Do aggregation methods influence EFW Index performance? An examination using cluster analysis

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Abstract Recent empirical studies provide evidence that economic freedom, as measured by the Economic Freedom of the World (EFW) Index of the Frazer Institute, is strongly related to economic growth. None the less, the nature of this effect is subject to debate. Criticism regarding the arbitrary composition of the index has been voiced, inspired by the unclear effect of its categories on GDP p.c. growth rates. This paper develops alternative categories for the 42 individual variables of the EFW Index, by using cluster analysis. Theory is very important in telling us which variables can be used to measure economic freedom, but it certainly tells us much less as to how these variables should be grouped together. Based on that premise, the new index categories will not be pre-determined in their composition. Using a cross-sectional data set, the performance of the recalculated index is then compared to that of the original EFW Index. It is shown how the results may help to solve some of the open issues regarding the effect of economic freedom on GDP growth. Particularly, multicollinearity between index categories is reduced and new conclusions are reached on what parts of economic freedom are responsible for causing elevated growth rates, depending on the use of the freedom level or increase.

Keywords *Economic Freedom · Economic Growth · Aggregation · Cluster Analysis*

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1 Introduction

The World Bank has recently defined policy reform and economic growth as being fundamental for diminishing global poverty (Lopez, 2004) with other authors concluding that economic growth is the main factor behind worldwide poverty reduction (Sala-i-Martin, 2006, 2007). If this is the case, aiding economic growth should be a cornerstone in policymaking for governments worldwide and further understanding the fundamental causes of growth, an obligation for scholars. Neoclassical economic theory explains economic growth as a function of changes in several factors: capital, labor, human capital, and technology (Romer, 1990). However, as Berggren (2003) rightly points out, a fundamental question remains: Which policy reforms are most favorable to economic growth?

A recent line of research approaches this question by measuring the economic freedom of countries, claiming that it might constitute an explanatory factor. For that purpose, economic freedom is defined as an own concept, which is different from political freedom or civil liberty. Several indices have been constructed in recent years measuring economic freedom through a series of variables, which are then aggregated into an overall index. The most prominent are the Economic Freedom of the World (EFW) Index, originally developed by Gwartney, Lawson, and Block at the Fraser Institute, and the Index of Economic Freedom (IEF), developed by the Heritage Foundation and the Wall Street Journal. Most empirical studies have so far used the EFW Index, simply because it reaches back further in time than the IEF, making it more useful for historical comparison.

Lately, many researchers have used the EFW Index to test for a possible relationship between economic growth and economic freedom, using both cross-sectional and panel data. A large majority of these studies have obtained results which do point to a positive relationship between economic freedom and elevated GDP per capita growth rates. None the less, many issues regarding economic freedom remain unsolved up to date. These include discussions as: the EFW level vs. its change as a cause of growth, the direct vs. indirect effect of economic freedom on growth, the issue of the EFW Index aggregation, and the economic impact of its categories.

Regarding the critique made by Heckelman and Stroup (2000, 2005) on the arbitrary composition of the EFW Index and the unclear effect of its individual categories on growth rates, this paper tries to develop alternative categories for variable aggregation, using multivariate statistical methods. By disaggregating the 42 variables of the EFW Index for different years of observation and conducting a cluster analysis, new index categories are found that are not so much pre-determined in their composition, but rather based on mathematical-statistical criteria. So far, this method has not been applied in the analysis of economic freedom indices and their categories. The basic idea is that theory is very important in telling us which variables can be used to measure economic freedom, but it certainly tells us much less as to how these variables should be grouped together. Hence, the aim of this paper is twofold: First, to develop alternative categories for the EFW Index, using exactly the same variables. Second, to show how this can help to resolve some open issues regarding the effect of economic freedom on GDP growth.

The remainder of this article is organized as follows: Section 2 briefly discusses the concept and design of the EFW Index. Section 3 revises the relevant literature

on the relation between economic freedom and growth. The focus lies on discussing the general issues, as well as reviewing articles where scholars have studied the composition of the EFW Index, measured the impact of the EFW Index areas, or have tried to develop alternative weighting schemes for these areas. Section 4 describes the cluster analyses conducted on the individual variables of the EFW Index and shows how these lead to the construction of alternative categories (areas) with these same variables. Category names are found by trying to express the logic behind data affinity. Section 5 compares the performance of both the EFW Index and the rearranged index, by conducting OLS regression with both indices on GDP p.c. growth rates. Special emphasis is placed on the issue of multicollinearity between index areas. Section 6 concludes and comments on areas of future research.

2 The concept and construction of the EFW Index

Generally speaking, the term *economic freedom* results from a conceptual separation of the freedom principal into political freedom, civil liberty, and economic freedom. The former are supposed to measure to what degree a country is democratic, while the latter attempts to quantify if an economy is driven by market principals. The EFW Index itself is based on what Gwartney and Lawson (2009) call the key ingredients of economic freedom: *personal choice*, *voluntary exchange coordinated by markets*, *freedom to enter and compete in markets*, and *protection of persons and their property from aggression by others*. These four cornerstones determine the structure of the EFW Index, which is nowadays divided into five major categories or *areas*. These are: 1 *Size of Government: Expenditure, Taxes, and Enterprises*, *2 Legal structure and security of property rights*, *3 Access to sound money*, *4 Freedom to trade internationally*, *5 Regulation of credit, labor, and business*. In table 1 it can be observed that each of these areas is made up of several variables, some of which are measured directly, and others that are measured by combining different variables for an approximation. In total, the index today comprises 42 basic variables, all of which are measured on a scale from zero to ten. The scale reflects the distribution of the underlying data. Zero represents the least-free and ten the most-free, meaning that every variable in the index is already scaled, by virtue of what the creators believe it means for economic freedom. What adds to the transparency of the EFW is that the distinct variables are all based on data published in secondary sources, making it easy to verify them (Berggren, 2003). The overall index is calculated by simply taking the arithmetic mean of all five areas. Each area is calculated in an analogous manner. According to de Haan, Lundström and Sturm (2006), the elements of the EFW Index clearly prescribe an important function for government policy and the data used for the index is reliable, in spite of the strong ideological position of the organizations providing them.

Tracing the evolution of the EFW Index, one can see that numerous editions have been published up to date, and nowadays there is even an annual Freedom of the World report. Along with different collaborators, Gwartney and Lawson (1996, 2001, 2002) have successively added more variables to their index and changed the areas a number of times. The authors have also experimented with different weighting schemes in the past, recognizing that it is unlikely that all elements

measured in the index have an equal effect on economic freedom (Gwartney and Lawson, 1996, 2001). Nowadays, all five areas have the same value in the compound index again. The authors argue that theory does not provide them with any clear guidance for establishing a weighting system, and since the summary index is not very sensitive to variations in the area weights, it seemed to be the most logical response (Gwartney and Lawson, 2009). For a historical overview of the EFW Index, Heckelman and Stroup (2005), as well as de Haan, Lundström and Sturm (2006) offer a detailed and critical discussion on the past and present versions. According to the latter, some of the EFW versions are quite different when measured by rank correlation coefficients, thereby reflecting the underlying changes that have been made in the index. Consequently, when comparing results from different studies on the relation between the EFW Index and GDP growth rates, one has to consider carefully which version the authors are eventually using in each study, since this could make quite a big difference.

Table 1 The Areas and Components of the EFW Index

Area 1: Size of Government: Expenditures, Taxes, and Enterprises

A	General government consumption spending as a percentage of total consumption
B	Transfers and subsidies as a percentage of GDP
C	Government enterprises and investment
D	Top marginal tax rate
i	Top marginal income tax rate
ii	Top marginal income and payroll tax rates

Area 2: Legal Structure and Security of Property Rights

A	Judicial independence (GCR)
B	Impartial courts (GCR)
C	Protection of property rights (GCR)
D	Military interference in rule of law and the political process (CRG)
E	Integrity of the legal system (CRG)
F	Legal enforcement of contracts (DB)
G	Regulatory restrictions on the sale of real property (DB)

Area 3: Access to Sound Money

A	Money Growth
B	Standard deviation of inflation
C	Inflation: Most recent year
D	Freedom to own foreign currency bank accounts

Area 4: Freedom to Trade Internationally

A	Taxes on international trade
i.	Revenues from trade taxes (% of trade sector)
ii	Mean tariff rate
iii	Standard deviation of tariff rates
B	Regulatory Trade Barriers
i	Non-tariff trade barriers (GCR)
ii	Compliance cost of importing and exporting (DB)
C	Size of the trade sector relative to expected
D	Black-market exchange rates
E	International capital market controls
i	Foreign ownership/investment restrictions (GCR)
ii	Capital controls

Area 5: Regulation of Credit, Labor, and Business

A	Credit market regulations
i.	Ownership of banks
ii	Foreign bank competition
iii	Private sector credit
iv	Interest rate controls/negative real interest rates
B	Labor market regulations
i	Minimum wage (DB)
ii	Hiring and firing regulations (GCR)
iii	Centralized collective bargaining (GCR)
iv	Mandated cost of hiring (DB)
v	Mandated cost of worker dismissal (DB)
vi	Conscription
C	Business Regulations
i	Price controls
ii	Administrative requirements (GCR)
iii	Bureaucracy costs (GCR)
iv	Starting a business (DB)
v	Extra payments/bribes (GCR)
vi	Licensing restrictions (DB)
vii	Cost of tax compliance (DB)

(Source: The Fraser Institute)

3 Literature Review

Before entering the description of how the individual variables of the EFW Index will be regrouped using cluster analysis, this section seeks to review the relevant literature on economic freedom and GDP growth. First, a brief overview will be given, on what are considered to be the open questions regarding economic freedom indices and growth. Second, articles are revised in which the areas and individual variables of the EFW Index are the central point of interest, and critique of the aggregation procedures is revised.

