OECD Working Papers on Public Governance No. 17

Assessing the Impact of Regulatory Management Systems: Preliminary Statistical and Econometric Estimates

Stephane Jacobzone,

Faye Steiner,

Erika Lopez Ponton,

Emmanuel Job

https://dx.doi.org/10.1787/5kmfq1pch36h-en

OECD

OECD WORKING PAPERS ON PUBLIC GOVERNANCE

No. 17

ASSESSING THE IMPACT OF REGULATORY MANAGEMENT SYSTEMS: PRELIMINARY STATISTICAL AND ECONOMETRIC ESTIMATES

Stéphane Jacobzone, Regulatory Policy Division, OECD
Faye Steiner, Stanford University, University of Paris I
Erika Lopez Ponton, University of Paris I
Emmanuel Job, Regulatory Policy Division, OECD

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where the governments of 31 democracies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities takes part in the work of the OECD.

Issued under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the OECD member countries.

This project received significant financial assistance of the European Commission, which made it possible to perform a full analysis of the data. The views expressed herein can in no way be taken to reflect the official opinion of the European Commission.

© OECD 2010.

ABSTRACT

Assessing the impact of regulatory management systems: Preliminary statistical and econometric estimates

This Working Paper presents preliminary analytical estimates using the 1998 and 2005 surveys of indicators of systems for the management of regulatory quality. Two broad dimensions are found in regulatory management systems using Factor Analysis, and Principal Component Analysis. The first reflects an integrated approach to *ex ante* assessment, with the use of tools such as formal consultation and regulatory impact analysis as well as institutions for regulatory oversight, training and capacity building. The second focuses on the stock of regulation, with administrative simplification, streamlining licences and permits, etc. These data are correlated with other available datasets on regulatory frameworks, including the OECD indicators of Product Market Regulations, subsets of the Doing business and Worldwide Governance Indicators (WGI) from the World Bank and the Global Competitiveness Index (GCI) from the World Economic Forum. Finally, the report presents some preliminary regressions with reduced forms, including fixed and random effects, linking the indicators to macroeconomic indicators. The findings tend to support the view that improvements in regulatory management system quality yield significant economic benefits.

Note: Stephane Jacobzone is a senior economist, and Emmanuel Job, statistician in the Regulatory Policy Division at the OECD. The econometric analysis was prepared by Prof Faye Steiner, Economics Department, Stanford University and Erika Lopez Ponton, University of Paris I Sorbonne, Economics Department, at the time the report was drafted.

Stephane Jacobzone would like to thank Sander Wagner for his outstanding research assistance. The authors would like to thank the following OECD staffs for their comments: in the OECD Public Governance and Territorial Development Directorate: Christiane Arndt, Gregory Bounds and Josef Konvitz from the Regulatory Policy Division, Zsuzsanna Lonti and Laurent Nahmias in the Public Sector Management and Performance Division. In the Economics Department: Paul Conway, economist at the time the report was drafted. The authors would also like to thank the network of national delegates and experts who provided feedback and inputs, as well as participants to the workshop organised in London in March 2009. Any potential errors remain the authors' responsibility.

TABLE OF CONTENTS

Tables

Figures

Boxes

INTRODUCTION

This note presents preliminary analytical results derived from the results of the 1998 and 2005 data collection on indicators of systems for the management of regulatory quality. The descriptive statistics are available in the two documents: *OECD Working Papers on Public Governance* 2007/4, *OECD Working Papers on Public Governance* 2007/9. The analytical work that is being presented builds on the previous work to further analyse the structure and trends of regulatory management systems in OECD countries.

From an analysis of the data, two broad dimensions in the systems of OECD countries for the management of regulatory quality have been derived. The first dimension is characterised as an integrated approach to the *ex ante* assessment of regulatory quality, represented by institutions for regulatory oversight, training and capacity building and the use of a number of regulatory quality tools, including formal consultation and regulatory impact analysis. The second dimension focuses more on the stock of regulation. It includes institutions and tools for administrative simplification, streamlining licences and permits and, to a lesser extent, programmes for administrative on burden reduction.

Using these two dimensions, correlation and regressions through reduced forms, with fixed and random effects, have been performed linking these with economic indicators. The findings from this analysis are consistent and coherent across four economic dimensions: total employment, employment in the business sector, GDP in the business sector and labour productivity. The findings tend to support the view that improvements in regulatory management system quality yield significant economic benefits.

I. INDICATORS OF REGULATORY MANAGEMENT SYSTEMS: AN ANALYTICAL OVERVIEW

This report presents a set of analytical results to deepen and extend the current work of the OECD on indicators systems for the management of regulatory quality. The analysis relies on the 1998 and 2005 surveys for which full results were available when all the analysis was performed. The current OECD data analyses the extent to which countries' regulatory management systems and practices conform to the 2005 OECD *Guiding Principles for Regulatory Quality and Performance*. The analysis below is designed to improve the understanding of the interrelations between the various dimensions of regulatory policy, helping to prepare typologies and to identify groups of countries. This also lays the ground for further analysis of the implications of policies for regulatory quality in terms of the broader competitiveness agenda as well as in relation to economic growth.

Mapping core dimensions of regulatory management systems quality through principal Component Analysis

Principal component analysis is a powerful statistical method that can help to map a wide ranging and diverse set of qualitative data (see Box 1 for more technical details). This statistical data reduction technique can be used to explain variability among observed variables in terms of a few underlying and unobserved variables, called "factors". In the context of the data of the Indicators of Regulatory Management Systems, Factor Analysis has a double purpose. It helps to show the core dimensions of the dataset and to identify groups of countries with similar institutional settings for system of regulatory management. It also allows the building of more aggregate data, at the level of factors and composite indicators for use in econometric work and correlation analysis to assess the policy implications of the quality of regulatory management systems in terms of widely available indicators from other surveys and economic growth. Reduction of the number of variables into key factors helps to focus attention on the most salient aspects of countries' Regulatory Management System (RMS) from a statistical perspective.

The reduction is possible because the variables (survey responses in the case of the RMS) are related. Hence, a first step in Factor Analysis (FA) is an analysis of the correlations within the datasets, which will be demonstrated below. FA helps identify groups of interrelated variables. This is particularly useful with respect to the Regulatory Management System (RMS) questionnaire, since responses to the different questions are often related. FA provides guidance on how the variables may be grouped. Factor analysis does not impose either specification of dependent variables, independent variables, or causality. It is a non-parametric technique that requires no assumptions about the probability distributions of the variables. It simply helps to express the significance of the data and make it "speak".

This requires preliminary steps, with semi-aggregate composite indicators of regulatory management systems quality which have been constructed in past research (OECD, 2007), with a number of dimensions, mainly derived from each of the main questions from the 2005 questionnaire. These composites are displayed below and represent the core building block of the statistical analysis. They rely on a set of chosen weights, which were discussed and agreed with a professional network of data correspondents and regulatory policy experts.

Box 1. Principal Component Analysis: A methodological overview

The application of PCA makes sense for a set of variables that are slightly interrelated, which is the case of our dataset. The variables represent an assessment of the different aspects of implementing high quality regulation across OECD countries. Therefore, it is a legitimate hypothesis to assume to assume that they are correlated (*Cf.* Correlation analysis).The PCA reduces an original set of correlated variables to a new smaller set of uncorrelated variables. These newly created variables are the principal components. They are linear combinations of the original variables and sorted in descending order of explanatory power (which is measured by how much of the total variance of the dataset they can explain).

Normally the first principal components explain most of the total variance within the dataset. Therefore, when analyzing the dataset one can simply use a few principal components instead of a multitude of variables, thus *achieving clarity without compromising data integrity*.

To illustrate how principal components are created, a simple example would be combining two variables into one principal component. Graphically, this start with a two-dimensional space in which the data is plotted as points (see Figure 1). If the goal is just to keep the information given by Variable 1 and ignore Variable 2, this means ending up with all points being represented on one axis. Starting from the two dimensional plan above, this might be interpreted as projecting all the points unto the first axis as illustrated below. All information about variable 2 is lost (see Figure 2).

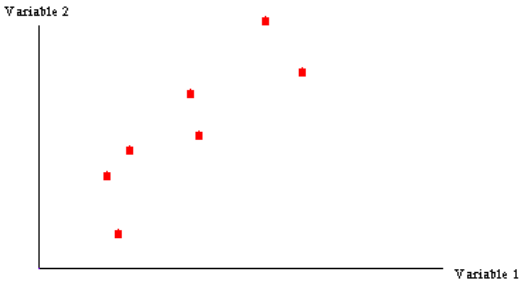


Fig.1

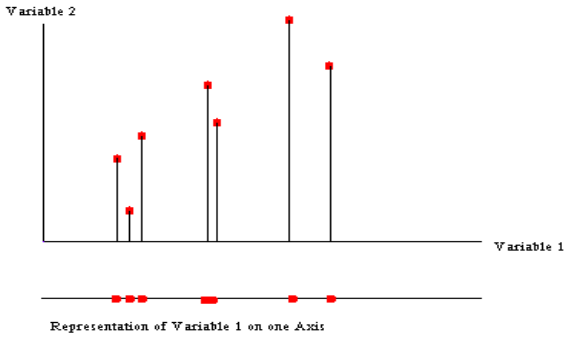


Fig. 2

On the second plot, there is a projection unto the axis representing Variable 2 and as a result all information about Variable 1 is lost (see Figure 3)

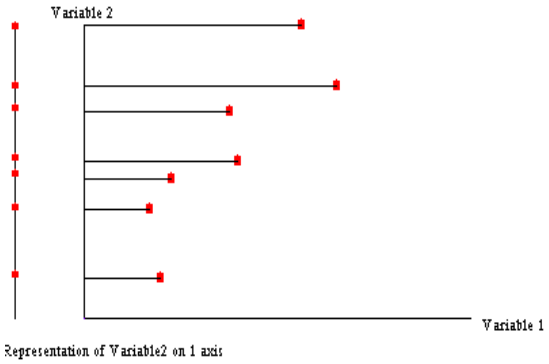


Fig. 3

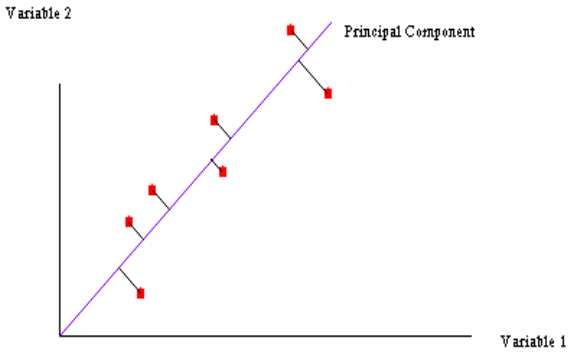


Fig. 4

A Principal Component Analysis would project the data onto an axis (the principal component) which is a combination of Variable 1 and Variable 2, constructed in such a way as to preserve the maximum of information about the difference between the single points (technical term: variance) (See Figure 4).

