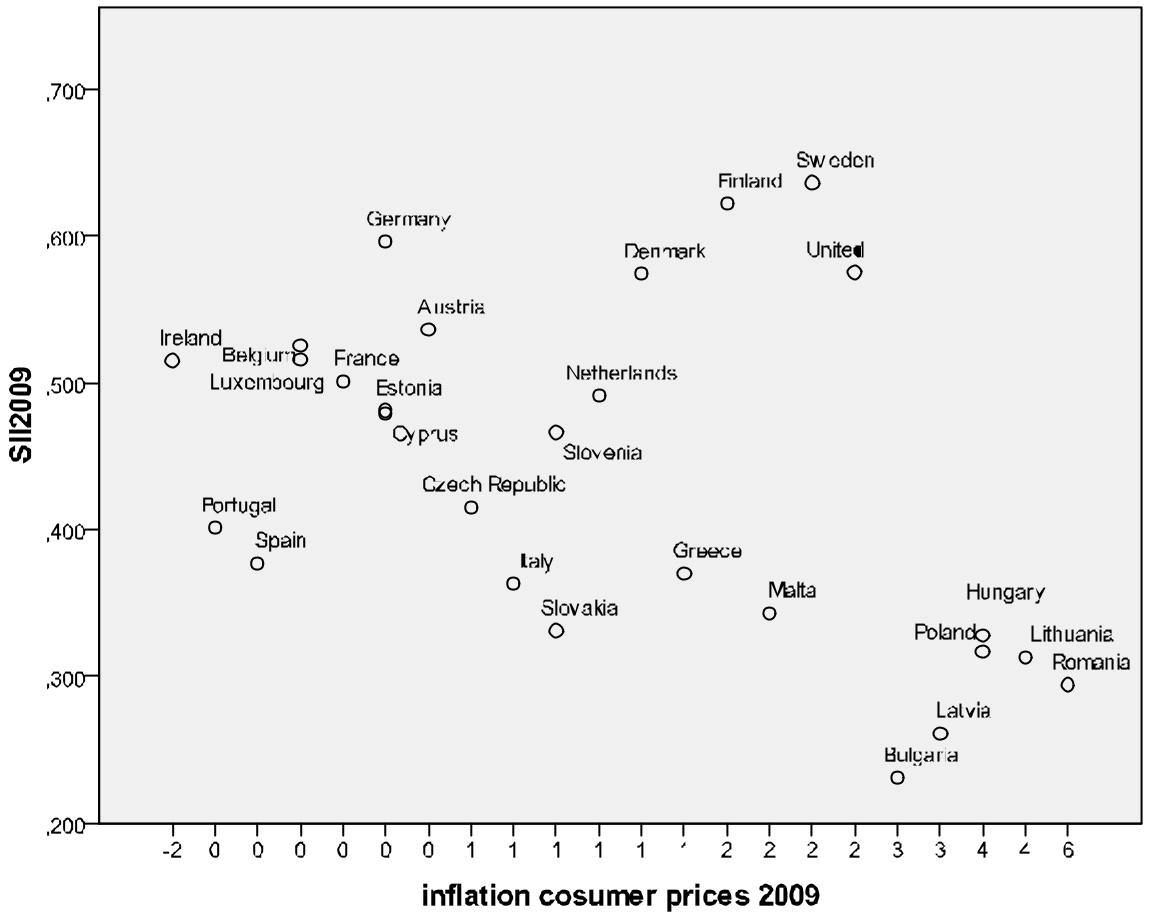

FIGURE 12 THIRD FACTOR INFLATION CONSUMER PRICES

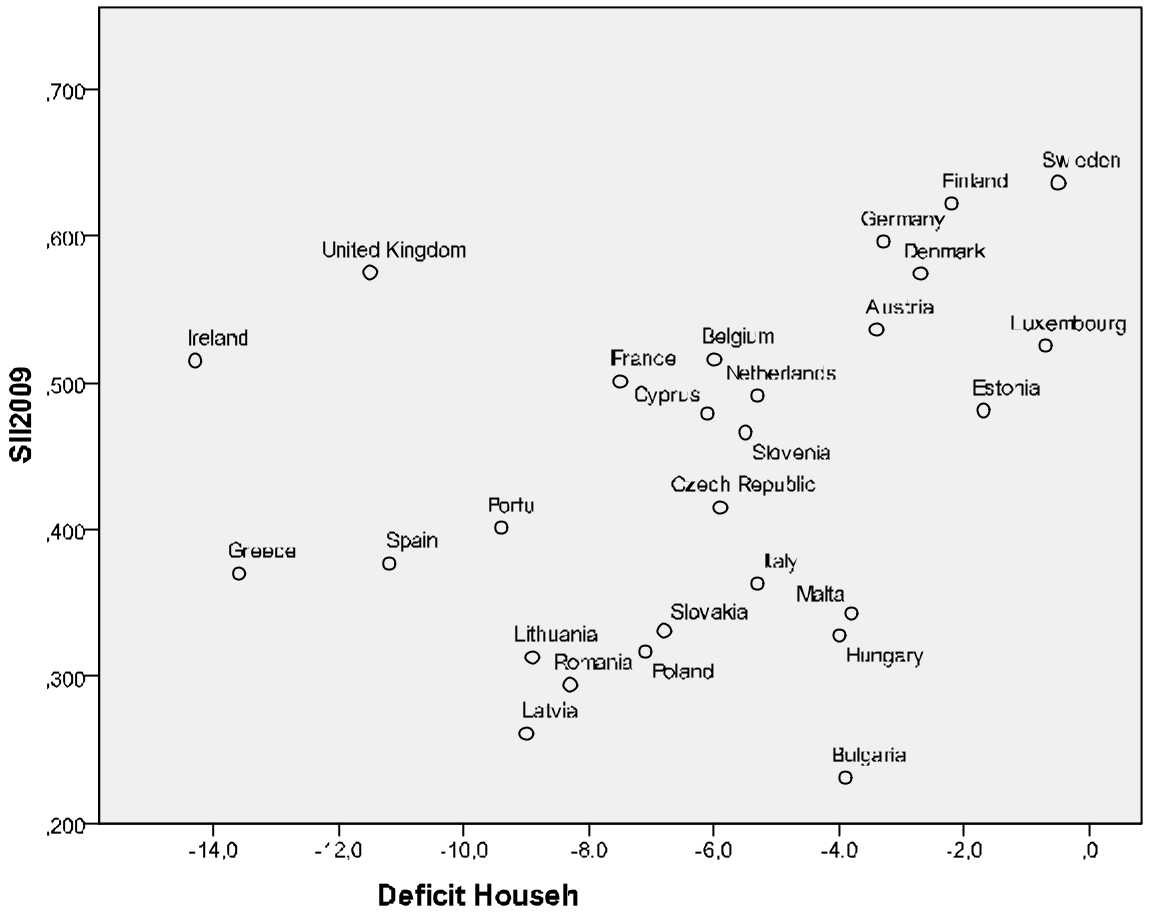