In recent years, researchers have used the EFW Index to test for a relationship between economic growth and economic freedom. Almost all have used cross-sectional or panel data. Two general surveys, one by Berggren (2003) and another, more recent one, by de Haan, Lundström and Sturm (2006) give a good overview of the existing literature and summarize the open issues. In both articles one can observe that the majority of studies obtained results which point to a positive effect of economic freedom on GDP growth. This counts for studies that used the EFW Index of the Frazer Institute, as well as for those that used the IEF of the Heritage Foundation and the Wall Street Journal. A meta-analysis conducted by Doucouliagos and Ulubasoglu (2005) of the existing quantitative literature further confirms this impression. It therefore seems pretty clear that economic freedom is an explanatory factor for growth. However, the nature of this effect is subject to dispute: De Haan and Siermann (1998), de Haan and Sturm (2000), like Sturm, Leertouwer and de Haan (2002) find that the level of economic freedom at the beginning of the period investigated does not contribute significantly to subsequent GDP growth and a positive relationship exists only when the period increase is considered. Furthermore, they claim that an increase in economic freedom is the only robust cause of GDP per capita growth. Other authors find, however, that a positive relationship between the level of economic freedom and GDP growth does exist: Dawson (1998), Weede and Kämpf (2002), Pitlik (2002), and Doucouliagos and Ulubasoglu (2005) maintain that the increase in economic freedom is the principal cause of GDP growth, but they also find the relationship between the economic freedom level and GDP growth to be positive and significant. On the other hand, Easton and Walker (1997), like Heckelman and Stroup (2000), Ali and Crain (2001, 2002), Cole (2003), Gwartney, Holcombe and Lawson (2004), and Weede (2006) encounter the level of economic freedom to be the main cause of GDP growth. The latter all agree though, that the increase in economic freedom also has a positive effect on GDP growth. Here, Weede (2006) makes an interesting observation, when he states that depending on how the level of economic freedom is measured, it will have an effect on GDP growth, or not. He claims that studies which have measured the level as period averages have obtained positive and significant effects on GDP growth, while results are largely insignificant when the initial level at the beginning of the observation period is used.

Apart from investigating the direct influence of economic freedom on GDP growth, some authors have also tried to control for a possible indirect influence of economic freedom on growth via the investment rate. Here, evidence is also mixed: While de Haan and Siermann (1998) claim that investment is not related to their indicator of economic freedom, others like Gwartney, Holcombe and Lawson (2004, 2006), Dawson (2006), Justesen (2008), and Aixalá and Fabro

(2009) state that economic freedom has a positive influence on the investment rate. As a consequence, economic freedom has the potential to stimulate growth rates indirectly. What is especially interesting regarding these results is that if economic freedom really does have a positive influence on investment, it would automatically mean that many articles mentioned above have systematically underestimated the real effect of economic freedom on growth, due to the inclusion of the investment rate as a control variable in their regressions. Gwartney, Holcombe and Lawson (2004, 2006) even try to estimate this effect in their articles, but for the moment further research seems necessary to clarify this issue.

Another open issue, which arises in the relevant literature, centers on causality. With a large number of investigations finding a positive relationship between economic freedom and GDP growth, some authors questioned whether economic freedom in fact causes growth or an inverse relationship is the case. De Haan and Sturm (2000), Ali and Crain (2002), Carlsson and Lundström (2002), Pitlik (2002), and Faria and Montesinos (2009) have all rejected economic growth as an explanatory variable for economic freedom. This is the case for the level, as well as the changes of the EFW Index. As Dawson (2003) makes clear on the other hand, the causality issue could still be more complicated: Using a Granger causality test, he finds that some EFW areas cause growth, while others could in turn have a multidirectional effect, meaning that they partly cause growth but are also somewhat caused by growth. Two more recent studies by Justesen (2008) and Aixalá and Fabro (2009) largely confirm these results, each also using Granger causality tests for their analysis. What definitely speaks against reverse causality in these articles though, is that there is no change in economic freedom category ratings which is caused by GDP growth. So generally speaking, the evidence for economic freedom causing GDP growth is pretty strong in the existing literature, while there is virtually no evidence of GDP growth causing changes in economic freedom ratings.

Other recent articles focus on the areas and individual variables of the EFW Index, with some authors critically reflecting upon the aggregation procedures of the index. These will be discussed below. This body of literature is especially relevant for the following sections of this article, since it provides the general motives for rearranging the EFW Index.

One important question regarding the EFW Index is which variables should be included in an index of economic freedom. Here, de Haan and Sturm (2000) incorporate an own version of the EFW Index in their regressions, which they purged of all variables that they considered unnecessary or undesirable. They make some theoretically well-developed and sound arguments why the inclusion of tax-rates and government consumption variables is inadequate, when trying to measure economic freedom. Consequently, they clear the index of all variables that represent a transfer of resources from the private to the public sector. Basing themselves in definitions by North (1981), they differentiate between variables that measure either *rules* or *outcomes*. However, the resulting index does not adjust notably better, neither in terms of the resulting coefficients nor the significance level. A similar move in that direction was recently made by Kapás and Czeglédi (2008), who also purge the EFW Index of certain variables. These authors let themselves be guided by a concept of economic freedom as defined by Hayek (1960), regrouping the EFW Index in freedom related variables, policy variables, and other variables. However, the index calculated from variables which they identify as freedom related does not produce a notably better

significance level than the EFW Index and the coefficients obtained are even lower. Subsequently, no researcher has created an index so far that performs similarly well than the EFW Index in multiple linear regressions, by previously excluding some of its variables on theoretical grounds.

A number of studies have also taken a closer look at the individual areas of the EFW Index, recognizing that some might promote economic growth more than others. Carlsson and Lundström (2002) claim that out of the seven areas in the year 2000 version of the EFW Index, four are positively correlated with growth, two are negatively correlated with growth, while another is statistically insignificant. In particular, *Size of Government* and *Legal Structure and Security of Private Ownership* have a large and positive effect on growth, while the area *Freedom to Trade with Foreigners* has a large and negative effect. In another study, Berggren and Jordahl (2005) produce similar results with the year 2002 version of the EFW Index, but show that these are neither robust to more refined change in model specification, nor to a reduction of the sample. Their tests only leave them with *Legal Structure and Property Rights* exercising a positive and significant influence on growth rates. Still, also Ayal and Karras (1998), Heckleman and Stroup (2000), Dawson (2003), and Justesen (2008) detect that some of the EFW Index areas can have a statistically negative and significant effect, when regressing them on GDP growth rates. These are somewhat puzzling results, when taking into account that every variable is already measured in a manner that it reflects how the EFW Index creators, Gwartney and Lawson, think it will influence economic freedom. Consequently, an area affecting growth negatively would mean that less economic freedom in that area is actually good for growth.

Heckelman and Stroup (2005) have attributed the problem of areas negatively affecting growth in some investigations to the arbitrariness of the EFW Index composition. They proclaim to have some serious doubts, as to what exactly some of the index areas and the compound index are really measuring. According to them, one of the main problems of the EFW Index is the missing of an adequate weighting scheme for the index areas, which prevents research from taking full advantage of the information contained in the variation of the individual elements.

In an earlier approach, Heckleman and Stroup (2000) made an attempt to develop weights for the areas of the EFW Index. Here, the authors first run a series of individual regressions of every EFW category on GDP growth rates, using the resulting t-statistics of every category to construct the weighting schemes for the calculation of their own index version. The proclaimed intention of both authors was to highlight which components of the EFW Index are most important to achieve elevated GDP growth. Not surprising, the areas of their weighted index adjust better in regression than the non-weighted version. This article, however, produced a fierce reaction from Sturm, Leertouwer, and de Haan (2002), who accused Heckleman and Stroup (2000) of biasing their weighted index by using the t-statistics of the individual regressions to calculate it. Using extreme bound analysis, they try to show that this index is, above all, statistically insignificant for having applied the economic freedom level and not the economic freedom increase. Their critique is understandable, since Heckleman and Stroup (2000) do not try to find a weighting scheme that reflects the intrinsic importance of each area for the composite of economic freedom, but create area weights from the perspective of GDP growth, thereby creating an index which is biased on an economic growth perspective. Furthermore, since the influence of the index on growth is the principal point under discussion, Sturm, Leertouwer, and de Haan

(2002) consider that Heckleman and Stroup (2000) don't contribute to the clarification of the issue, but rather evade it. Instead, the critics propose a latent variable approach to construct the EFW Index, but fail to find a robust correlation between growth and their own index, which they construct, using principal component analysis. In the ensuing article, Heckleman and Stroup (2005) don't go back to try and weigh the areas of the EFW Index, but maintain their original idea of a possible *growth enhancing institutions index* instead of an intrinsic EFW Index. They do not give an answer on how such an index could be constructed, but attack the methodology of averaging the variables in the current EFW versions. They make an important point here, when saying that from the 2002 edition onwards variables are also weighted in the compound index, although that is what the averaging-methodology is supposed to avoid. Due to the equal weight of every area, but the different number of variables included in each, variable weights are inversely related to their quantity. The same can be said about the individual index areas (see Table 1). Element weights in the averaging system are therefore based strictly on the arbitrary structure of the economic freedom taxonomy, which both authors call totally subjective. Heckleman and Stroup (2005) claim that this is particularly important, since many variables of a given area are actually more correlated with variables in a different area than amongst themselves. In their latest survey, de Haan, Lundström, and Sturm (2006) partly agree with this critique on the aggregation procedure, but go back and make their case regarding principal component analysis. In addition, they mention another problem of the EFW Index measurement that is related to its frequent changes. Due to the successive inclusion of variables and the reorganization of areas, past versions of the index are missing a number of observations, which means that the index is measured inconsistently over time and nations. Possibly, this interferes when investigating the relationship with GDP growth. De Haan, Lundström, and Sturm (2006) go on to revise the theoretical arguments, why each area should positively affect growth or not. Regarding the current EFW Index version, arguments for and against a positive effect on growth rates can be found for each of the five areas.