In practice, there is a need for dealing with a data set including a much greater number of variables, which are then to be reduced to a few principal components. Each variable has a unique contribution to a certain principal component, as well as a correlation with the principal component, which helps to interpret the components. For example, if the choice is to conduct a study about political views and activities. The questionnaire design will include the various items. This may include asking respondents about how interested they are in politics (1) and how much time they devote to pursuing political activities (2). Most likely the responses to these two questions are highly correlated with one another, and therefore quite redundant. They can probably be reduced to a single principal component, which is indicated by the fact that they both strongly contribute to this component. Therefore the data structure is simplified and underlying structures are clarified.

Glossary of useful technical terms when interpreting a PCA

1. **Individual countries** are the subjects of a study, in our case the 31 OECD member countries.

2. **Variables** are the measured characteristics of the individuals, in our case the 16 different policy areas, for which composite aggregate values have been created based on the indicators questionnaire. (See

3. **Principal Components** are linear combinations of the variables, constructed in order to simplify the dataset and identify underlying structures.

4. **Eigenvalues** are a measure of how much of the total variance of the original data set is explained by a certain principal component. They are therefore a measure of how much information a principal component contains (*i.e.* its relative importance).

5. **Percentage of variance explained** is, just like Eigenvalues a measure for the variance explained by a principal component, but is expressed in percentage terms.

6. **Contribution** measures the influence of one variable in the construction of a principal co-ordinate. It gives the percentage with which a certain variable influences the overall construction of the component. The contribution is therefore very useful in order to see how a principal component is composed and interpret its meaning.

7. **Co-ordinates** give information on whether a question is positively or negatively correlated with a principal component. A positive correlation translates into positive co-ordinates, a negative correlation into negative ones. This is helpful for interpreting a principal component. For example, if the variables *age* and *income* of a given questionnaire have strong contributions to the component that is being interpreted. If both of these variables have positive co-ordinates, the component will display older and richer individuals on the positive side and younger and poorer individuals on the negative side. If however *age* has positive co-ordinates and *income* negative ones, the component will serve to distinguish between old poor individuals on the positive and young rich individuals on the negative side.

8. **Axis (Principal Component)** is a term often used instead of the term principal component. Every individual (*i.e.* country) within the dataset has a certain value for every principal component, which helps to see how it performs concerning the aspects measured by the principal component. Therefore the component can be considered as an axis on which the countries can be shown according to the value they have for the corresponding component.

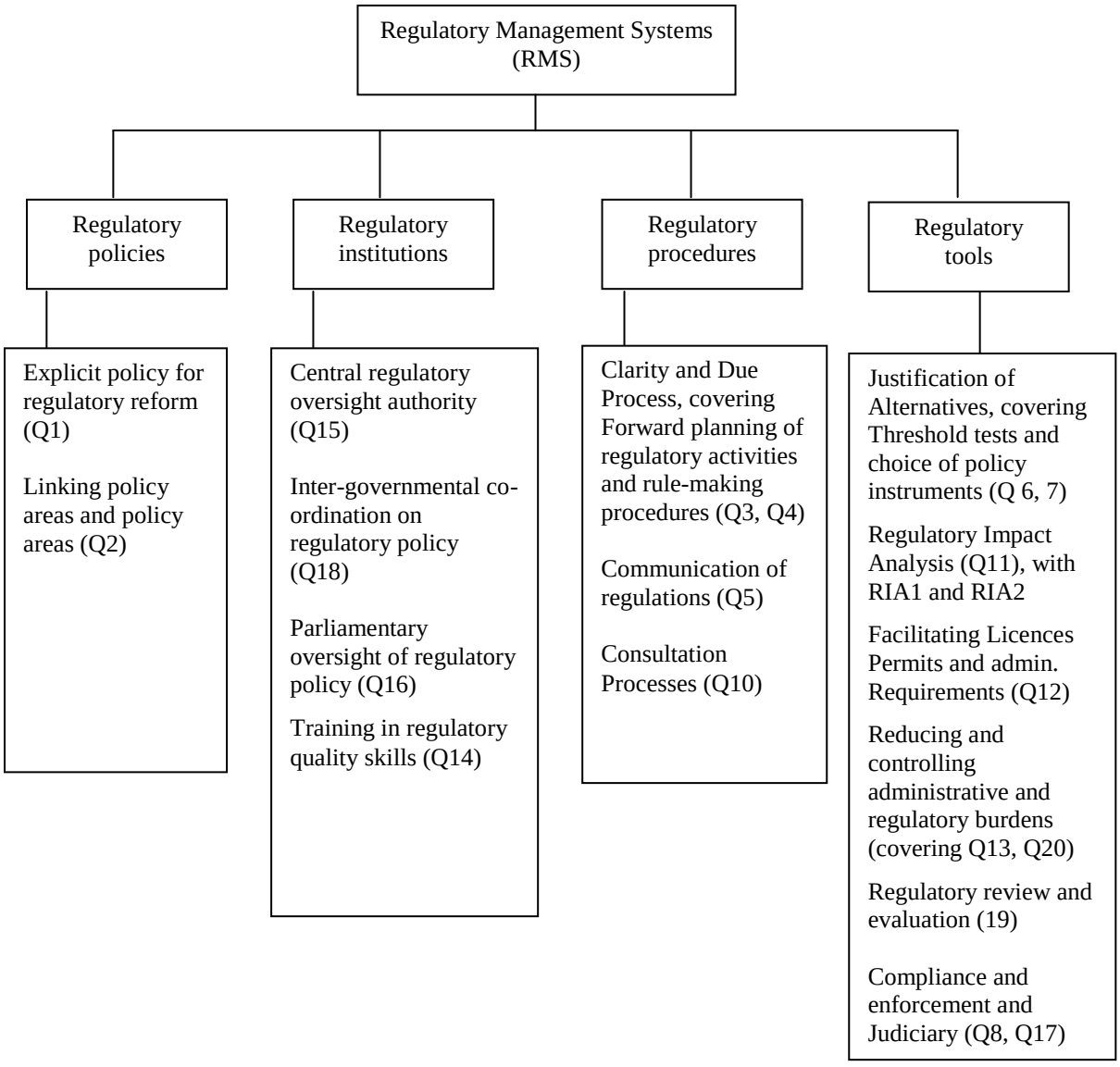
9. **Factor Plan** is the two-dimensional plan obtained when combining two axes, each representing a different principal component. These factor plans are very useful in order to classify or analyse the countries regarding their approach to regulation.

The Regulatory Management System Dataset

The Regulatory Management System Dataset involves 16 dimensions from the 2005 survey, which correspond mainly to the various questions of the 2005 questionnaire. They are presented below by groups in terms of policies, institutions, procedures and tools (Figure 1).

A number of adjustments were made, following close investigations into the data. Questions 3 and 4 which were combined in an aggregate on clarity and due process in rule making procedures, as displayed in Figure 8.1-8.2 of Jacobzone *et al.* (2007b). Question 5 on transparency and easy access to regulations was slightly re-labelled as communication, to facilitate the distinction from Q10 on consultation. Questions 6 and 7 were combined under justification and alternatives, as in figure 11 on the provision of justification for regulatory actions. The RIA questions were split into two dimensions, given the number of sub-questions, and the necessity to distinguish between the structure of the RIA process and the associated quality checks (Question 11), and the extent of RIA, including the various dimensions which can be brought into the analysis (Question 12). Few data were available on the role of the judiciary (Figure 6 in Jacobzone *et al.*, 2007b). As a result, this item was combined with availability of options for appeal (Question 8), in an aggregate item on compliance and enforcement. Question 13 on the reduction and control of administrative burdens was combined with question 20 on controlling aggregate regulatory burdens into a composite on the burden reduction. The other items are relatively straightforward.

Figure 1. Policy areas covered by the 1998 and 2005 surveys



These dimensions correspond to the full 2005 database. A table of correspondence is presented below which presents also the mapping with the 1998 data.

Table 1. List of policy areas of 2005 and 1998 surveys

N°	Questions	Titles	Titles	98-05
1	Q1	EXPL_POL	Adoption of explicit policy for regulatory reform. ***Figure 1,***	Yes
2	Q2	COHER	Policy coherence integrating competition and market openness ***Figure 2.1-2.2,***	Yes
3	Q3&Q4	CLAR_PROC	Clarity & due process in rule-making procedures ***Figure 8.1-8.2,***	Yes
4	Q5	COMMUNI	Communication of Regulations. Easy Access ***Figure 10,***	Yes
5	Q6&Q7	JUSTIF_ALTER	Provision of justification for regulatory action, search for alternatives ***Figure 11,***	Yes
6	Q8/Q17	COMPL_ENFOR	Compliance, enforcement and judiciary ***Figure 16.1 and figure 6.***	Yes
7	Q10	CONSULT	Consultation processes ***Figure 9,***	Yes
8	Q11	RIA_PROCESS	Assessing the quality of new regulation through RIA 1 ***Figure 12-1, Explicit RIA processes,***	Reduced to 1 var.
9	Q11	RIA_EXTENT	Assessing the quality of new regulation through RIA 2 ***Figure 12-2, Extent of RIA processes***	No
10	Q12	FACIL_LICEN	Facilitating licences, permits and administrative requirements ***Figure 14.1, 14.2,***	Yes
11	Q13&Q20	REDUC_BURD	Reducing and controlling administrative and regulatory burdens ***Figure 13.1, 13.2, 13.3,***	Yes
12	Q14	TRAINING	Training in regulatory quality skills ***Figure 7.2,***	Yes
13	Q15	INSTIT_CAP	Institutional capacity for managing regulatory reform ***Figure 3.2,***	Yes
14	Q16	PARLIAM	Parliamentary oversight of regulatory policy ***Figure 5,***	No
15	Q18	LEVEL_GVT	Multi-level co-ordination mechanisms for regulatory policy ***Figure 4,***	No
16	Q19	REVIEW-EVAL	Dynamic process of evaluation and update of regulations ***Figure 15.1, 15.2***	Yes

Note: all figure numbers are from the publication Jacobzone *et al.* (2007b).