FIGURE 13 THIRD FACTOR HOUSEHOLD DEFICIT IN % OF GDP

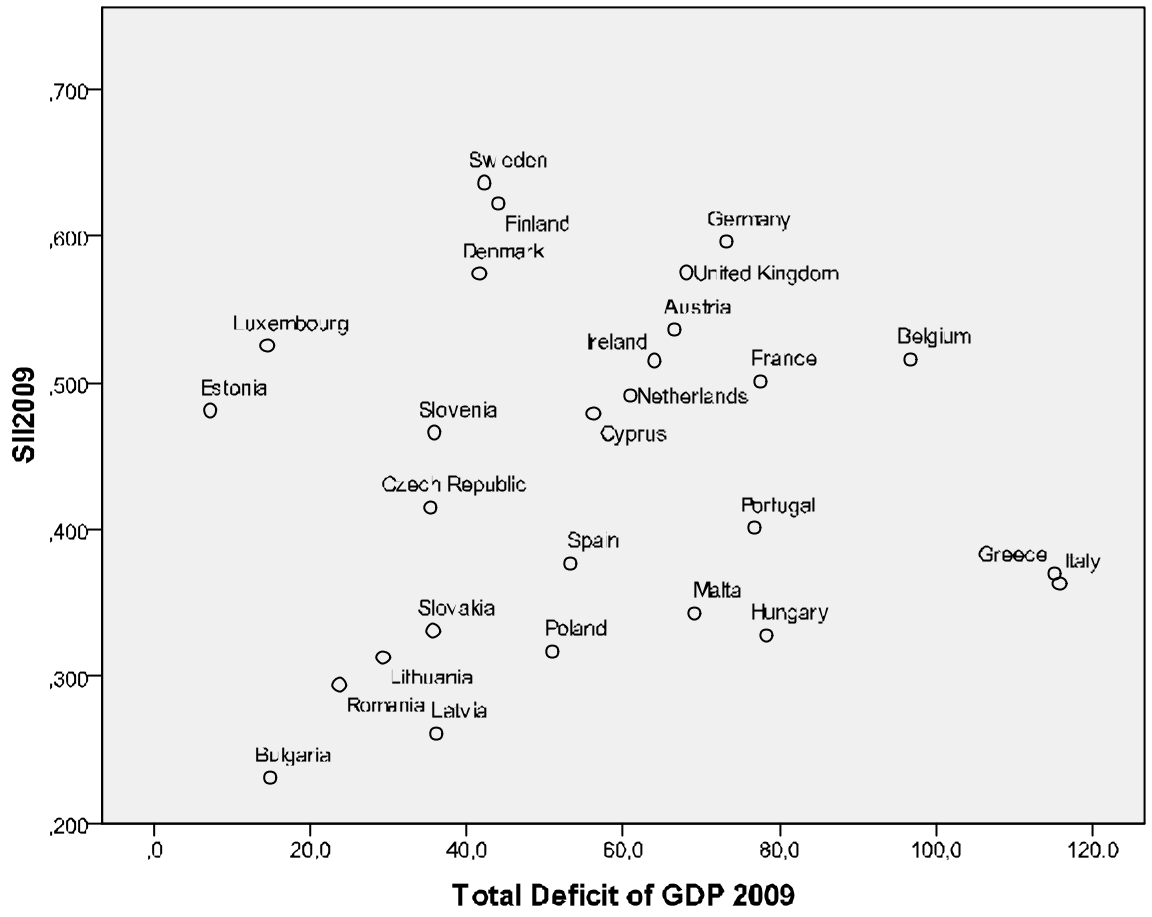