4 Rearranging the EFW Index

The critique made by Heckleman and Stroup (2000, 2005) on the arbitrariness of the EFW Index composition is anything but trivial. Gwartney and Lawson (2009) give some well-developed arguments in their annual Economic Freedom of the World report, explaining why each of the five areas is important for measuring the concept of economic freedom. In this context, the justification for including every one of the 42 individual variables is given by the authors. Some areas or variables of the index might not appeal to all readers and doubts are somewhat justified regarding certain components, but it is difficult to present theoretical arguments for definitely excluding them. This is even more so, when considering that no theoretical security exists regarding the term economic freedom. Depending on which definition is used, economic freedom indices constructed from the EFW variables can result to be quite different from one another, as the articles by de Haan and Sturm (2000) or Kapás and Czeglédi (2008) make clear. Furthermore, these authors do not produce indices that perform notably better in regression

when applying theoretical criteria to purge the EFW Index, as was discussed in the preceding section. Hence, Gwartney and Lawson (2009) seem to have created a valid framework to determine which variables can be used to measure economic freedom. However, this is not a sound argument for arranging the variables in the particular manner they do. Indeed, apart from the use of common sense, no real argument is given by the authors, why they arrange the individual variables as they do, and the missing of a weighting scheme is simply defended by the argument that the summary index is not very sensitive to substantial variations in the weights. On the contrary, Heckleman and Stroup (2000, 2005) make some good arguments against the current form of aggregating the EFW Index, all of which were revised above. Also Sturm, Leertouwer, and de Haan (2002), as well as de Haan, Lundström, and Sturm (2006) agree that aggregation procedures are rightly criticized as being *ad hoc*.

To solve this dilemma, a method is employed in this paper, which has not been used in the analysis of economic freedom and its components so far. Since theory alone doesn't suffice to settle the question of aggregation, the view has been taken of letting the data speak by itself. To this end, cluster analysis is applied here to rearrange the EFW Index. Generally, this method is concerned with the identification of groups of similar individuals, which are then assigned into a subset (a cluster), so that observations in the same cluster are similar in some sense. It is a completely numerical method and the number of clusters is not known beforehand (Manly, 1989). Since theory does not provide us with a clear guidance of how to arrange the individual variables of the EFW Index, cluster analysis will base areas on the similarity of variable observations. Certainly, this seems to be a better criterion than using one that is insecure.

In economics, cluster analysis is normally used to identify geographical entities which present a set of similar characteristic. Following this logic, cluster analysis could also be used to define groups of countries that present similar forms of economic freedom, for example. Without a doubt this is also an interesting question, but unfortunately it would not aid the problem of changing the aggregation procedure, which is the principal point investigated in this paper. Consequently, the dimension used here to form similar groups are the individual variables of the EFW Index. This is an unusual application. But just as in biology, where cluster analysis is often used to find groups of similar species form data on their individual characteristics, observation similarity can give hints on which variables should be considered jointly, so they can tell us something on the different aspects of economic freedom.

The structure of the EFW Index and its areas, as put forth by Gwartney and Lawson (2009), is then quasi taken as a framework for the selection of variables for an economic freedom index. Here, it can be referred to as a top-down method of choosing variables for an index of economic freedom, which are arranged into new areas using cluster analysis. Certainly, when relying on this logic, one could also argue that more or different variables should be used to construct a new economic freedom index.[1] This is undoubtedly the case. But since the EFW Index

[1] The data published in the EFW reports refers to the values of 42 variables, many of which, in turn, probably have a combination of even more disaggregated indicators as their determinants. Hence one could think that these numerous indicators, and not the 42 variables, should provide the inputs for this exercise. Still, these basic indicators are neither listed nor standardized in the EFW reports, and often times they simply serve to the purpose of qualifying other quantitative variables. Hence, in this sense, we join the authors who have launched prior attempts to purging or rearranging, starting with the variables of the EFW Index.

is already made up by a good number of variables and their selection is sensible, as was revised above, the 42 individual variables of the EFW Index will be used here to find the new areas. This also has a practical advantage: The conduct of the rearranged index areas can then easily be compared to the EFW Index areas and more credible conclusions can be drawn with respect to the influence of current aggregation procedures on the performance of the EFW Index in growth regressions.

A number of different algorithms have been proposed for cluster analysis, but the method used in this approach is the hierarchic technique. This method calculates the distances of each individual to all other individuals, and the Euclidean distance measure is used to create a matrix of distances for all individuals. Groups are then formed by a process of agglomeration or division. Generally speaking, divisive hierarchic methods are less often used than agglomerative ones (Manly, 1989), and agglomeration is also used here.

Of course, cluster analysis is not the only possibility to aggregate the variables of the EFW Index in a new fashion, and other multivariate methods could accomplish something similar. The big point in favor of cluster analysis though, is its methodological simplicity (Romesburg, 1984). Other methods can certainly be tried in the future, but what stands out when comparing cluster analysis to other multivariate methods, is that the information contained in the different variables is not sent through some kind of black box, where the usefulness of the outcome is quite uncertain. Variables are simply rearranged according to observation similarity. The methodology is simple, and its theoretical basis is clear cut.

Regarding the cluster analysis conducted to rearrange the EFW Index, the data used and its source deserve a quick explanation: Data for the analysis was taken from the Economic Freedom Network of the Frazer Institute. The index version used is from the year 2009, which is the latest one available and contains country data from 1970 to 2007. Due to the expansion of the index, a full data set for all 42 individual EFW Index variables only exists in the last three observation years. Thus, three individual cluster analyses were conducted with all 42 variables, using the observation years 2005 through 2007, and another five cluster analyses were conducted with 37 variables, using observation years 2000 through 2004. Earlier versions present much less variables and therefore it is doubtful whether they can be used to conduct a rearrangement of the index. Regarding the individual country observations, missing data leads to a reduction of countries that can be included in each cluster analysis, since all sets have to be complete to carry it about. So, for every observation year, cluster analysis has to be conducted with a different number of countries. What sounds like a shortcoming of the analysis at first, is actually an advantage if stable clusters can be found. This would mean that the analysis is neither sensitive to the inclusion of further variables, nor to an expansion of the country sample. In fact, authors that have written on cluster analysis frequently propose to conduct exactly those kinds of robustness tests (Romesburg, 1984).

Table 2 The New Index categories and components

original category	variable name	stability	new category name
1A	General government consumption spending as a percentage of total consumption	S	**1. Government weight in the economy**
1B	Transfers and subsidies as a percentage of GDP	S	
1Di	Top marginal income tax rate	S	
1Dii	Top marginal income and payroll tax rates	S	
4C	Size of the trade sector relative to expected	LS	
5Bii	Hiring and firing regulations (GCR)	LS	
5Biii	Centralized collective bargaining (GCR)	S	
5Biv	Mandated cost of hiring (DB)	LS	
2A	Judicial independence (GCR)	S	**2. Legal and institutional setting**
2B	Impartial courts (GCR)	S	
2C	Protection of property rights (GCR)	S	
2E	Integrity of the legal system (CRG)	LS	
2F	Legal enforcement of contracts (DB)	LS	
4Aiii	Standard deviation of tariff rates	LS	
4Bi	Non-tariff trade barriers (GCR)	S	
5Bi	Minimum wage (DB)	LS	
5Bv	Mandated cost of worker dismissal (DB)	U	
5Ci	Price controls	S	
5Cii	Administrative requirements (GCR)	U	
5Ciii	Bureaucracy costs (GCR)	S	
5Cv	Extra payments/bribes (GCR)	S	
5Cvii	Cost of tax compliance (DB)	S	
2D	Military interference in rule of law and the political process (CRG)	S	**3. Freedom of the money market, trade, and investment**
2G	Regulatory restrictions on the sale of real property (DB)	LS	
3A	Money Growth	S	
3B	Standard deviation of inflation	S	
3C	Inflation: Most recent year	S	
4Ai	Revenues from trade taxes (% of trade sector)	S	
4Aii	Mean tariff rate	S	
4Bii	Compliance cost of importing and exporting (DB)	LS	
4D	Black-market exchange rates	S	
4Ei	Foreign ownership/investment restrictions (GCR)	U	
5Ai	Ownership of banks	S	
5Aii	Foreign bank competition	U	
5Aiii	Private sector credit	S	
5Aiv	Interest rate controls/negative real interest rates	S	
5Civ	Starting a business (DB)	U	
5Cvi	Licensing restrictions (DB)	LS	
1C	Government enterprises and investment	S	**4. Government enterprises and investment**
3D	Freedom to own foreign currency bank accounts	LS	**5. Freedom to own foreign currency bank accounts**
4Eii	Capital controls	S	**6. Capital controls**
5Bvi	Conscription	S	**7. Conscription**

S: stable LS: largely stable U: unstable

Table 2 demonstrates the new arrangement of the index: The original number of the EFW Index area and the variable name are shown on the left. The stability in all cluster analyses is indicated in the center, and new area names appear on the right hand side. To make things easy with respect to the EFW Index and its areas, the recalculated index will simply be called the *New Index* and its areas will be referred to as *categories*.