The 2005 data was linked to the 1998 data, albeit for a more limited number of variables. In the 1998 data sets, the parliamentary aspects, multi level regulatory governance were not addressed. RIA was also analysed in a way that does not offer the possibility of constructing two separate variables, as the details on the extent of the tests involved in the RIA processes are missing As a result, three policy areas do not appear in 1998 and the 1998 data covers 13 dimensions for 27 countries.[1] Data in 2005 was also often richer and more detailed for the same variables. As a result, for many of the existing dimensions, the composite indicators that are linked for 1998 and 2005 are constructed on a sub-set of data. Therefore, three data sets will be considered for the analysis:

- the ***full 2005 database*** (2005 data);
- the ***2005 linked database*** (sub-set of the 2005 database that is linked to the 1998 data);
- the ***1998 database*** (1998 data).

The main element of the grouping above is to present together meaningful dimensions of regulatory policy, building on the previous analysis (Jacobzone, 2007b). The steps that will be followed for the purpose of mapping of these dimensions involve:

- an overview of the correlation between the variables;
- a discussion and interpretation of the results from the principal component analysis. The presentation includes technical aspects as well as a policy-oriented discussion of the results.

Analysis of the correlation between the variables

A detailed analysis of correlation is a prerequisite for performing factor analysis. The results generally show that about 85% of the time, the correlations are positive (see Tables A1.1, A1.2, A.3, Correlations). This means that countries which perform well for one category of systems of for regulatory management are more likely to perform well for others as well.

Strong correlation appears between Institutional Capacity and the existence of a formal regulatory policy. These are also linked to training, compliance and enforcement, as well as the structure and extent of the RIA process. This is consistent with the OECD analysis and message that the role of Regulatory Oversight Bodies is crucial to ensure core aspects of regulatory quality, including regulatory impact analysis. A number of variables are also related that touch upon processes for preparing new regulations. These include consultation, which is closely related to the search for alternatives, as well as RIA and mechanisms for co-ordination across levels of government. Similarly communications in terms of easy access to regulations is linked to clarity and due process in regulatory procedures, as well as to alternatives. These variables link core aspects of a high quality regulation framework, with tools such as RIA, easy access to regulation through communication with capacity for high quality regulation with a central oversight body, training and co-ordination across levels of government.

The aspects on facilitating licences and permits, which reflect administrative simplification policies, tend to not be correlated with other elements. They are even sometimes slightly negatively correlated with consultation, training or clarity and due process, which will be explained by further analysis. Policies for burden measurement and reduction are weakly but positively correlated to facilitating licences and permits and are positively correlated to all variables which distinguish them from the other administrative simplification policies.

The variables on policy coherence, linking regulatory policy and management to other policy areas in terms of competition and trade, are only related to rule making procedures but not to the other aspects.

The patterns are generally confirmed in the 2005 linked dataset, which is a subset of the above, even if there are slightly stronger negative correlations at times. For 1998, things are slightly different. The main patterns involve links between the variables focused on the processes for preparing new regulations, (consultation, justification and alternatives, RIA) and variables such as communication and easy access to regulations, as well as institutional capacity and training. The variables on policy coherence and explicit regulatory policy were less strongly linked then, except with institutional capacity. The facilitation of licences and permits was positively correlated with clarity and due process, and more strongly and negatively correlated then with compliance, enforcement and policy coherence. These results will be understood better in the context of the graphical depiction below. Burden reduction was also a policy area not correlated with others. At that time, policies for review evaluation and update were more closely related to RIA, institutional capacity, as well as to consultation, clarity and due process as well as communication and easy access. This may also reflect the specific emphasis in earlier days of regulatory reform on stocktaking and full reviews of the regulatory stock, as experienced by a number of countries.

The principal component approach

Number of Principal Components retained

The factor analysis involves a Principal Component Approach (PCA). The variables that reflect the various policy areas are first evaluated according to their contribution to the overall variance in the data, and then grouped according to each of the principal components. One of the key aspects is to understand how many principal components can help structure the dataset. Since the 16 variables are combined to a smaller number of principal components, this will reduce the information, while offering the benefit of some form of tractable analysis. Therefore there is a trade-off between obtaining a parsimonious and easily interpretable dataset on the one hand and saving as much information as possible on the other hand.

The amount of additional information provided by a principal component equals the percentage of the datasets total variance explained by this component. This percentage in turn depends on what is called the Eigenvalue.[2] The principal components are therefore numbered in descending order according to their Eigenvalues. A standard approach is to keep all principle components with Eigenvalues above 1, which in the current case in all the factor analysis for the first four components. These four components will be used when computing aggregate composites for the purpose of regressions.

Another criterion is also the share of the total variance explained and also in relation to the policy relevance of the principal component. Under this approach, the first four components represent approximately two third of the total variance of the dataset in each of the analyses, while the first two already include close to half of the total variance (Table 2 below). More detailed descriptive analysis will therefore be undertaken on the first two components below.

Table 2. Eigenvalue and share of total variance explained by the principal components

2005 data				2005 linked data			
Principal component	**Eigen value**	**Percentage of variance explained**	**Total cumulated percentage of variance explained**	**Principal component**	**Eigen value**	**Percentage of variance explained**	**Total cumulated percentage of variance explained**
1	5.98	37.4	37.4	1	3.69	28.4	28.4
2	1.85	11.5	48.9	2	2.24	17.3	45.6
3	1.65	10.3	59.2	3	1.48	11.4	57.0
4	1.17	7.3	66.5	4	1.25	9.6	66.6

1998 data			
Principal component	**Eigen value**	**Percentage of variance explained**	**Total cumulated percentage of variance explained**
1	4.37	33.6	33.6
2	1.87	14.4	48.0
3	1.38	10.7	58.7
4	1.19	9.1	67.8

Regulatory Policy Management in 2005: two core dimensions

This section describes and interprets the principal components, which were retained for the purpose of the PCA. The focus is on the first two components since they are more easily interpretable and contain the most information. The full first four components are presented in the Annex (Tables A1.4, A.1.5, A.1.6) The goal is to provide some relevant policy oriented interpretation of the information provided by the components. The variables that contribute strongly to the construction of each principal component will be listed together with their relative contributions.

The results of the correlations can help anticipate the patterns derived from the PCA. These show a clear link between the different dimensions of regulation. Generally countries strongly involved in certain areas of regulation also tend to be strongly involved in others. For example countries providing formal training programs for regulation skills are also much more likely to conduct regulatory impact analysis and have strong capacity for regulatory reform. There is a group of regulatory indicators for which such a mutually supportive dynamic is especially strong. This group includes such areas as:

- the existence of procedures for communicating regulations;
- conducting of regulatory impact analysis;
- having a dedicated body for promoting regulatory policy;
- providing training in regulatory skills;
- the existence of formal mechanisms for intergovernmental co-ordination.

These are related to the existence of strong regulatory institutions and tools as well as regulatory capacity building. The strong positive correlations among these regulatory indicators as well as their positive correlations with the other indicators lead to the hypothesis that there may be positive externalities linked to setting up an effective institutional framework for regulation and developing tools and capacities for good regulation. All of this is reflected in the first axis of the analysis.

First component: Institution, Tool Capacity Building (ITC QREG)

The first component driven by the Factor Analysis was named Institution, Tool and Capacity building (ITC QREG), as this generic term reflects the contribution of the key variables of quality regulation to this axis. This component regroups the variables that are closely related, and may provide overlapping information, into single principal components

The variables that contribute strongly to the construction of each principal component are listed together with their relative contributions that are expressed in terms of co-ordinates in the table below. The *contribution* concerns the percentage that a certain variable contributes to the construction of a component. The *co-ordinates* concern whether a variable correlates positively or negatively with a principal component. A stronger positive correlation will translate into numerically higher positive co-ordinates.

This first component represents 37% of the total variance, showing the importance of these grouped variables. This is consistent with [2]what is known among statisticians as the "Gutman effect". In a dataset where mainly positive correlations exist among variables, the first principal component will often represent these correlations. This means that the variables which are most strongly positively related with the dataset will have the strongest contributions to the principal component and that all variables are going to have positive co-ordinates, as is the case with the current dataset.

This is the first and most significant principal component. It explains more than a third of the total variance, *i.e.* the information within the dataset. This component provides further evidence on the importance of what has been noted as part of the correlation analysis: the mutually supportive dimensions of a strategy for regulatory quality, mainly focused on setting up an appropriate institutional framework and assessing the quality of new regulations through appropriate tools. "ITC Q REG effect" (see correlation analysis). The variables below relate to RIA, consultation, institutional and parliamentary oversight, multi level aspects and procedures. The variables that form the core of this "IT effect"[3] are the ones contributing most strongly to the construction of this component. Since they all have positive co-ordinates, the countries that appear on the positive side of this axis will be those that have most widely adopted such practices.

Table 3. Component 1 – "Institution, Tool, Capacity Building", 2005 data

Variable		Contribution	Co-ordinates
RIA_EXTENT	Assessing the quality of new regulation through RIA (extent of coverage)	11.8	0.84
JUSTIF_ALTER	Provision of justification for regulatory action, search for alternatives	10.1	0.78
LEVEL_GVT	Multi-level co-ordination mechanisms for regulatory policy	9.2	0.74
RIA_PROCESS	Assessing the quality of new regulation through RIA (RIA process)	8.5	0.72
COMPL_ENFOR	Compliance, enforcement and judiciary	8.4	0.71
TRAINING	Training in regulatory quality skills	8.3	0.7
INSTIT_CAP	Institutional capacity for managing regulatory reform	8.2	0.7
CONSULT	consultation	6.7	0.64
PARLIAM	Parliamentary oversight of regulatory policy	6	0.6
CLAR_PROC	Clarity & due process in rule-making procedures	5.7	0.58
REVIEW_EVAL	Dynamic process of evaluation and update of regulations	5.7	0.58
COMMUNI	Communication of Regulations. (easy access)	5.4	0.57

Note: See full detail of the axis in Table A1.4. The contribution is the percentage of the variance explained. The coordinate corresponds to the factor loading.

Second Component – Stock Oriented Strategies, Simplification (SOSS)

The second component produced by the Factor Analysis represents in turn only 11.5% of the total variance. The variables that are positively correlated with this component involve "Facilitating Licences and Permits", "Explicit Regulatory Policy", "Evaluation Review and Update" and "Burden Reduction" to a lesser extent. This is consistent with corrective strategies aimed at administrative simplification, burden reduction and ex post review of regulations. These policies are also often supported by explicit policies for regulatory reform and administrative simplification.