FIGURE 14 THIRD FACTOR TOTAL DEFICIT

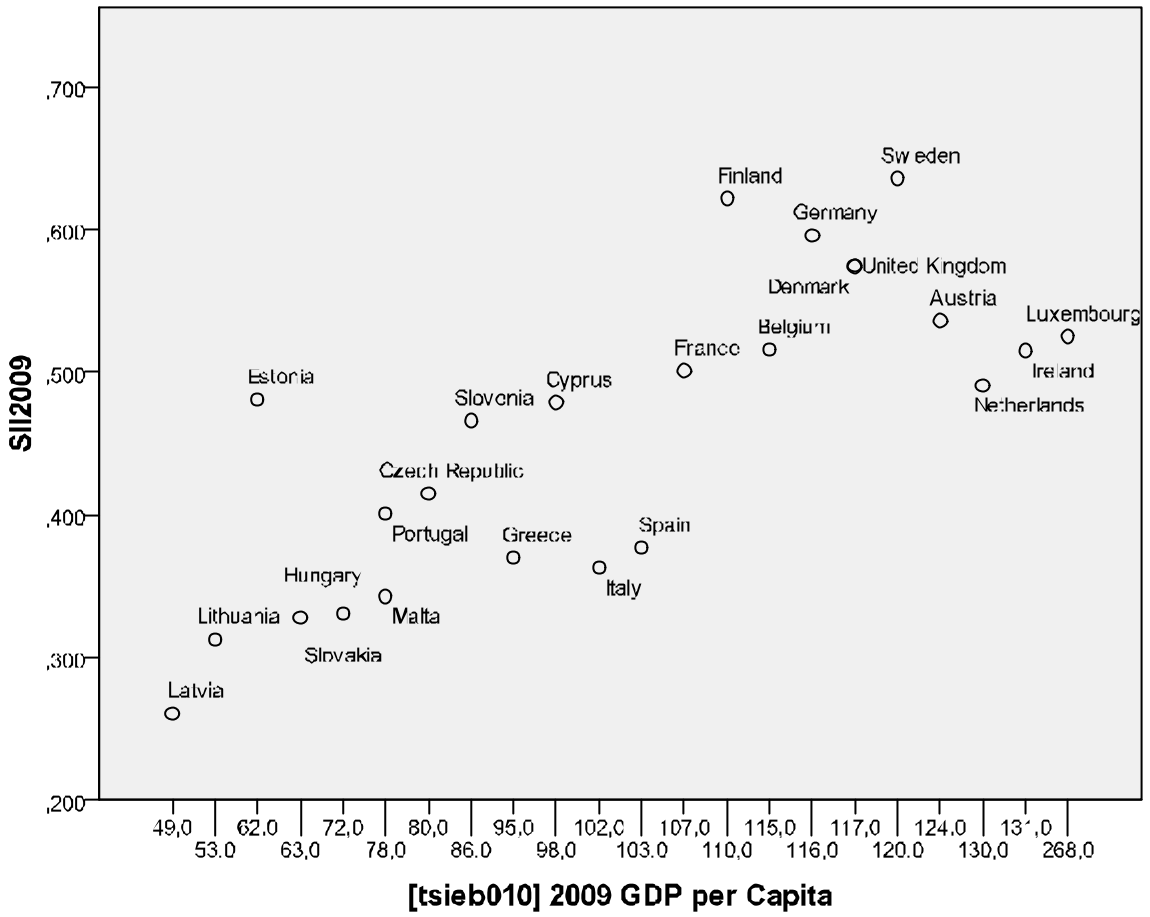

FIGURE 14 THIRD FACTOR GDP / CAPITA