In practice, the EFW Index is rearranged using eight different cluster analyses. An individual cluster analysis was conducted with the data from each year, 2000 through 2007, but for reasons of space, these are not reported in the paper.[2] Of course, there is always a certain degree of arbitrariness involved when choosing the number of clusters. However, this problem was reduced here, since three multi-variable clusters were found to be especially permanent. Even when successively increasing the number of clusters, only individual variables would split off these, to form cluster-variables of their own, but multi-variable clusters would never divide completely. This certainly does provide evidence for the general structure of the rearranged index, and common sense was applied when deciding on the final number of categories.

The final categories presented themselves as fairly easy to establish, since the majority of variables were unchanging in all observation years. Variables which remained in the same clusters in all observation years have been marked as *stable* in table 2. Variables which remained in the same cluster in most observations years were marked as *largely stable*, and variables which changed clusters frequently were marked as *unstable*. One can observe in table 2 that of the 42 basic index variables, 26 are *stable*, 11 are *largely stable* and only 5 are *unstable*. So despite the inclusion of more variables from 2005 onward and the annual enlargement of the country sample, most variables are surprisingly stable in all cluster analysis, presenting indeed strong indication for the new structure of the index. Again, some degree of arbitrariness is certainly involved in the final arrangement of the New Index, since the *unstable* variables could also be moved to other categories. Still, the variables in question are very few and changing their location would not really alter the overall structure of the index. So on large, the structure of the New Index is not liable to subjectivity.

The resulting New Index categories were further confirmed by a cluster analysis for the corresponding years, where each country was weighted by its total GDP[3]. In the weighted cluster analysis, more than two thirds of the variables were placed in identical clusters for all three observation years. Especially, variables marked as *stable* in table 2 formed almost identical clusters in the weighted analysis. That certainly is another strong indication for the constant data-affinity of most variables, rearranged into the categories of the New Index.[4]

Contrary to the top-down construction of the EFW Index, category names in the New Index are identified by formulating the common denominator between all variables in one category. The surprising stability of most variables is also an advantage here, since it suggests a real relation behind the data affinity, which

[2] These are available from the author upon request. Email: martin.rode@unican.es

[3] Total GDP in constant (year: 2000) US$. Source: The World Bank.

[4] The idea that inspired such an attempt was that a country with a higher total GDP also has greater power in the world economy. Furthermore, it is possible that economically powerful countries create a model that other nations might want to imitate, in order to be economically successful themselves. Therefore, the global influence exercised by countries with a higher total GDP on what is defined as economic freedom, should be greater.

only needs to be expressed correctly. A more detailed description of how categories and their names were established is given below.

The first category displays variables through which the government and legislative take direct influence on the economy, like taxes, wage regulation, and public spending. Thus the title: *Government weight in the economy*. The first four variables are all from the same original EFW Index area, which tries to measure the *Size of Government*. It therefore makes some sense that they are placed together. As de Haan and Sturm (2000) have made clear, one could discuss whether it is a good idea to include both *Top marginal income tax rate* and *Top marginal income and payroll tax rates* in the same index, because both variables are highly correlated. Generally though, this is a different matter and here it just demonstrates how cluster analysis works, having placed two very similar variables in the same category. Of the remaining four variables in the first category, *Size of the trade sector relative to the expected* can also be seen as a natural extension of the first four, since as a consequence of measuring the expected size of the trade sector, it automatically has to measure government's size in the economy as well. Meaning that, if for example the trade sector is smaller than expected respective to total GDP, government size will automatically be larger than expected. The remaining three variables *Hiring and firing regulations, Centralized collective bargaining,* and *Mandated cost of hiring* are the one's on which government or the legislative do not necessarily have a direct influence, and they may therefore seems a little out of place at first. However, what is important in this context is how strongly government regulates the labor market through hiring and firing regulations, whether it decides to actively join in on the collective bargaining processes, or whether it influences the costs of labor through the mandated cost of hiring, thus meaning that this variables measures how much government takes part in redistributive policies by trying to influence decisions in the labor market. Obviously, just the relationship between the degree of centralization in a collective bargaining process and wage efficiency is already a complex matter (Calmfors and Driffill, 1988)[5], and the effect on GDP per capita growth is anything but clear. Therefore, it is unlikely that such complicated relationships can be adequately captured by some single variables of the kind. But still, it does make sense that government has an influence on the general regulation of the labor market and that these tree variables can adequately display this fact. Consequently, *Hiring and firing regulations, Centralized collective bargaining,* and *Mandated cost of hiring* will display citizen's preferences for a government's role in the economy and reflect their level of demand for a strong and beneficial state, which is precisely what these variables measure here.

In the second category, *Legal and institutional setting*, one finds variables that have to do with the functioning of the legal system (*Judicial independence, Impartial courts, Protection of property rights, Integrity of the legal system, Legal enforcement of contracts*), and variables that have to do with how well institutions function in a broad sense, which also includes cultural variables. These are: *Standard deviation of tariff rates, None-tariff trade barriers, Minimum wage, Mandated cost of worker dismissal, Price controls, Administrative requirements, Bureaucracy costs, Extra payments/bribes*, and *Cost of tax compliance*. Of these, *Standard deviation of tariff rates, None-tariff trade barriers, Minimum wage, Mandated cost of worker dismissal,* and *Price controls* are all variables that reflect the influence of political decisions on the economy, which indirectly represents

[5] According to Calmfors and Driffill (1988), the relationship between the degree of collective bargaining and the level of unemployment (efficient wages) is approximately an inverted U.

the functioning of institutions broadly defined. For example, the power of pressure groups in the institutional arrangement is probably displayed here. In turn, the variables *Administrative requirements, Bureaucracy costs, Extra payments/bribes*, and *Cost of tax compliance* directly reflect the institutional setting and a countries' political culture. Thus, all category variables seem to be either directly related to the quality of the legal system, or the general functioning of a country's institutions. This means that they measure norms and rules in a broad sense. So ultimately, this category represents the fact that norms and rules exist in a formalized manner, as it is the case with a legal system, but also establish themselves as generally accepted conduct and practice, which expresses itself in the functioning of national institutions and a countries' culture. When taking such a broad perspective, these variables seem to fit into one category.

The name for the third category, *Freedom of the money market, trade, and investment* is chosen because all variables are related to the money market (*Money growth, Standard deviation of inflation, Inflation: Most recent year, Ownership of banks, Foreign bank competition, Private sector credit, Interest rate controls/negative real interest rate*), investment security and regulation in a broad sense (*Black market exchange rates, Foreign ownership/investment restrictions, Starting a business, Licensing restrictions*), and restrictions on trade and exchange (*Regulatory restrictions on the sale of real property, Revenues from trade taxes, Mean tariff rate, Compliance cost of importing and exporting*). The only variable which is perhaps a bit counterintuitive in this category, is *Military interference in the rule of law and the political process*. Here, an explanation may be that military interference in legal processes can be detrimental to general investment security. All other variables fit together pretty well, with a number of them being related to more than one of the three topics summed up in this category.

Regarding categories two and three, it should be mentioned that, when reducing the number of clusters in the analysis, the variables contained in *Legal and institutional setting* and *Freedom of the money market, trade, and investment* show a tendency to form a single cluster. This always happens before both join up with the rest of variables in a further reduction of clusters. Furthermore, practically all variables of both categories, which are labeled *largely stable* or *unstable* in table 2, change between categories two and three, only, in all observation years. This indicates that both categories ultimately belong together, even though they have been separated here. The decision to separate them in the New Index was taken since they split along a common line when augmenting the number of clusters. Practical considerations also play a part here, since a fusion of *Legal and institutional setting* and *Freedom of the money market, trade, and investment* would have united almost three quarters of all index variables in one single category. That will greatly complicate an investigation on the components of economic freedom. None the less, the strong affinity of the variables contained in both categories might indicate that both could possibly represent the essence of our unknown variable, economic freedom.

The last four categories are all comprised of a single variable. Each of them shows a tendency to form individual clusters in all eight years of analysis, but with different intensity. The variable *Freedom to own foreign currency bank accounts* presents a weak affiliation for categories two or three, but it would always establish itself as an individual variable cluster when the total number of clusters was increased to six or seven. Therefore, it was decided to convert it into a single category. Variables *Government enterprise and investment*, *Capital controls*, and *Conscription* each had a strong tendency to form individual variable clusters in all

years of analysis, even when the number of clusters was substantially reduced. In fact, the variable *Conscription* presented the greatest distance to any of the other variables, which means that it would even form its own cluster when the total number of clusters is reduced to two. In some observation years, *Government enterprise and investment* and *Capital controls* already form individual clusters when reducing their total number to five. Hence, the conversion of these three variables into an own category is a logical response.

5 Performance of the New Index

Once the composition of the new categories had been decided on, the whole index was recalculated for 68 countries from the EFW database. A list of these can be found in the Appendix. The choice of countries is entirely based on the availability of EFW data. It includes industrialized countries and developing countries from all continents. Using the terminology of the World Bank and its classification as of June 2009, it includes 32 *high income countries*, 21 *upper middle income countries*, 13 *lower middle income countries*, and 2 *lower income countries*. It can be observed that countries with a higher income are overrepresented in this list, which obviously is related to the existence of institutions that adequately collect the necessary data. Still, according to the World Bank, more than half of the countries (36) are classified as developing nations and therefore the sample should not be overly biased in the manner stated above. What does stand out though is the missing of African countries: In the end, only three African countries (Kenya, South Africa, and Tunisia) could be included, representing the more developed nations of this continent. A further examination of how the regression results presented below are influenced by the sample of countries is given at the end of the section.