However, some variables contribute negatively to this axis, including "Policy Coherence" and "Clarity and due process". This may only reflect that those countries with a key emphasis on simplification, evaluation review and burden reduction, may also at the same time have less integrated regulatory policies, and less attention to due process. More detailed analysis of the variables with negative co-ordinates on this axis also involve communication and easy access to regulations, search of alternatives, consultation, extent of RIA processes and training. Clearly this means that countries that may be located on the positive side of this axis SOSS, may have less developed strategies for regulatory quality in terms of their new regulations, reflecting maybe a different stage in regulatory reform.

Table 4. Component 2 – Stock Oriented Strategies, Simplification (SOSS), 2005 data

Variable		Contribution	Co-ordinates
FACIL_ LICEN	Facilitating licences, permits and administrative requirements	28.5	0.73
COHER	Policy coherence integrating competition and market openness	12.9	-0.49
CLAR_ PROC	Clarity & due process in rule-making procedures	12.6	-0.48
EXPL_ POL	Adoption of explicit policy for regulatory reform.	10.2	0.43
REVIEW_ EVAL	Dynamic process of evaluation and update of regulations	9.9	0.43
REDUC_ BURD	Reducing and controlling administrative and regulatory burdens	9.7	0.42

Note: See full detail of the axis in Table A1.4. The contribution is the percentage of the variance explained. The coordinate corresponds to the factor loading.

These results show that in 2005 two very different approaches to regulation were chosen by OECD countries, with countries focused on capacity, ex ante assessment and consultation on the one side, and other countries focusing more on simplification and burden reduction strategies. This will serve when mapping groups of countries through the factor plans, with the next step of the analysis below.

Complementary elements from the 2005 reduced sample

The results are consistent with the full sample, even if they are slightly less clear cut, with a first axis mainly structured around alternatives (19.6%), RIA (16.4%), clarity and due process (13.8%), communication and easy access to regulations (9.2%), policy coherence (8.8%). This time the review and evaluation, also comes in (7.6%), with institutional capacity (7.4%) and training (6%). The message remains therefore broadly the same (see Table A1.5 for full details).

Similarly the second axis involves an explicit regulatory policy (22.4%), facilitating licences and permits (20%), policy coherence (10.7%), institutional capacity (8.5%), and burden reduction (6.6%). However in this 2005 linked sample fewer questions were available on burden reduction, as they are consistent with the 1998 questionnaire. The fact that institutional capacity and policy coherence appear positively is dimmed by the fact that consultation (6.8%), training (14.3%), and communication and easy access to regulation (6.7%) all appear negatively correlated with this axis. It is still mainly consistent with a focus on regulations ex post, with a strong policy, but a less clear cut strategy for the rest.

Regulatory Policy Management in 1998: broadly similar patterns

In the 1998 data, the first axis represented a third of total variance (33.6%), and the second about a seventh (14.4%). The first component is still consistent with an "Institution, Tool, Capacity Building Effect". The variables are all positively correlated and supportive, including RIA, consultation, training, institutional capacity, clarity and due process and communication. The only major difference is the fact that the "Review evaluation and update" of regulation had a much greater contribution to this axis, reflecting perhaps the fact, that, in early steps of regulatory reform, this wider emphasis on the review of the stock and update was part of the core general strategy (see Table A1.6 for full details).

Table 5. Component 1 – "Institution, Tool, Capacity Building", 1998 data

Variable		Contribution	Co-ordinates
RIA	Regulatory Impact Analysis	15.7	0.83
JUSTIF_ ALTER	Provision of justification for regulatory action, search for alternatives	14.9	0.81
REVIEW_ EVAL	Dynamic process of evaluation and update of regulations	13.8	0.78
CONSULT	Consultation	12.5	0.74
TRAINING	Training in regulatory quality skills	12.4	0.74
CLAR_ PROC	Clarity & due process in rule-making procedures	10.9	0.69
COMMUNI	Communication of Regulations. (easy access)	8.8	0.62
INSTIT_ CAP	Institutional capacity for managing regulatory reform	7.2	0.56

Note: See full detail of the axis in Table A1.6. The contribution is the percentage of the variance explained. The coordinate corresponds to the factor loading.

However, the patterns are slightly different in terms of the second axis. The burden reduction variable is below the 5% contribution threshold. The main variable is the "facilitating licences" variable, which has the strongest contribution, and is also positively correlated with due process. The second contribution, corresponds to compliance and enforcement, and is negatively correlated with the former. The main conclusion is that this axis is still weakly consistent with a focus on administrative simplification, but that the countries which are strong in terms of efforts to facilitate licences and permits are also scoring less well in terms of policy coherence.

Table 6. Component 2 – Administrative simplification, due process 1998 data

Variable		Contribution	Co-ordinates
FACIL_ LICEN	Facilitating licences, permits and administrative requirements	36.6	-0.83
COMPL_ ENFOR	Compliance and Enforcement	29.8	+0.75
CLAR_ PROC	Clarity & due process in rule-making procedures	11.2	-0.46
COHER	Policy coherence integrating competition and market openness	5.5	+0.32

Note: See full detail of the axis in Table A1.6. The contribution is the percentage of the variance explained. The coordinate corresponds to the factor loading. The graphical depiction was inverted for the second axis, so that the countries in the upper part of the chart do reflect higher scores on the variables for facilitating licences.

Typologies of country approaches to regulatory quality in 1998 and 2005

The principal components identified by the can be represented in a graphical way as axes. When combining two principal components using one as the horizontal axis and the other as the vertical axis one obtains a two-dimensional *factor plan*. The countries can then be projected onto the plan. This allows one to see the countries characteristics, as measured by the two principal making up the factor plan. The factor analysis also provides the co-ordinates of the countries against those axes. As a result, it helps to identify a typology, grouping countries according to their relative approaches towards regulatory reform. The analysis will first proceed with the 1998 data, before turning to 2005, and drawing the lessons from countries move and progress over the period.

1998: early patterns of regulatory reform adoption

The factor plan presented below corresponds to 45%, approximately half, of the total variance of the sample. The horizontal axis represents the first principal component, which mainly measures the existence of the mutually supportive institutions tools and capacity building measures, as described above. The vertical axis represents the second principal component and displays countries with administrative simplification efforts, on the top, as the side above is positively correlated with facilitating licences and permits.[4]

Countries have been grouped in three main groups. The *GROUP A*, with the United States, Korea and Canada, is the further on the right, in terms of the extent of use of regulatory quality tools and institutional capacity for regulatory reform. It only has moderate exposure in the second dimension, in terms of facilitating licences and permits. The *GROUP B* involves Australia, and New Zealand, which are also positively on the first axis, but with much less emphasis on these tools for simplification, and more attention to compliance and policy coherence. The *GROUP C* involves countries which had very limited adoption of regulatory reform tools and institutions in these early days, and also with fewer initiatives for licences and permits (Belgium, France, Ireland, Japan, Czech Republic).

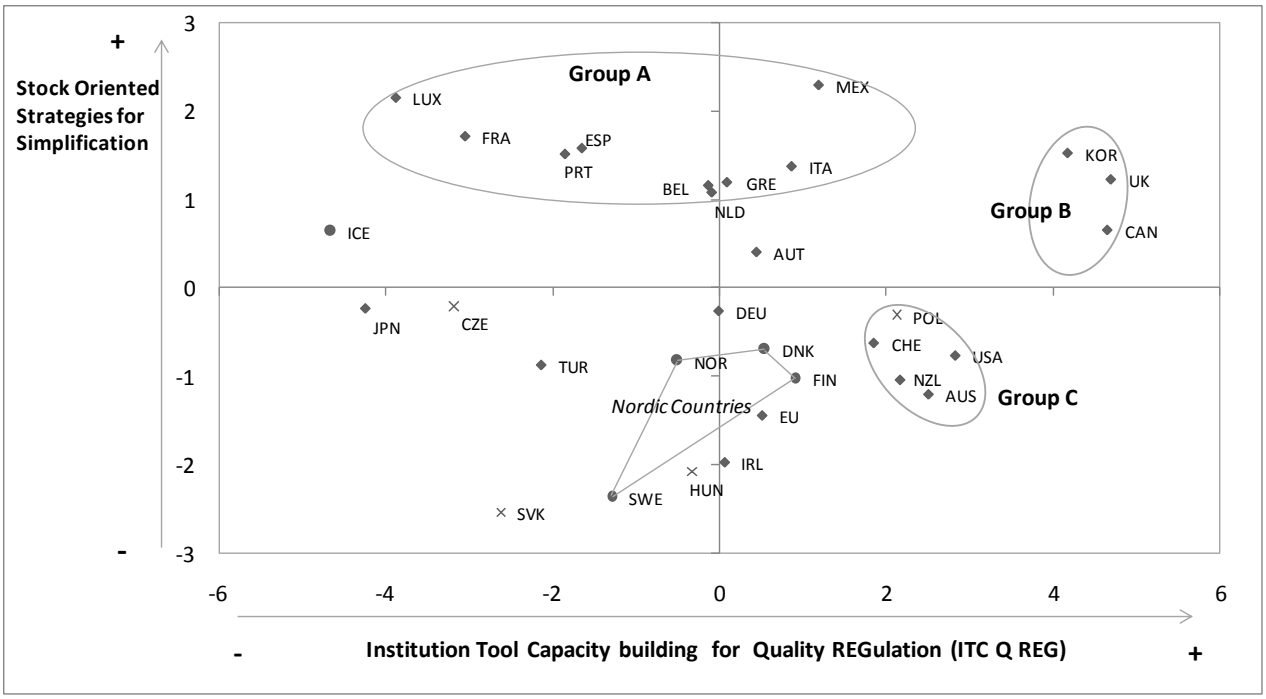
Otherwise, a set of Mediterranean countries tends to show a significant reliance to simplification, with less use of other regulatory quality tools (Italy, Portugal and Spain, and even less so for Greece in those years). Finland and Hungary stand out for their initiatives for facilitating licences and clarity and due process together with some adoption of regulatory quality tools. Many other countries, including Norway, Sweden, the Netherlands, and Germany were in the centre of the factor plan, which would be closer to the OECD average at that time. Switzerland, Mexico or the UK were also slightly more advanced on the first axis.

Figure 2. Cross country Patterns of regulatory management strategies in 1998

In 2005, the first axis has broadly a similar significance, but with more variables contributing to an enhanced notion of capacity building and tools. The second axis is also clearer cut, in terms of combining administrative simplification and burden reduction strategies.

Three main groups have been identified. *GROUP B* involves Canada, Korea, but with the UK this time. This group is the most advanced on the first axis, in terms of recourse to regulatory quality tools and institutional set up, while also developing policies for administrative simplification and burden reduction. *GROUP C*, including the United States, Australia, New Zealand, as well as Poland and Switzerland, is relatively advanced in terms of use of regulatory quality tools, RIA, consultation, but is not prone to the use of administrative simplification strategies and burden reduction. *GROUP A* on the contrary involves a larger set of countries that have adopted a strategy for regulatory reform clearly aimed at simplification, including Mediterranean countries, France, Italy, Spain, Portugal and Greece. Mexico is also in this group and is slightly more advanced in terms of regulatory quality tools, mainly due to its adoption of RIA. The positive side of this axis also involves less policy coherence and less clarity in rule making procedures, which may also reflect some of the fragmented nature of regulatory policy in some of these countries. Luxembourg is in this group the country with less recourse to tools and institutional set up.

Figure 3. Cross country patterns of regulatory management strategies in 2005



Apart from these main groups, Iceland is overall the country that had less developed regulatory quality tools and institutions, below Luxembourg. The new EU countries, including the Slovak Republic, the Czech Republic and Hungary also tended to have less developed quality tools on average, while this was not the case for Finland, and also to rely comparatively less on administrative simplification and burden reduction.

However, this second axis is also negatively correlated with coherence and clarity in rule making procedures. This implies that the countries that are below on this axis do in fact score high on coherence and clarity in rule making procedures, while those on the top may not. This may also explain why Nordic countries, such as Sweden, first, but also Finland, Norway and Denmark, all score high in the bottom, which can also positively reflect their search for coherence and clarity, given their consensus driven culture. Germany was very close to OECD average in that 2005 year.

These results show interesting trends between 1998 and 2005, in terms of countries developing and implementing various aspects of regulatory reform, strengthening their regulatory management systems framework. This overview will now be complemented by a set of correlations assessing the links between overall regulatory management policies, as well as main policies as expressed through the first two components of these factor analyses, in relation to external factors and data measuring governance, quality of doing business framework, product market regulation and competitiveness.

II. TESTING HOMOGENEITY AND CONSISTENTY OF REGULATORY MANAGEMENT SYSTEM INDICATORS WITH EXTERNAL INDICES

This section will rely on results from the previous section to analyse the correlations and links between the OECD RMS indicators and external available indices. This involves correlation analysis in order to assess the robustness of the RMS indicators and the strength and direction of possible linear relationships between the RMS and other external indices. Identifying associations between these indicators can improve understanding of how various dimensions of regulatory management systems quality can relate to externally measured features of competitiveness, quality of doing business environment or governance. The section will briefly introduce the indicators used for the analysis, both in terms of OECD and external indicators, before turning to the results from correlation tests.

The indicators used for the correlations

External indicators

The current choice of indicators selected below is the result of a selection based on the availability of these indicators and their relevance to the issue of regulatory quality management. Given some of the international debates in the field, it does not imply either a positive or negative judgement on the intrinsic value of these data in the perspective of good governance and development. Simply, those indicators exist and are widely used. Therefore, they are a reference for policy assessment in a number of countries. In some cases, as they rely on perception surveys, they may be felt as less "robust" than some of the OECD indicators, which are reflecting institutional features. However, they are also addressing some of the dimensions that are of importance for policy makers, as they also relate to outcomes, or results, either in a way that reflects business perceptions, or some more simple but objective measures of regulatory burdens, such as the number of days to open a business.

The data used for the correlations include the following set of external indicators:

Doing Business Indicator (DBI)

The Doing Business database is managed by the World Bank[5] and provides objective measures of business regulations and their enforcement, based on surveys from experts and private sector consultants around the world. The database is structured along a number of core dimensions illustrating the regulatory costs of business. The 2005 edition includes a methodological note on the construction (measuring with impact), showing their filiations with some early work of De Soto *The Other Path*, on a time and motion study to show the obstacles to establishing a business in Peru. These dimensions may have varied over the years. In 2005, this study covered 145 countries, and was structured across the issues of:

- starting a business;
- hiring and firing workers;
- registering property;
- getting credit;
- protecting investors;
- enforcing contracts;
- closing a business.

These data have often had a significant impact on the domestic debates in many countries. Many of the countries' efforts at cutting red tape have been sometimes related to some of the dimensions illustrated in that work. More details can be found in Annex.

The data used for the OECD study involve the aggregate overall score, the dimension 1, with its sub-categories on procedures, time, the dimension 2 on dealing with licences, including number of procedures and days, the employing of workers overall rank (dimension 3), the registration of property (dimension 4), and the closing of a business (dimension 10).

Table 7. Doing Business indicators for the correlations (DB)

DB05 **(-)**	Ease of doing business rank in 2005
DB05_SB **(-)**	DB05 : Starting a business rank
DB05_SBProcedures **(-)**	DB05 : Starting a business (Number of procedures)
DB05_SBTime **(-)**	DB05 : Starting a business (Time in days)
DB05_DL **(-)**	DB05 : Dealing with licences rank
DB05_DLProcedures **(-)**	DB05 : Dealing with licences (Number of procedures)
DB05_DLTime **(-)**	DB05 : Dealing with licences (Time in days)
DB05_EW **(-)**	DB05 : Employing workers rank
DB05_RP **(-)**	DB05 : Registering property rank
DB05_CB **(-)**	DB05 : Closing a business rank

Note: (-) = Lower the better (+) = Higher the better.

These indicators are, to some extent, complementary to OECD RMS indicators. For instance, through "dealing with licences", the DB indicator determines if the regulatory environment promotes the operation of business. Licences are assessed by the RMS in the context of how much efforts government are making for reducing and streamlining them.

Global Competitiveness Index (GCI)

The World Economic Forum publishes annually the Global Competitiveness Report which includes the *Global Competitiveness Index*[6] to measure the group of institutions, policies and factors that are thought to encourage sustainable current and medium-term levels of economic prosperity. This index is very broad and it includes over 90 variables, of which two thirds come from the Executive Opinion Survey and one third comes from publicly available sources. The Executive Opinion Survey relies on a network of private sector executives which provides perception data on the quality of the business environment.

The correlations have included the main general competitiveness index, which is a composite of many dimensions. The analysis also included the score and rank on institutions, the sub-index on burden of government regulation, as part of "government inefficiency", as measured by the executive opinion survey. It also includes the pillar on market efficiency, with the corresponding score, which reflects product market competition among others, and the sub-index on the efficiency of the legal framework, including the settlement of disputes and the challenge of government actions and/or regulations.

Table 8. Global Competitiveness Indicators for the correlations (GCI)

GCI05 (-)	Global competitiveness index rank in 2005
GCI05_Institutions (+)	GCI05 Score : Institutions
RGCI05_I (-)	Rank of GCI05_Institutions
GCI05_Inst_Burden (+)	GCI05 Score : Institutions > Burden of government regulation
RGCI05_IB (-)	Rank of GCI05_Inst_Burden
GCI05_Markets (+)	GCI05 Score : Market efficiency
RGCI05_M (-)	Rank of GCI05_Markets
GCI05_Mar_Legalframe (+)	GCI05 Score : Market efficiency > Efficiency of legal framework
RGCI05_ML (-)	Rank of GCI05_Mar_Legalframe

(-) = Lower the better. (+) = Higher the better.

This Global Competitiveness Indicator provides information about the capacity of regulatory systems to promote private sector development, and to promote or inhibit competition. It also reflects a private sector perspective based on perception data.

Worldwide Governance Indicators (WGI)

The World Bank Worldwide Governance Indicators is a research project covering 212 countries over the period 1996-2007. It covers six dimensions of governance, with a set of aggregated indicators (Kaufmann *et al.*, 2008). This includes the process according to which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them.

The governance indicators reflect the statistical compilation of responses on the quality of governance given by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries (35 data sources by 32 organisations). The individual data sources underlying the aggregate indicators are drawn from heterogeneous survey institutes, think tanks, non-governmental organisations, and international organisations.

For the purpose of the correlation, a general aggregate was built by summing up the various dimensions. The level of aggregation of the full governance index makes it very general. Contrary to some other scores, these scores reflect a higher performance when the levels are higher. The dimensions considered for the OECD analysis include the Government Effectiveness, Regulatory Quality, the Rule of Law and the Control of Corruption. The aggregation into these various dimensions is obtained by an unobserved component model, based on underlying characteristics which are assumed to contribute to these dimensions. The mixed nature of the various inputs renders difficult a full and direct tracking of the sources to the results.

Table 9. World Governance Indicators for the correlations (WGI)

WGI_total (+)	World governance index
WGI_GE (+)	WGI : Government Effectiveness
WGI_RQ (+)	WGI : Regulatory Quality
WGI_RL (+)	WGI : Rule of Law
WGI_CC (+)	WGI : Control of Corruption

(-) = Lower the better. (+) = Higher the better

The WGI are considered as a way to quantify some dimensions of governance that are relevant from the perspective of regulatory quality. They are therefore related to Regulatory Management Systems which provides indications on countries practices in relations to established OECD guidelines for quality regulation and performance. The correlation will provide insights as to how the two approaches can be related. It could be expected that good regulatory management practices could contribute to the quality of the institutional framework, even measured through more indirect and statistical methods.

OECD Product Market regulation indicator (PMR) and Regulatory Reform Index (REGREF)

The OECD indicators of Product Market Regulation (PMR) provide a comprehensive and internationally comparable set of indicators that measure the degree to which policies promote or inhibit competition in product markets. Until now, they measure the regulatory and market environments in OECD countries in 1998 and 2003 and are consistent across time.

The analysis has selected the overall indicator, in terms of product market regulation, as well as the sub-index on Barriers to Entrepreneurship, which relates to licences permits, communication and simplification of rules and procedures, administrative burdens for corporations, for sole proprietor firms and for specific sectors, antitrust exemptions and legal barriers, as well as the administrative burdens on start-ups.

Table 10. Global Competitiveness Indicators for the correlations (GCI)

PMR (-)	Product Market Regulation Indicator
PMR_BE (-)	PMR : Barriers to entrepreneurship
REGREF (-)	Regulatory Reform Indicator

Note: (-) = Lower the better, (+) = Higher the better.

The OECD REGREF indicator examines regulatory reforms of member countries annually over the period 1975-2003 for 21 OECD countries measuring restrictions on competition and private governance. More specifically, this indicator summarises information on regulatory conditions, such as entry barriers, public ownership, market structure, price control and vertical integration, in seven non-manufacturing sectors: airlines, telecoms, electricity, gas, post, rail, and road freight. It is on a scale of 0 to 6 (from least to most restrictive), and is the only OECD indicator of regulation with such an extensive time-series component.