In analogy to the areas of the EFW Index, the New Index categories are also calculated as the arithmetic mean of all category variables. The problems with such an approach, as put forward by Heckleman and Stroup (2000, 2005), have already been discussed above. However, given the different structure of categories in the New Index, some of the problems related to averaging are greatly reduced. Those are concerned with the subjective arrangement of variables that result in a weighting system. Contrary to the praxis applied in the EFW Index, no variable in the New Index is calculated by combining several others for an approximation. As a consequence, all variables in the New Index have the same weight for calculating the corresponding category rating and therefore no subjective weight is attached to any of them. This does not mean that the New Index necessarily attaches the correct weights to each variable, but simply that they are not randomly influenced by the index structure. Furthermore, since the components of economic freedom are the general interest of this paper and some serious doubts exist regarding the construction of the composite EFW Index, no overall economic freedom rating was calculated for the New Index. Only the categories of the New Index were compared to the areas of the EFW Index. Therefore, the problem of individually different variable weights in the composite index can also be avoided. In this regard, the New Index will be quite different from the EFW Index, since the emphasis is much more on the different categories that make up economic freedom and not on the economic freedom composite rating.

Unfortunately, the EFW data sets for 1990 and 1995 are missing quite a number of variables, which is due to the inclusion of more elements into the index in recent years. In those cases, the category value is calculated from the arithmetic mean of the remaining variables, as applied by Gwartney and Lawson (2009). This means, that the index is measured inconsistently over time and nations, which is highlighted by de Haan, Lundström, and Sturm (2006). Albeit imperfect, nothing better is available up to date and the use of cross-country data considerably reduces the problem of inconsistency, as compared to the use of panel-data.

Regarding the effect of both indices on GDP growth, a neoclassical model of new growth theory is used for cross-country regressions. As proposed by Barro (1990), four control variables are introduced into each ordinary least squares regression analysis: *Initial GDP per capita, physical capital*, *human capital*, and *population growth rate. Initial GDP per capita* refers to the hypothesis of convergence, which states that countries with a lower initial GDP p. c. have the potential to grow faster in subsequent periods. The inclusion of p*hysical capital*, *human capital*, and *population growth rate* responds to considerations that no growth equation seems valid outside the framework of the aggregated production function (Romer, 1990). Here, *physical capital* is measured as the ratio of investment over total GDP, and the estimate used for *human capital*, is national average levels of intelligence test scores (IQ), given by Lynn and Vanhanen (2002). This variable is also used in the works of Weede and Kämpf (2002) and Weede (2006) to estimate the effect of economic freedom on GDP growth. These authors conclude that national IQ levels seem to be an excellent measure for nation's human capital resources, since it adapts much better than, for example, school enrollment variables. This point is also confirmed by Jones and Schneider (2006), who find it to be the most robust variable to measure human capital of all the proxy variables generally used. All of these authors argue that using IQ levels is also better in the sense that it really measures the output of national education systems, rather than measuring the input, as it happens when using school enrollment variables. Furthermore, IQ levels only change very slowly over time, consequently making it less important if the periods investigated do not perfectly coincide with this control variable. The use of national average IQ levels, as estimated by Lynn and Vanhanen (2002), thus represents a viable and practical option to measure a countries' human capital. Indeed, national IQ levels also produced much better results in this investigation than any other proxy variables for human capital, which is why they are used here.[6]

[6] The use of national IQ levels as a human capital proxy does not imply that the author of this article agrees with the theories put forward by Lynn and Vanhanen (2002) on the heritability of intelligence between human beings of different heritage. There seems to be little evidence on this point, but what little there is fails to support the genetic hypothesis (Neisser et. al., 1996). Generally though, this issue is somewhat irrelevant for the use of IQ levels as a human capital control-variable, since it is mainly concerned with the causes of cross country differences in IQ scores. Obviously, those causes are of little interest here. Whether they are genetically determined or not, it seems that IQ scores do vary substantially from country to country, and Lynn and Vanhanen (2002) present data for 185 nations in their work. Even authors that have heavily criticized the methods and theories of Lynn and Vanhanen (2002) agree that a correlation between average national IQ estimates and GDP p. c. exists (Whetzel and McDaniel, 2006). Hunt and Wittmann (2008) go on to conclude, that although the Lynn and Vanhanen data set contains questionable data points, their empirical conclusion, that there is a strong statistical relationship between GDP per capita and IQ, is correct.

Before going on to the estimation results, a few technical remarks shall be made: All estimations were realized using multiple linear regression analysis. Average GDP growth in per capita terms between 1992 and 2007 is the dependent variable in each table. In tables 3 and 4 the independent variables were the *average freedom level* between 1990 and 2005. Using the average of the period and not just the economic freedom ratings at the beginning of the period corresponds to considerations which highlight the need for economic freedom levels to be reasonably permanent to show an effect on growth rates (Pitlik, 2002). In tables 8 and 9 the independent variables are the *average freedom level increase* between 1990 and 2005. Economic freedom level and increase are not introduced into the same regression, since such a model would suffer from an endogeneity problem, as de Haan, Lundström and Sturm (2006) demonstrate. In order to control for a lagged effect, a gap of two years on growth was intentionally introduced. Economic data was taken from the World Development Indicators database of the World Bank and all monetary variables were measured in constant US$ (year: 2000). According to White's heteroskedasticity contrast, all models presented homoskedasticity at the 5% level. Variables that are marked with (*) are significant at the 10% level, with (**) at the 5% level, and with (***) at the 1% level. R- and F-statistics are given in the lower rows. Of course, all the results given below might suffer from a possible downward bias of regression coefficients. Since economic freedom could further increase growth rates indirectly by increasing a countries' investment, the inclusion of the investment rate as a control variable means that we systematically underestimate the real effect of economic freedom on growth.

Table 3 Estimation results for the EFW Index (level)

Dependent variable: Average GDP per capita growth (1992-2007)						
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	-0,0598 ** (-2,2964)	-0,0307 (-1,1981)	-0,0407 * (-1,6715)	-0,0322 (-1,2713)	-0,0301 (-1,1906)	-0,0304 (-1,2195)
GDP level 1992	-1,3861 *** (-4,5397)	-7,1930 *** (-3,3641)	-1,2565 *** (-4,3507)	-8,2015 *** (-3,1430)	-7,1134 *** (-3,2778)	-6,5103 *** (-3,0219)
Investment / GDP average (1992-2007)	0,0869 ** (2,4626)	0,0928 ** (2,5829)	0,0792 ** (2,2970)	0,0874 ** (2,3715)	0,0948 ** (2,5697)	0,0828 ** (2,2797)
IQ average (2002)	0,0006 ** (2,2200)	0,0005 * (1,9089)	0,0004 (1,6210)	0,0004 * (1,8517)	0,0005 * (1,8785)	0,0004 * (1,8383)
Population growth rate, average (1992-2007)	-0,3783 ** (-2,1129)	-0,3886 ** (-2,2739)	-0,2853 * (-1,8588)	-0,4121 ** (-2,5326)	-0,3790 ** (-2,4082)	-0,2628 (-1,4463)
EFW Area 1 Freedom level (1990-2005)	0,0004 (0,3620)	9,0275 (0,0836)				
EFW Area 2 Freedom level (1990-2005)	0,0040 * (1,7675)		0,0040 ** (2,5634)			
EFW Area 3 Freedom level (1990-2005)	-0,0002 (-0,1519)			0,0007 (0,6287)		
EFW Area 4 Freedom level (1990-2005)	-0,0035 * (-1,7792)				-0,0003 (-0,2082)	
EFW Area 5 Freedom level (1990-2005)	0,0041 (1,3229)					0,1338 (1,2529)
R^2	0,4859	0,3782	0,4377	0,38211	0,3786	0,3935
adj. R^2	0,4061	0,3281	0,3924	0,3322	0,3285	0,3446
F-Statistic	6,0918	7,5436	9,6548	7,6685	7,5553	8,0462
N	68	68	68	68	68	68

Table 4 Estimation results for the New Index (level)

Dependent variable: Average GDP per capita growth (1992-2007)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Constant	-0,0551 ** (-2,1678)	-0,0306 (-1,2066)	-0,0398 (-1,6558)	-0,0334 (-1,2840)	-0,0296 (-1,1679)	-0,0332 (-1,3265)	-0,0314 (-1,2547)	-0,0421 (-1,5969)
GDP level 1992	-1,0114 *** (-3,8259)	-7,1621 *** (-3,2572)	-1,1420 *** (-4,5868)	-7,9081 *** (-3,0905)	-7,0851 *** (-3,2679)	-6,3423 *** (-2,8913)	-6,2030 *** (-2,6826)	-8,2053 *** (-3,7353)
Investment / GDP average (1992-2007)	0,0841 ** (2,3078)	0,0921 ** (2,4836)	0,0828 ** (2,4365)	0,0878 ** (2,3425)	0,0933 ** (2,6035)	0,0891 ** (2,5069)	0,0923 ** (2,5978)	0,0919 ** (2,6022)
IQ average (2002)	0,0005 ** (2,2207)	0,0005 * (1,8964)	0,0003 (1,4695)	0,0005 * (1,8678)	0,0005 * (1,9111)	0,0005 ** (2,1896)	0,0005 ** (2,0460)	0,0006 ** (2,2507)
Population growth rate, average (1992-2007)	-0,3153 * (-1,7830)	-0,3923 ** (-2,1306)	-0,3368 ** (-2,2702)	-0,3941 ** (-2,4945)	-0,3835 ** (-2,4530)	-0,3545 ** (-2,2713)	-0,3544 ** (-2,2497)	-0,4179 *** (-2,6732)
NI Category 1 Freedom level (1990-2005)	0,0007 (0,5427)	0,0001 (0,0982)						
NI Category 2 Freedom level (1990-2005)	0,0071 *** (3,5627)		0,0046 *** (2,7866)					
NI Category 3 Freedom level (1990-2005)	-0,0024 (-1,2404)			0,0007 (0,4671)				
NI Category 4 Freedom level (1990-2005)	-0,0003 (-0,5980)				-0,0001 (-0,2643)			
NI Category 5 Freedom level (1990-2005)	-0,0005 (-0,8001)					-0,0007 (-1,2532)		
NI Category 6 Freedom level (1990-2005)	-0,0010 (-1,2241)						-0,0006 (-1,0245)	
NI Category 7 Freedom level (1990-2005)	0,0008 * (1,8650)							0,0005 (1,3507)
R^2	0,5319	0,3782	0,4473	0,3803	0,3788	0,3935	0,3885	0,3959
adj. R^2	0,4400	0,3281	0,4028	0,3303	0,3287	0,3446	0,3392	0,3472
F-Statistic	5,7869	7,5444	10,0389	7,6115	7,5638	8,0465	7,8789	8,1281
N	68	68	68	68	68	68	68	68