Both PMR and REGREF indicators provide information about the capacity of regulatory systems to promote private sector development, and to promote or inhibit competition. They are built on similar principles as the OECD indicators of regulatory management systems, but their coverage of economic issues is different, broader for PMR, more specific for REGREF with the advantage of the yearly availability. These indices are important since they have also been statistically found to be significant for economic growth and productivity (Conway *et al*., 2006) in a number of OECD economic studies.[7] Hence, if the RMS indicators, or some of their component are statistically correlated to these indices, they can also be expected to have a positive impact on economic growth, and broader economic outcomes.

OECD Regulatory Management System Indicators

The OECD indicators involve a set of four indicators. The first two are the value of the countries co-ordinates on the first two axes. A high value will involve a country placed on the right side of the charts above, with either a high use of tools, institutions for quality regulation, or a more intensive approach to stock burden reduction (as in the 2005 data). In addition, two other indicators have been computed. The first is a simple average of the various 13-16 dimensions of regulatory management system quality analysed above. Each of the indicators is computed with the full 2005 sample, the 2005 sample restricted to the linked data and the 1998 sample.

Table 11. OECD Indicators of Regulatory Management Systems

RMS1 RMS2	Indices which are calculated from the co-ordinates of the projections of the countries positions on the first two components of the Principal Component Analysis RMS1 = ITCQ REG RMS2 = Stock Oriented Strategies, Simplification
Ind_av	Naïve aggregated index, by simple average of the 13 or 16 variables
Ind_ag	Index aggregated using the weights given to each variable by the Principal Component Analysis:
05	Broad 2005 sample
05lk	Linked reduced 2005 sample
98	1998 data sample.

The second is a more elaborated indicator built using weights derived from the Principal Component Analysis (See detailed method in Annex). In fact, the two indicators built with weighted averages or with equal weights are relatively similar. The first wave of the Product Market Regulation Indicators constructed by the Economics Department in 2003 used weights from Principal Component Analysis (Conway and Nicoletti, 2003) while some of the recent updates have limited themselves to simple average weighted composites (Wölfl A. *et al*., 2009).

Results from the correlations

Correlation tests are performed to quantify the relationship between the various sets of indicators presented above and the family of RMS indicators. The correlations are using Spearman correlations tests, as the scale of ranks is ordinal and which present the interesting statistical property of allowing testing for correlations of ranks, which simplifies the approach when various indicators are constructed through different techniques. In addition, this offers a test of sensitivity, with a P Value shown in the tables in Annex. A P Value of less than 0.10 (0.05) means that the correlations are significant at a threshold of 10% (respectively 5%) (see Tables A1.7, A1.8, A1.9, A.10 in the Annex).

Doing Business

The results of the correlations with the Doing Business indicators are available for 2005 data only (Table A1.7). They show that at an aggregate level, the main indicator that is positively correlated with the Ease of Doing Business in general is the RMS1, or ITQ REG, which is a composite involving the use of Institutions, Tools and Capacity Building for Quality regulation, including also consultation and RIA. This core dimension reflects the thrust of the message of the OECD principles for quality regulation and performance, in terms of regulatory management. Whether for the full sample, or the restricted sample (RMS105lk), the correlation is significant and with the expected sign (negative, as to facilitate the Ease of Doing Business). However, this is not the case for the aggregated indicators, which include many other dimensions of regulatory quality.

The correlation is also significant, and with the wrong sign with regards to the second dimension of regulatory management system, in terms of burden reduction. However, this needs to be interpreted with caution: countries that have identified themselves as investing strongly in this dimension are active in rolling out simplification programmes and cutting licences and permits. Generally, these countries, where this activity is a priority, have made a diagnostic which acknowledges the fact that regulatory burdens hinder their business activity, and that they need to take steps to reduce these burdens. Therefore, the correlation could also imply that those countries with relatively more significant regulatory burdens are also those which are pushing their regulatory management system quality efforts towards administrative simplification and burden reduction.[8]

The other correlations found with doing business involves correlations with the expected sign for ITCQ REG (RMS 1), in terms of reducing the time to start a business, or dealing with licences, or even employing workers. No correlation is found for closing a business. The same effect is found for the administrative simplification policies (RMS2) concerning the registration of property.

Global Competitiveness Index (GCI)

The results of the correlations with the GCI index exist for 1998 and 2005 data. Some correlations are found, with the expected sign, for the global competitiveness index for 1998; and its component for institutions (Table 12). However, the only RMS indicator for which this is true is for the first component, with the ITC QREG effect. Correlations are negative but not significant with the aggregate indicators. A slight negative correlation is also found with the second component, in terms of administrative simplification and due process.

Table 12. Correlations of OECD RMS with World Bank Doing Business indicators

	RMS1_98	RMS2_98	IND_AV98	IND_AG98
GCI98	**-0.42****	**-0.37***	-0.22	-0.21
GCI98	0.03	0.06	0.28	0.29
	27	27	27	27
GCI98_IN	**-0.35***	-0.14	-0.13	-0.13
GCI98_Institutions	0.07	0.48	0.51	0.53
	27	27	27	27

The results of the correlations for the 2005 data show the correlations with the expected sign only in terms of market efficiency and for the first ITC Q REG of the OECD indicators of regulatory management system's quality (Table A1.8). No effects are found with the aggregate or the second component with the full data set. The second component with the linked data reflects correlations with the wrong sign, confirming some of the points made above concerning doing business indicators.

Worldwide Governance Indicators (WGI)

The results of the correlations with the worldwide governance indicators are available for 1998 and 2005 data (Tables A1.9 and A1.10). Almost no correlation is found in the 1998 samples, except between the subcomponent of the worldwide governance indicators on regulatory quality and the RMS1, which reflects the ITC QREG effect. However, no correlations exist in the 2005 sample, except for correlations with the wrong sign with RMS2, but only with its component computed with linked data. There, the parsimony of the data available to compute this second component may require caution before further interpretation.

Overall these results may bear on the relatively abstract nature of the WGI indicators, which are computed through rather aggregate econometric methods and are more difficult to rely to concrete dimensions of regulatory governance and management.

OECD Product Market Regulation and REGREF Indicators

The correlations can be computed with the 1998 PMR and REGREF indicators (Table 13 below). Significant negative correlations, hence with the expected sign, are found both with the aggregate indicators as well as the first component (RMS1), ITC Q REG effect, with the REGREF indicator. This indicator is very important since it has been found in econometric regressions to be statistically significant in terms of contributing to increasing long term economic growth. Expected correlations are also found but only with the RMS1, main ITC Q REG effect with the overall PMR indicator for 1998 as well as its component on Barriers to entrepreneurship. For the first time here, the second component of the RMS data, RMS2, in terms of administrative simplification, was also correlated with lower product market competition barriers in 1998.

Table 13. Correlations of OECD RMS indicators with PMR and REGREF indicators 1998

	RMS1_98	RMS2_98	IND_AV98	IND_AG98
PMR_98	-0.38*	-0.50***	-0.23	-0.22
PMR_98	0.05	0.01	0.24	0.27
	27	27	27	27
PMR_BE98	-0.35*	-0.28	-0.24	-0.23
PMR_Barriers to Entrepreneurship 98	0.07	0.16	0.23	0.26
	27	27	27	27
REGREF_98	-0.46*	0.09	-0.52**	-0.51**
REGREF_98	0.06	0.72	0.03	0.03
	18	18	18	18

Some effects in terms of 2005 data are also found but they are less clear cut (Table 14 below). A strong and significant correlation is found for the indicators computed on the linked data only with the REGREF indicator. The RMS1, first component, is generally not significant this time. However, negative effects, with the wrong sign are again to be found with the indicator reflecting administrative simplification policies. This could be consistent with some of the findings presented above in terms of the significance of administrative simplification policies. It should also be pointed that technically the PMR indicators relate to 2003 data while the second RMS data point is for 2005.

RMS of year 2005 (RMS05) is only statistically correlated to REGREF indicator. The tested version of the GCI, WGI are DBI indicators correspond to year 2005. However, PMR and REGREF indicator are just available to 2003, so this table must be read carefully. Even if the information collected through 2005 survey is not statistically significant with most of the external indicators, its relation with GCI, DBI and PMR has the expected sign.

The RMS linked indicator links 1998 and 2005 survey data, as it was explained in the first section of this report (see Table 1). This indicator is statistically correlated to GCI, DBI, PMR and REGREF indicators, and has the expected. RMS overall indicator is constructed by estimating a wide average of 1998 and 2005 datasets. The correlation test indicates that it is statistically correlated with REGREF indicators. The coefficients signs are the expected, except for WGI. The RMS linked and the RMS overall cover a longer period and are tested with the 2003 or 2005 waves of the external indicators depending on their availability.

Table 14. Correlations of OECD RMS indicators with PMR and REGREF Indicators 2005

	RMS1_05	RMS2_05	IND_AV05	IND_AG05	RMS1_05lk	RMS2_05lk	IND_AV05lk	IND_AG05lk
PMR_03	-0.20	0.27	-0.06	-0.03	-0.22	**0.43****	-0.03	-0.01
PMR_03	0.30	0.15	0.75	0.86	0.28	0.02	0.89	0.96
	30	30	30	30	27	27	27	27
PMR_BE03	-0.20	**0.36****	-0.04	-0.02	-0.25	**0.47****	-0.02	-0.01
PMR_Barriers to Entrepreneurship 03	0.29	0.05	0.83	0.92	0.20	0.01	0.92	0.98
	30	30	30	30	27	27	27	27
REGREF_05	-0.23	0.01	-0.31	-0.28	-0.35	-0.22	**-0.44***	**-0.44***
REGREF_05	0.32	0.95	0.17	0.22	0.16	0.38	0.06	0.07
	21	21	21	21	18	18	18	18

Finally, the additional point can be made that closer insights into the data tends to show that Mexico and Turkey rank well according to the RMS indicators while they score less favourably on the WBI. GCI and PMR indicators. Repeating the one-tailed correlation test excluding these two countries leads to a significant correlation between the RMS indicators and all other indicators except the WGI.

Dynamic correlations with OECD Product Market Regulation and REGREF Indicators

The results for the variable RMS2, which embodies administrative simplification and burden reduction policies were slightly puzzling from a cross sectional perspective. Many countries are cutting red tape in order to improve their competitiveness. However, those countries which make the most efforts may not, at a given point in time, get the best marks in terms of ease of doing business or impediments to product market competition. For this reason, a dynamic perspective will be adopted to relate changes in variables of competitiveness or restrictions to market competition, and intensity of country efforts over this second dimension of the factor analysis, which reflects simplification and burden reduction policies.

Among the indicators available, the OECD product market regulation indicator and the REGREF variable are the most consistent over time, given the methodological stability to construct them. The other external indicators have been subject to some slight methodological change over time, which makes them irrelevant for dynamic analysis. For this reason, the analysis will focus on this section on the REGREF variable and the product market regulation indicator, with the restriction that REGREF is available for slightly less countries, and that the trend measured covers in fact a shorter time period 1998-2003.

Graphical depictions in Annex tend to show some significant correlations between reductions in the REGREF indicator, showing greater market competition, between 1998 and 2005, in relation either to the level of the efforts at the end of the period (RMS2-05) or at the beginning (RMS2-98). The correlations are less pronounced for product market regulation, with the caveat of a slightly different time period (see Annex Figure 1 trends in product market regulation and administrative simplification policies).

This is also confirmed when analysing the significance of the correlation analysis, through bilateral linear regressions (Table 15 below). The slopes are always negative and highly significant with REGREF, explaining up to 30% of the variance with the 2005 dimension, and still negative, but less significant with the PMR indicator, explaining between 3 and 9% of the variance. Additional correlations on the sub-index on Barriers to Entrepreneurship of the OPMR indicator yield slightly more pronounced results than the overall PMR indicator.

Table 15. Correlations between changes in REGREF and Product Market Regulation and administrative simplification policies

	RMS2_05	RMS2_05lk	RMS2_98
SLOPREG	-0.52** (-2.66) R-sq: 27.3%	-0.61*** (-3.383) R-sq: 37.6%	-0.35 (-1.63) R-sq: 12.4%
SLOPPMR	-0.16 (-0.83) R-sq: 2.6%	-0.28 (-1.47) R-sq: 8%	-0.29 (-1.52) R-sq: 8.5%
SLOPPMRBE	-0.24 (-1.29) R-sq: 6.1%	-0.23 (-1.21) R-sq: 5.6%	-0.27 (-1.41) R-sq: 7.4%

These represent encouraging signals for countries involved in efforts aimed at improving the stock of their existing regulations and cutting red tape. These efforts are consistent with an increase in regulatory quality as measured through these other measures. It shows that these efforts may help to reduce impediments to market competition and regulatory reform, as measured in terms of the REGREF and PMR variables, which in turn in the long run will improve economic growth. This outcome deserves to be explored in more detail as a follow up to the regression analysis presented in this version of the note.

III. ASSESSING THE IMPACT OF SYSTEMS FOR THE MANAGEMENT OF REGULATORY QUALITY FOR ECONOMIC GROWTH

Overview

This analytical work[9] is designed to assess the relevance of regulatory management indicators for economic policy. Regulatory management systems indicators have been constructed to reflect compliance with good OECD principles for regulatory quality and performance. Therefore, a key issue is to assess whether improvements in regulatory quality may influence macro-economic performance.

While quantifying the link between performance and regulatory quality involves significant technical challenges, this report provides a first econometric attempt at quantifying the impact of improvements in the RMS on a number of macro-economic outcomes. The analysis and methodology is constrained by a paucity of observations, as only two waves of the RMS data were available until now.

The results of the regressions are suggestive but they need to be considered with caution due to the paucity of data. Movement toward best-practice in the RMS unambiguously corresponds to improved economic performance, along any of the dimensions that are measured. As a further robustness check, the same regressions were run with the established Product Market Regulation (PMR) indicators, corroborating inferences regarding the RMS. The apparent link between improved regulatory quality and economic outcomes captured in these simple econometric models also highlights the value of the current RMS survey being collected in 2008. With each additional year of survey data, the econometric possibilities expand.

The analysis will first introduce the empirical model and strategies pursued, before turning to the variables used to measure economic performance and the indicators of regulation and the results of the regressions. All figures and tables are presented in Annex A1.

The modelling strategy

The modelling strategy uses the indicators of the Quality of Regulatory Management Systems, as single aggregate variables. Existing models at the OECD have used the REGREF/PMR indicators to establish a significant link between regulation and economic performance. The less frequent incidence of the RMS indicators precludes their application in the model estimated with REGREF/PMR and glossed in Box 2. Therefore, the econometric methods and specification are simplified and modified as appropriate to fit the current context and data constraints.

In trying to isolate the impact of improvements in regulatory quality, *per se*, on economic performance, it is important to control for factors that are unobserved or not measured by the econometrician but correlated with both a country's regulatory stance and labour productivity. Cross-country heterogeneity has presented a significant obstacle to researchers seeking to quantify the link between performance and different aspects of regulation, both inside the OECD and out. In most cases, researchers are constrained by having a purely cross-sectional indicator that captures variation across countries only for a single year. In a cross-sectional regression of performance on regulatory stance, the coefficient on regulatory stance could absorb spurious idiosyncrasies across countries, and in the cross-sectional context, fixed effects to control for this heterogeneity cannot be used. A large part of the achievement in the previous OECD study (Conway *et al.,* 2006) is the construction of a time series beginning in the mid 1970s with the REGREF data for a cross-section of countries, permitting use of a panel data methods, and particularly, inclusion of fixed effects to control for persistent, unobserved individual heterogeneity across countries.

Box 2. The productivity growth "catch-up" model

The model of the previous OECD study (Conway, *et al*., 2006) uses the framework of *Aghion and Howitt* (2005) to relate labour productivity growth in a given country to productivity growth of the leader country as well as the difference in productivity levels between the country and the leader. Positive productivity shocks in the technology leader may stimulate growth in other countries, while "catch-up" suggests that countries situated at a greater distance from the productivity frontier would have greater scope for productivity improvements.

The previous study introduced the REGREF indicators into the *Aghion and Howitt* model to examine how regulation and institutions might affect productivity growth, both directly, and indirectly by affecting the speed at which countries catch up to the productivity leader.

$$\Delta \ln LP = \delta(\Delta \ln LP_{leader}) + \sigma(TechGap) + \gamma PMR + \alpha(PMR * TechGap) + \sum \beta X + \mu$$

where LP denotes labour productivity, TechGap is the 'technological gap', and PMR denotes the appropriate indicator of product market regulation. X contains various control variables. Country, time, and industry-specific fixed effects are included to account for unobserved factors affecting productivity growth. Reflecting data availability, the model is estimated for a panel of 20 OECD countries over the period 1978 to 2003.

In the current RMS context, a proper time-series with yearly data is not available. Nonetheless, the empirical strategy will be to construct a panel, making use of the limited time-series available The RMS indicators are extended through time in two ways. First, a panel with time dimension T = 2 is created using the Regulatory Quality Indicators that are available on a similar basis between the 1998 and 2005 survey waves. Second, linear interpolation is performed on the RMS indicators from the 1998 and 2005 survey waves to "fill-in" otherwise unmeasured regulatory quality between these years. Linear interpolation requires the strong assumption that movement over time in regulatory stance follows a linear path, but has the advantage of yielding additional years of data, bringing the total to T = 7 years. Using either the T = 2 or the T = 7 panels, since all variables vary over time, the model may be estimated using panel data methods, such as Fixed or Random Effects, to control for unobserved individual heterogeneity. The econometric difference and the relative significance of fixed versus random effects are explained in the Annex.

A very simple model of performance outcome as a function of the relevant RMS indicator is estimated using both fixed and random effects:

$$Performance_{it} = \alpha + \beta(RMS)_{it} + \varepsilon_{it}$$

where *i* indexes countries, and *t* indexes years, and the error is treated differently, according to the fixed or random effects context. Both methods may be considered to control for unobserved individual heterogeneity, so that estimates of the model correspond to a *per se* effect of regulatory quality on performance.

Fixed effects are typically the method of choice to estimate *per se* effects. However, fixed effects are costly in terms of loss of degrees of freedom when the sample is small. In this context, random effects may be more efficient. Random Effects estimation requires the assumption that the unobserved, time constant portion of the error is uncorrelated with all explanatory variables for all periods. This assumption is not likely to pose problems in the current context since no time constant regressors are included in the specification. Random effects have the advantage of being more efficient, allowing identification of the impact of regulation quality on performance with greater precision.[10]

A Hausman specification test is performed to determine the power of Random Effects estimates. This tests the null hypothesis that the time constant component of the error is uncorrelated with all of the explanatory variables at all time periods. Failure to reject the null may mean, *inter alia*, that estimates using Fixed Effects and Random Effects are statistically similar enough that either method may be used to estimate the model.[11]

In both fixed and random effects regressions, the Breusch-Pagan test for heteroskedasticity is performed, and where appropriate, robust standard errors are employed. Additionally, while controlling for possible endogeneity in the link between regulatory quality and performance is beyond the scope of this report, the RMS indicators are lagged by one year, with respect to the performance variables, eliminating the possibility of reverse causality between regulation quality and performance. Given the limited number of observations, the model had to be kept as parsimonious as possible. It includes only the RMS indicator on the right hand side as exogenous variables. This is in fact not too problematic, since fixed or alternatively random effects will control for all other unobserved differences across countries that impact performance.

Finally, each regression is re-estimated using the PMR indicators in place of the RMS indicators. To the extent that the PMR indicators have been found to be significant in explaining economic performance in more sophisticated, structural models, confirmation of the RMS results with the PMR indicators strengthens the validity of the RMS estimates.

Data

Dependent Variables

The analysis below will consider four dimensions in terms of performance outcomes:

1. Total employment

The numbers of workers here are compiled with sample household surveys for all OECD countries except for the United States where the source is the establishment survey. Total employment is defined as the sum of civilian employment and members of the armed forces. Data from 1970 to 2006 were collected from OECD Statistics, ADB database, Economic Outlook No 81.

2. Employment in the business sector

Employment in the business sector is the difference between total employment and employment in the government sector. These data were compiled from OECD Statistics, ADB database, *Economic Outlook* No. 81 for 1970 to 2006.

3. GDP, business sector

GDP volume in the business sector is calculated by subtracting the value added of the government sector from total GDP. GDP was converted to a common currency using purchasing power parities (PPP) for base year 2000 to make comparison across countries and time possible. The data were collected from OECD Statistics, ADB database, *Economic Outlook* No. 81 for 1970 to 2006.

4. Labour productivity, business sector

Labour productivity for the business sector is defined as output per unit of labour input minus the contribution of the government sector. These data are derived from OECD Statistics, ADB database, Economic Outlook No 81 and are calculated as the ratio of GDP to total employment in the business sector.

Exogenous variables of regulatory management quality

Two sets of variables are used in the regressions:

1. Regulatory management system indicators (RMS)

The regressions make use of RMS indicators from the 1998 and 2005 surveys These indicators reflects compliance with OECD good practice for regulatory management system's quality, through a number of components. The regressions were done using aggregate indicators covering all policy areas, or sub-indexes mainly through the first (RMS1) and second component (RMS2) of the principal component analysis. The aggregation is either done through a simple additive aggregate (RMS_av),[12] or an aggregate based on the weights of the Principal Component Analysis (RMS_ag). RMS1 reflects institutions, tools and processes for quality regulation (ITC Q REG effect). The regressions with the second component RMS2 are less conclusive and are not presented.