It can be observed in the estimations of the EFW- and New Index-level that the independent variables *GDP level 1992*, *Investment/ GDP*, *IQ average,* and *average population growth rate* result to be statistically significant for explaining the dependent variable, *average GDP per capita growth*. Furthermore, they all present the expected sign. Regarding the components of economic freedom, in both indices the level of the second category (area) results to be statistically significant for explaining GDP p.c. growth rates. In the EFW Index (table 3) this would be the category *Legal structure and security of property rights*, while in the New Index (table 4) it is the category *Legal and institutional setting*. Apart from this, area four of the EFW Index (table 3), *Freedom to trade internationally*, only explains GDP p.c. growth if it is jointly regressed on growth with the other EFW Index areas. Here, it also has a negative effect on growth, which is the same result as obtained by Carlsson and Lundström (2002), and by Berggren and Jordahl (2005). In the New Index (table 4), the level of category seven, *Conscription*, is important for explaining growth, but only when regressing it jointly on growth with the other New Index categories. An initial conclusion can thus be drawn, which indicates that the level at which the legal system functions seems to have a significant and robust effect on growth in both indices.

So the question for now is: Why should the New Index be preferred over the EFW Index, if both give similar results when using levels? The answer is found in the individual area regressions of the EFW Index (table 3). Here, the missing level of significance of its area four in model five leads one to suspect that a certain degree of multicolinearity must be present between the areas of the EFW Index. Since area four, *Freedom to trade internationally*, is only significant when jointly regressing it on growth with the other areas, and the coefficient and t-statistic change so drastically from the joint to the single regression, indications are pretty good that a number of variables, from different EFW Index areas, strongly interact with one another to cause this result. The area also presents an unexpected negative sign, which would mean in practice that less freedom to trade is actually good for growth. There is obviously no logic to this result. It is true that something similar happens with category seven, *Conscription,* in the New Index (table 4). But there, the coefficient is neither negative, nor does the t-statistic change so radically form the joint to the individual regression. In contrast with the EFW Index areas, the New Index categories practically show the same conduct in the joint and individual regressions. Thus, it is more likely that category seven of the New Index simply does not have a robust effect on growth, while the effect of area four from the EFW Index on growth is exclusively caused by the strong presence of multicollinearity between the EFW Index areas.

Heckleman and Stroup (2005) believe that this collinearity problem is caused by the arbitrary composition the EFW Index. The obviously subjective nature of the structure of area four (see table 1) would suggest this to be a plausible explanation. This can be further illustrated by showing Spearman and Pearson correlation coefficients for categories (areas) of both indices. These coefficients are not a clear indication of collinearity, but they allow us to make an educated guess as to its presence. Here, coefficients are only shown for the year 2005, since this is the first year in which all variables contained in the EFW Index have been measured, and this way there are no distortions due to missing observations. Results for the years 2006 and 2007 are practically identical. When observing the correlation coefficients produced by the areas of the EFW Index (table 5), it becomes clear that apart from area one, all present important similarities. Coefficients are not particularly high, but areas two, three, four, and five show

quite some relation. Especially, since all areas but the first present similarity with coefficients always being above 0,4. This could be an indication of the EFW Index's multicollinearity problem, when regressing the areas on growth. Regarding the New Index (table 6), just categories two and three show a strong similarity, which is also indicated by cluster analysis as already mentioned. This shows how these two categories ultimately measure something very similar and reinforces the view expressed above that those two categories probably represent the essence of the unobservable variable, economic freedom. In addition, a weak relationship exists among almost all categories, particularly between two, three, and five when taken by pairs. The coefficients are somewhat lower than those of the EFW Index though, and categories six and seven of the New Index can be termed as unrelated to the rest. So on large, most New Index categories are not so strongly related as compared to the EFW Index areas, which indicates why multicollinearity problems might not be so severe when regressing the categories of the New Index on GDP per capita growth.

Table 5 Correlation coefficients – EFW freedom level (2005)

Pearson / Spearman	Area 1	Area 2	Area 3	Area 4	Area 5
Area 1	1	-0,315 **	-0,245 **	-0,050	0,012
Area 2	-0,359 **	1	0,599 **	0,455 **	0,723 **
Area 3	-0,204	0,635 **	1	0,526 **	0,554 **
Area 4	-0,140	0,436 **	0,494 **	1	0,478 **
Area 5	-0,085	0,733 **	0,524 **	0,471 **	1

Table 6 Correlation Coefficients – New Index freedom level (2005)

Pearson / Spearman	Cat. 1	Cat. 2	Cat. 3	Cat. 4	Cat. 5	Cat. 6	Cat. 7
Cat. 1	1	-0,313 **	-0,266 **	-0,261 **	-0,257 **	0,073	0,130
Cat. 2	-0,378 **	1	0,853 **	0,479 **	0,452 **	0,230	0,075
Cat. 3	-0,290 **	0,876 **	1	0,482 **	0,550 **	0,247 **	0,140
Cat. 4	-0,357 **	0,537 **	0,541 **	1	0,340 **	0,094	0,270 **
Cat. 5	-0,234	0,498 **	0,557 **	0,355 **	1	0,520 **	0,011
Cat. 6	0,052	0,208	0,236	0,083	0,539 **	1	0,112
Cat. 7	0,157	0,075	0,098	0,194	0,047	0,098	1

Table 7 Collinearity diagnostics – EFW Index level (1990-2005)

Variable	VIF	R^2 using Klien's Rule	Eigenvalue	Conditioning Index	Eigenvalue	Conditioning Index
GDP level 1992	4,6210				4,2099	1,0000
Investment / GDP	1,1540				1,7882	1,5344
IQ average	2,9790				1,1060	1,9510
Population growth rate	2,1870				0,6489	2,5471
Area 1	2,3770	0,5555	2,9656	1,0000	0,4240	3,1510
Area 2	8,5320	0,7663	1,1780	1,5867	0,3437	3,4998
Area 3	3,1040	0,6159	0,4349	2,6113	0,2422	4,1692
Area 4	2,3540	0,4889	0,2911	3,1918	0,1594	5,1392
Area 5	4,4430	0,7593	0,1304	4,7689	0,0779	7,3514

Table 8 Collinearity diagnostics – New Index level (1990-2005)

	VIF	R^2 using Klien's Rule	Eigenvalue	Conditioning Index	Eigenvalue	Conditioning Index
GDP level 1992	3,6730				4,4868	1,0000
Investment / GDP	1,3040				1,9992	1,4981
IQ average	3,0230				1,1351	1,9882
Population growth rate	2,2630				0,8616	2,2820
Category 1	2,0080	0,2142	3,2411	1,0000	0,7876	2,3868
Category 2	4,2270	0,7004	1,3731	1,5364	0,4665	3,1013
Category 3	3,4190	0,6560	0,7992	2,0138	0,3867	3,4063
Category 4	1,3940	0,2521	0,6561	2,2226	0,3034	3,8456
Category 5	2,5730	0,5913	0,5087	2,5242	0,2351	4,3686
Category 6	2,8810	0,6406	0,2334	3,7265	0,1873	4,8944
Category 7	1,5280	0,2231	0,1884	4,1477	0,1505	5,4601

Of course, simply because results from growth regressions with the New Index are more intuitive than with the EFW Index, it does not proof the hypothesis of multicollinearity being a smaller problem in the New Index. The fact that correlation coefficients from one observation year yield some support to this view is a good thing, but it certainly is not sufficient evidence either. As Belsley, Kuh, and Welsh (1980) make clear, rather than being a statistical problem, collinearity is above all a property of the data matrix used for regression. It has its origin in the similarity of observations from the real world, and can therefore neither be ruled-in nor ruled-out by simply looking at pair-wise correlation coefficients. Furthermore, it also does not bias regressions coefficients. In that sense, it is better to think of multicollineartiy as a matter of degree, rather than an absolute value.

The tests generally proposed to detect multicollinearity are given in table 7 for the EFW Index, and table 8 for the New Index. The first column shows the variance inflation factor. Generally, this method quantifies the severity of multicollinearity in an ordinary least squares regression analysis, and here it is applied to the joint regression models used in table 3 and table 4. This number provides a measure of how much the variance of an estimated regression coefficient is increased through collinearity. (Fox, 1991) It can be observed that in the case of both indices, standard errors for the coefficients of the independent variables are larger than they would be if those independent variables were uncorrelated, and this confirms the view that multicollinearity is present in regressions using both indices. None the less, it can be observed that on average the variance inflation factors for the EFW Index (table 7) are higher than those for the New Index (table 8), which reinforces the view that mutlicollinearity is less of a problem in the New Index as compared to the EFW. This is further supported by applying Klien's rule of thumb (Klien, 1962) in the second column of both tables. Here, each independent variable in question is regressed on the remaining independent variables. In this case, the dependent variable is each area of the EFW Index (table 7) and each category of the New Index (table 8). The numbers obtained are the R^2 from regressions when using the remaining areas or categories as independent variables. If any of these R^2 is significantly higher than those obtained by regressing the full model in tables 3 or 4, one can conclude that there is probably a multicollinearity problem in the model. Once again, the collinearity problem is confirmed for both indices, but with the EFW Index areas (table 7) producing on average higher R^2s, than the New Index categories (table 8).

Belsley, Kuh, and Welsh (1980) favor the approach of detecting collinearity by looking at the condition index of the data, which is the square root of the ratio of the largest to the smallest eigenvalue of the data matrix. Hereby, the conditioning number is obtained, which is simply the root of the largest eigenvalue divided by the smallest. If this number is *large*, it indicates problems with multicollinearity in the data matrix. Unfortunately, there exits no general consensus on what large or small is, and that is a serious drawback of the method. Since the comparison of both indices is the main objective though, this problem is not severe in our case as the conditioning number can very well be used to compare both indices. The last four columns on the right of table 7 show the eigenvalues and conditioning index for the EFW Index, while the corresponding columns of table 8 show it for the New Index. Here, each value does not correspond directly to the variables shown on the left hand side, but rather it refers to the dimensions of the matrix, from which the corresponding eigenvalues and conditioning indices are calculated. In both tables, the conditioning index is shown for just the data matrix of the EFW Index areas (table 7) and the New Index categories (table 8), but also for both

indices including the control variables used for regression. For each, the conditioning number is simply the value of the conditioning index in the last row. There it can be observed that the conditioning number for the data matrix of both indices alone does not vary too much, showing a value of 4,7689 for the EFW Index, and 4,1477 for the New Index. Only when including the control variables does the conditioning number vary quite a bit, producing a value of 7,3514 for the EFW Index, and 5,4601 for the New Index. This shows that the magnitude of collinearity is actually not very different in both indices. Compared to the New Index, it seems to be more of a problem in the EFW Index though, when the control variables are also included in the data matrix. Rearrangement then obviously achieves that the New Index performs better than the EFW Index in multiple linear regression analysis, since it obviously interacts less with the control variables from the neoclassical model.

Table 9 Estimation results for the EFW Index (increase)

Dependent variable: Average GDP per capita growth (1992-2007)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	-0,0372 (-1,4714)	-0,0308 (-1,2222)	-0,0342 (-1,3900)	-0,0292 (-1,1612)	-0,0350 (-1,3784)	-0,0304 (-1,2195)
GDP level 1992	-5,8997 ** (-2,6059)	-7,0990 *** (-3,3534)	-7,2392 *** (-3,5399)	-7,3728 *** (-3,5092)	-6,4257 *** (-2,8921)	-6,5103 *** (-3,0219)
Investment / GDP average (1992-2007)	0,0856 ** (2,3177)	0,0936 ** (2,6133)	0,0885 ** (2,5325)	0,0922 ** (2,5837)	0,0998 *** (2,7620)	0,0828 ** (2,2797)
IQ average (2002)	0,0005 ** (2,0292)	0,0005 * (1,8948)	0,0005 ** (2,1445)	0,0005 * (1,8956)	0,0005 * (1,9929)	0,0004 * (1,8383)
Population growth rate, average (1992-2007)	-0,3224 * (-1,6770)	-0,3610 ** (-2,2171)	-0,4548 *** (-2,9022)	-0,3775 ** (-2,4240)	-0,3847 ** (-2,4810)	-0,2628 (-1,4463)
EFW Area 1 Freedom increase (1990-2005)	0,0068 (0,1064)	0,0295 (0,4701)				
EFW Area 2 Freedom increase (1990-2005)	0,1362 (1,5710)		0,1594 * (1,8981)			
EFW Area 3 Freedom increase (1990-2005)	-0,0040 (-0,8764)			-0,0035 (-0,7996)		
EFW Area 4 Freedom increase (1990-2005)	0,1171 (1,0511)				0,1167 (1,0428)	
EFW Area 5 Freedom increase (1990-2005)	0,1259 (1,1281)					0,1338 (1,2529)
R^2	0,4402	0,3803	0,4123	0,3845	0,3888	0,3935
adj. R^2	0,3533	0,3304	0,3649	0,3348	0,3396	0,3446
F-Statistic	5,0678	7,6124	8,7001	7,7470	7,8911	8,0462
N	68	68	68	68	68	68

Table 10 Estimation results for the New Index (increase)

Dependent variable: Average GDP per capita growth (1992-2007)								
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Constant	-0,0469 * (-1,8232)	-0,0416 * (-1,7223)	-0,0302 (-1,1991)	-0,0381 (-1,5148)	-0,0328 (-1,2938)	-0,0298 (-1,1578)	-0,0308 (-1,2144)	-0,0303 (-1,1987)
GDP level 1992	-8,3189 *** (-2,9146)	-7,7064 *** (-3,8680)	-7,1537 *** (-3,4054)	-5,2467 ** (-2,2033)	-7,6425 *** (-3,5153)	7,2408 *** (-3,4312)	-7,0322 *** (-2,9507)	-7,3056 *** (-3,2417)
Investment / GDP average (1992-2007)	0,0933 ** (2,5652)	0,0849 ** (2,5024)	0,0932 ** (2,6081)	0,1069 *** (2,9639)	0,0933 ** (2,6127)	0,0932 ** (2,5941)	0,0931 ** (2,5973)	0,0935 ** (2,5812)
IQ average (2002)	0,0006 ** (2,5257)	0,0006 ** (2,4862)	0,0005 * (1,8992)	0,0005 * (1,9212)	0,0005 ** (2,0197)	0,0005 * (1,8593)	0,0005 * (1,9087)	0,0005 * (1,9132)
Population growth rate, average (1992-2007)	-0,3330 * (-1,7717)	-0,3092 ** (-2,0625)	-0,3970 ** (-2,5178)	-0,2725 (-1,6325)	-0,4001 ** (-2,5388)	-0,3840 ** (-2,4473)	-0,3702 ** (-2,1454)	-0,3882 ** (-2,3458)
NI Category 1 Freedom increase (1990-2005)	0,3022 *** (2,7925)	0,2610 *** (2,7656)						
NI Category 2 Freedom increase (1990-2005)	0,0165 (0,3224)		0,0304 (0,6073)					
NI Category 3 Freedom increase (1990-2005)	0,0780 (0,6832)			0,0304 (1,6529)				
NI Category 4 Freedom increase (1990-2005)	-0,0040 (-1,3667)				-0,0020 (-0,7181)			
NI Category 5 Freedom increase (1990-2005)	-0,0012 (-0,6860)					-0,0001 (-0,0933)		
NI Category 6 Freedom increase (1990-2005)	-0,0007 (-0,3126)						0,0003 (0,1720)	
NI Category 7 Freedom increase (1990-2005)	-0,0004 (-0,1906)							-0,0002 (-0,0996)
R^2	0,4815	0,4464	0,3818	0,4044	0,3833	0,3782	0,3784	0,3782
adj. R^2	0,3796	0,4018	0,3320	0,3563	0,3335	0,3281	0,3283	0,3281
F-Statistic	4,7278	10,0014	7,6600	8,4201	7,7072	7,5441	7,5508	7,5445
N	68	68	68	68	68	68	68	68

The estimations conducted with the EFW- and New Index- increase further reinforce the conclusions obtained by the level-regressions and the collinearity diagnostics. Again, all control variables have the expected sign, and all are statistically significant. Apart from that, results for the EFW Index (table 9) are a bit puzzling: No EFW area increase is statistically significant when jointly regressing the areas on GDP per capita growth. Only an increase in area two, *Legal structure and security of property rights*, significantly increases growth rates when individually regressing this area. Due to the fact that it only appears to be significant in the individual area regressions, it seems as if the arbitrary structure of the EFW Index also influences this result. On the contrary, results for the New Index (table 10) are sensible in this estimation: An increase in category one, *Government weight in the economy*, causes higher levels of GDP per capita growth. In practice, this would correspond to higher growth rates on average if government weight in national economies is reduced. The category is highly significant an its impact, as measured by the corresponding coefficient, turns out to be high, either when regressing all categories of the New Index jointly on growth, or when regressing them individually.
Having shown that, in contrast with the EFW Index areas, the regressions of the New Index categories do not show serious problems with multicollinearity, the results obtained by the New Index categories deserve some more attention. Regarding the estimations using the average freedom level (table 4), categories two and nine, *Legal and institutional setting* and *Conscription*, are statistically significant when regressing them on growth, even thought the effect of *Conscription* does not seem to be very robust. Estimations using the average freedom increase (table 10) show that category one, *Government weight in the economy*, causes higher levels of GDP per capita growth. To confirm these results, a series of tests have been conducted. Primarily, these consist of introducing other variables into the regressions, the majority of which were proposed by Sala-i-Martin (1997). The sample is also split according to different criteria, and an alternative regression model is used. The following robustness tests have been conducted with all New Index regressions:

1. Regional Influence: *Sub-Sahara Africa* (dummy), *Latin America* (dummy), Europe (split of sample), *Absolute Latitude* (Hall and Jones, 1996).
2. Political Variables: *Political Rights* (Freedom House), *Civil Liberties* (Freedom House), *War* (dummy).
3. Religious Variables: *Fraction Catholic*, *Fraction Protestant*, *Fraction Orthodox*, *Fraction Jewish*, *Fraction Muslim*, *Fraction Hindu*, *Fraction Buddhist*, *Fraction Not-Religious*. (Barro, 1996)
4. Legal Origin: *English*, *French*, *German*, *Scandinavian*. (dummies)
5. Primary Sector Production: *Fraction of Primary Products in total Exports* (Sachs and Warner, 1995), *Oil Producing* (dummy).
6. Economic Development: High Income Countries, High Income- and Upper Middle Income Countries, Upper- and Lower Middle Income Countries and Lower Income Countries (split of samples according to World Bank classification, 2008), *Life Expectancy* (United Nations data, 2005).
7. Other: *Former Communist* (dummy), *Former Spanish Colony* (dummy), *Ethnic- and Linguistic Fractionalization Index* (Atlas Narodov

Mira,1964), *Ethnic- Linguistic- and Religious Fractionalization Indices* (Alesina et al., 2003).

8. Alternative Regression Model: Model proposed by Jeffery Sachs (2001), using *Tropical location*, *Costal population*, and *Distance from mayor markets* as control variables. (Gallup, Sachs, and Mellinger, 1999)

Of theses robustness test, no one is really able to eliminate the significance of *Legal and institutional setting* and *Government weight in the economy* at conventional levels. Only reducing the sample to Middle Income Countries eliminates the significance of *Legal and institutional setting*, and reducing it to High Income Countries or European Countries eliminates the significance of *Government weight in the economy*. In all three cases, these sample splits also eliminate the significance of at least two control variables though. It can therefore be claimed that the New Index categories *Legal and institutional setting* and *Government weight in the economy* have a robust effect on growth rates. As expected, *Conscription* is not a robust variable, since it looses significance in half of all the tests conducted. Finally, when the same robustness tests are conducted on the EFW Index, there are three tests that eliminate the significance of all areas in growth regressions. No EFW Index area is significant when the dummy variables *Latin America*, *Legal Origin*, or *Former Spanish Colonies* are introduced into the model. Furthermore, results with the EFW Index areas vary quite a bit, depending on the robustness test conducted with the EFW model. This also does not happen with the results from categories of the New Index, which remain surprisingly stable with the distinct robustness tests.

Having discussed the robustness of the results obtained, some further conclusions can be drawn with respect to the effect of economic freedom on growth rates: The average level at which a country's legal system and institutions function has an important impact on GDP per capita growth (table 4). The corresponding variable was found to be statistically significant at the 1% level and it has a stronger impact than, for example, the variable used for measuring human capital. The Legal system and the institutional setting thus have an important and positive effect on growth, by assuring general security and the effective use of resources by society. This point goes hand in hand with the results obtained by many authors who analyze recent trends and is also endorsed by the historical investigations of North and Thomas (1973), who demonstrate that effectively designed property rights, and institutions that guarantee them were responsible for productivity increases and consequent economic growth in England and the Netherlands, even before the dawn of the industrial revolution. Moreover, it makes sense that this category is correlated with growth when using the average level, since it is strongly related to credibility. Considering that the credibility of legal entities and national institutions has to be established in order for the whole system to function properly, building and improving state institutions takes time. Therefore, the economic effects cannot be immediate. This category can thus be interpreted as a long run effect of economic freedom on growth.

In turn, a reduction of government weight in the economy has an immediate and positive effect on GDP per capita growth rates (table 10). This makes intuitive sense, since various economic mechanisms are measured in this category which can influence an economy in the short run. Marginal tax rates and labor market regulations are probably the best examples. Cutting taxes will almost immediately leave more money in the hands of a country's citizens that they can spend on other goods and that will augment growth rates Reducing payments to social

security systems may also has the immediate potential to cause growth, throught downsizing companies' costs and increasing their incentives to hire more employees. Generally speaking, this category can therefore be interpreted as the short run effect of economic freedom on GDP per capita growth. The corresponding variable is also significant at the 1% level, and the coefficient shows it to have approximately the same repercussion on output as the population growth rate.
Hence, it seems as if cluster analysis was particularly useful to rearrange the EFW Index variables in such a way that some of the resulting New Index categories appear to have a long run effect on GDP per capita growth, whereas others seem to exert their effect in the short run. This can probably help to understand the nature of the debate on whether it is the economic freedom level, or the economic freedom increase that is responsible for causing growth. Here, the answer is straightforward: Both are responsible, but different variables and categories are important, depending on whether the economic freedom level or the economic freedom increase is taken into account.

6 Conclusions, implications, and research agenda

In recent years many researchers have used the EFW Index to test for a possible relationship between economic growth and economic freedom, mainly employing cross-sectional or panel data. The majority of these authors have obtained results which do point to a positive relationship between economic freedom and GDP growth. However, the nature of this effect is subject to dispute and a number of investigations have also taken a closer look at the individual areas of the EFW Index, recognizing that some categories might promote economic growth more than others. The results indicate that, contrary to the logic used in constructing the index, some categories exhibit a negative and significant effect on growth rates. In this context, the arbitrariness of the index composition and the missing of adequate weighting schemes for the individual categories were heavily criticized by some authors. On the other hand, many authors defend that the variables used in the EFW Index construction should be able to tell us something about economic freedom.
Concerning the arbitrariness-critique made by scholars on the composition of the EFW Index categories, this paper tries to develop alternative categories for variable aggregation, through the use of multivariate statistical methods: By disaggregating the 42 variables of the EFW Index for different observation years and conducting cluster analysis, new index categories are found for aggregation that are not so much based on theory but rather on mathematical-statistical criteria. This is a new approach, for the reason that so far cluster analysis has not been used in the aggregation of economic freedom indices. The resulting structure of the New Index is quite different form that of the EFW, and category names try to express the logic behind data affinity.
To control for the performance of the New Index categories in explaining GDP growth and to compare it with that of the regular EFW Index areas, multiple linear regression analysis is used. In terms of category composition this New Index performs better, since it shows fewer problems with multicollinearity. A comparison made by the proper creators of the EFW Index shows that both are

aware of this issue: Gwartney and Lawson (2009) make clear that, rather than operating independently, they expect the key factors of economic freedom to operate together, something like the motor, transmission, steering mechanism, and wheels of a car. According to them, absence or major weakness in any one of several areas will tend to undermine the effectiveness of other key factors. If this is the case, then one would certainly expect some correlation (multicollinearity) among the key factors. It also means that the same correlation is certainly present among the variables of the New Index. Different conduct in regression thus comes from the manner of aggregation.

This obviously does not help to solve the problem of how to weight the individual categories. However, to the extent that the New Index exhibits fewer collinearity problems, the need for a correctly weighted compound index is not so pressing, considering that the individual aspects of economic freedom and their effect on growth can be investigated more easily. Regarding the consequences for policy making, this may be important, since the lessons to be drawn from the disaggregated approach are more concrete. Furthermore, this analysis also seems to give us a better idea of which variables and categories are at the center of the unobservable variable *economic freedom*, and which have little to do with it. Obviously, these points will depend on confirmation by future research.

Finally, the categories that are shown to be significant in explaining GDP per capita growth in the New Index are sensible. When using the average level of New Index categories as independent variables, *Legal and institutional setting* and *Conscription* result to be statistically significant, although the effect of *Conscription* on growth is not robust. The category *Government weight in the economy* results to be significant when the increase of the New Index categories is used as independent variables. This is a strong result, which helps to explain, why there are ongoing discussions as to whether it is the freedom level that causes GDP growth or just the freedom level increase. Here, the answer seems to be clear: Both are responsible, but different variables and categories are important, depending on whether the freedom increase or freedom level is taken into account.

Future research might focus on the following related issues: First, controlling for the indirect role that economic freedom might have on GDP via investment. To do this, regressions would have to be run that take the investment rate as the dependent variable. If a good fit is achieved and economic freedom indices turn out to be significant, a new model should be estimated. By replacing investment in the equation by its determinants, for example, it would be possible to estimate the effects of economic freedom on investment rates. This way, not only the direct effects of economic freedom would be taken into account, but also the possible indirect effects. Second, another task in the agenda rests in the idea that, like political freedom, also economic freedom might have an effect on variables like happiness. Using national levels of happiness as the dependent variable, this can be investigated. Finally, it might be worthwhile to submit to check the conceptual division of freedom into *political freedom*, *civil liberty*, and *economic freedom*. By using cluster analysis on all the basic variables of some corresponding indices, we might obtain a better idea, on whether the artificial separation of the freedom-concept is really consistent with the data. This could also shed some more light on the much debated issue, on what freedom-type is ultimately responsible for causing increased economic growth.

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7 Literature

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8 Appendix

Country list for regression

Albania
Argentina
Australia
Austria
Bangladesh
Belgium
Bolivia
Botswana
Brazil
Bulgaria
Canada
Chile
Colombia
Costa Rica
Croatia
Czech Rep.
Denmark
Dominican Rep.
Ecuador
Estonia
Finland
France
Germany
Greece
Honduras
Hong Kong
Hungary
Iceland
India
Indonesia
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kenya
Korea, Rep.
Latvia
Lithuania
Mexico
Netherlands
New Zealand
Nicaragua
Norway
Pakistan
Panama
Paraguay
Peru
Philippines
Poland
Portugal
Romania
Russia
Singapore
Slovak Rep
Slovenia
South Africa
Spain
Sweden
Switzerland
Thailand
Tunisia
Turkey
United Kingdom
United States
Uruguay
Venezuela