In addition, for all specifications, an interpolated version of the RMS is used to cover the entire period 1998 to 2006. This method makes the assumption that, on average and across countries, changes were introduced gradually through the period. This has the econometric advantage of providing a much larger sample of estimates, which helps to confirm the robustness of the coefficients and their validity. They are shown on the right hand side of the tables.

2. Product Market Regulation Indicators (PMR)

The PMR indicator measures the degree to which policies promote or inhibit competition in areas of the product market where competition is thought to be viable. The scale goes from least restrictive (0) to most restrictive (6). These indicators, together with the associated REGREF indicator, have been found in past OECD work to be econometrically significant in terms of economic growth.

Results

Fixed effect regressions

The regression results yield estimates of the impact of regulation management system quality on economic performance measured in terms of total employment, total employment in the business sector, GDP for the business sector and labour productivity. Where the null hypothesis of homoskedasticity was rejected, robust standard errors were used, which is the case for all regressions, except with labour productivity in the business sector as dependent variable. Generalizing across the different performance variables and all specifications, the coefficient on the RMS indicators are of the expected sign and statistically significant across the board. The coefficient on the relevant RMS indicator is significant at either the 5% or the 1% level except in the case of the regression of business sector GDP on RMS1, of the expected sign but not statistically significant, and of total employment on RMS1 and RMS_AV, which are still statistically significant at the 10% level. When the interpolated variables are considered, significance typically improves to attain the 1% level.

See Table A1.11. Fixed effect regressions with RMS1 indicator (simple/Interpol.)

See Table A.1.12. Fixed effect regressions with RMS simple average indicator (simple/Interpol.)

See Table A1.13. Fixed effect regressions with RMS weighted aggregated indicator (simple/Interpol.)

In these regressions, the coefficient on regulatory management quality is positive; an improvement in regulatory quality corresponds to a statistically significant increase in total employment, employment in the business sector, GDP for the business sector, and labor productivity for the labor sector.

Across methods and specifications, the R-square represent the residual share of the total variance in the performance variables that can be explained by the regression on regulatory management system quality indicators. As a result, they are low, but not surprisingly so given the paucity of data.

Random effect regressions

Random effect regressions have also been performed using the interpolated indicators with T = 7. In all regressions other than the regressions of business sector GDP on RMS_AV and RMS_AV, the Hausman accepts the null hypothesis that the individual effects are uncorrelated with the other (RMS) regressors, indicating that the assumptions needed to apply random effects are satisfied, and both fixed effects and random effects estimation produce valid results. This justifies presenting both sets of results in the report. The important element is that coefficient estimates are generally robust across the specifications.

In the random effects regressions, the R-square ranges from 1% to 6%. This is the percentage of the total variance that could be solely explained attributed to differences in regulatory management system quality.

See Table A1.14. Random effect regressions with interpolated RMS1 indicator

See Table A1.15. Random effect regressions with interpolated RMS_av indicator

See Table A1.16. Random effect regressions with interpolated RMS_ag

Product Market Regulation Indicators

Complementary results are obtained from identically specified fixed effects and random effects regressions where the RMS indicators are replaced with the PMR indicator. These regressions use, alternatively, the PMR at two points in time, 1998 and 2003, and the interpolated version.[13] The negative and significant coefficient on the PMR suggests that movement from less to more restrictive product market regulation corresponds to improved performance along these same dimensions. The coefficients are significant in all cases with the interpolated indicators, but only for labour productivity in the non interpolated indicator and fixed effect model. The value of the coefficient is the same for interpolated and simple indicator regressions.

See Table A1.17. Fixed effect regressions with PMR indicator (simple and interpolated)

See Table A1.18. Random effect regressions with interpolated PMR indicator

Summary

Overall, the regressions results yield some estimates of the impact of regulatory management system quality on economic performance, controlling for countries' idiosyncratic characteristics. The results tend to show that, while most of the cross country variance is explained by country specific characteristics, a small share could be attributed to the impact of factors linked to the quality of regulations. While they are not large in magnitude, these effects appear to be significant and systematic. This implies that an improvement in regulatory quality corresponds to a statistically significant increase in total employment, employment in the business sector, GDP for the business sector, and labor productivity for the business sector.

IV. CONCLUSIONS

This report takes a first step forward in using the data of indicators of quality of Regulatory Management Systems for analytical purposes. This follows a three-stage approach. First, a descriptive analysis of the sample was done using Principal Component Analysis. Second, correlations were performed linking information on systems for managing the quality of regulation with a set of other related institutional variables on governance, ease of doing business and regulatory quality itself, from other institutions as well as from the OECD PMR. Third, the RMS indicators together with the other OECD PMR indicators were inserted in an econometric model with a goal of measuring the impact of systems for the management of regulatory quality on economic performance.

The result of the correlations shows that generally the Doing Business, Competitiveness index are correlated with the PMR and REGREF indicators with the expected signs. This might reflect the fact that, when a country has a high-quality regulatory management system, its private sector and competition environments and their business friendliness, as measured by GCI, DBI and PMR indicators, are performing as well. In addition, investment in administrative simplification policies may translate in additional improvements in terms of product market competition, with positive implications for economic growth in the long term.

The correlations are also helpful to guide the econometric analysis. The correlations tend to indicate that both the aggregate indicators, as well as the first component RMS1, with the ITC QREG effect, may be the most relevant and robust RMS indicators to examine the impact of the quality of regulatory management systems in terms of economic growth.

The regression analysis is constrained by the small sample size. Nonetheless, panel regressions were performed, allowing control for idiosyncrasies across countries to isolate the *per se* effect of regulatory management system quality. The results uniformly indicated a significant improvement in economic outcomes (employment, GDP, labour productivity) in response to improvements in of the systems for regulatory management. These results are also consistent with similar regressions using the established PMR.

The finding of a statistically significant, positive link between systems for managing the quality of regulation quality and economic performance suggests that further analysis could be desirable. Each future wave of the survey on regulatory management systems will facilitate and strengthen the analytical base. With proper time series, different and more sophisticated models can be envisaged, in the framework of Aghion and Howitt (2005) to posit labour productivity growth in a given country as a function of productivity growth of the leader country as well as the difference in productivity levels between the country and the leader. The RMS indicators could then be introduced into the Aghion and Howitt model to examine how the systems for managing the quality of regulation might affect productivity growth, both directly, and indirectly by affecting the speed at which countries catch up to the productivity leader.

From a policy standpoint, while the scale and magnitude of the results can be disputed, they provide consistent support for the economic benefits of systems for managing the quality of regulations. They help to quantify some of the short term and long term effects that may occur when countries go through the often painful processes of improving the quality of their regulations. This implies rigor, process, impact assessment and often may be challenging in view of the constrained timing of the political agenda. However, this may also result in an economic environment that is also conducive to the achievement of greater prosperity, thus delivering results for citizens and businesses. The OECD can also add value to national insights through its comparative perspective, taking advantage of the cross country and over time variance that exist through the diversity of institutional and regulatory systems.

NOTES

1. Data are missing in 1998 for Luxembourg, Poland and Slovak Republic.

2. A mathematical term derived from the algebraic operations for calculating the explained variance.

3. As noted before, these are especially *Intergov, RIA, Comm, Cenral* and *Skills.*

4. This was to facilitate the coherence with the presentation of the 2005 results, as in the 2005 results, the variables on facilitating licences and permits, as well as burden reduction, are positively correlated with this axis.

5. See World Bank 2003, 2004, 2005, 2006, 2007, 2008.

6. See World Economic Forum (2007, 2008).

7. For a summary, see OECD (2008).

8. The effects are less clear cut concerning the linked data for the second dimension (RMS205lk), with generally correlations with a positive side, reinforcing the analysis made above. None of the indicators at aggregate level with the linked data only show any relevant correlations. This may reflect the restricted nature of such indicators.

9. This analytical work has been undertaken with the contribution of Prof. Faye Steiner, Economics Department, Stanford University, and Erika Lopez Ponton, University Paris I Sorbonne.

10. This is because random Effects estimation is a GLS (Generalized Least Squares) transformation in which a fraction of the average over time of each variable is subtracted from it. The fraction depends on the variance of the time-varying and time constant error components as well as the number of time periods in the panel. Moreover, there is no loss of degrees of freedom since country fixed effects are not included.

11. Technical details on Fixed and Random Effects can be found in the technical Annex following this report.

12. Now adopted by the Economics Department for its 2007 Survey on Product Market Competition Indicators (see Wölfl A. *et al*., 2009).

13. In the case of the interpolated PMR, T = 5.

BIBLIOGRAPHY

Aghion, P. and P. Howitt, (2005), "Appropriate Growth Policy: A Unifying Framework", Joseph Schumpeter Lecture, *20th Annual Congress of the European Economic Association*, Amsterdam, August.

Conway, P., and G. Nicoletti (2006), "Product Market Regulation in the Non-Manufacturing Sectors of OECD Countries: Measurement and Highlights", *OECD Economics Department Working Paper*, No. 530, OECD, Paris.

Conway, P., D. de Rosa, G. Nicoletti, and F. Steiner (2006), "Regulation, Competition and Productivity Convergence", *OECD Economics Department Working Paper*, No. 509, OECD, Paris.

Conway, P., DeRosa, D., Nicoletti, N., and Steiner, F. (2006), "Product market regulation and productivity convergence", *OECD Economic Studies*, No. 43, 2006/2.

Conway, P., V. Janod, and G. Nicoletti (2005), "Product Market Regulation in OECD Countries, 1998 to 2003", *OECD Economics Department Working Paper*, No. 419, OECD, Paris.

Gust, C., and J. Marquez (2003), "International Comparisons of Productivity Growth: The Role of Information Technology and Regulatory Practices", *Labour Economics, Special Issue on Productivity*, Gilles Saint-Paul (ed.).

Jacobzone, S., Bounds G., Choi C., Miguet C. (2007b), "Regulatory Management Systems Across OECD Countries: Indicators of Recent Achievements and Challenges", *OECD Working Papers on Public Governance*, No. 9, OECD Publishing.

Jacobzone, S., C.W. Choi and C. Miguet. (2007a), "Indicators of Regulatory Management Systems", *OECD Working Papers on Public Governance*, No. 4, OECD Publishing.

Kaufmann D., A. Kray, and M. Mastruzzi (2008), *Governance Matters VII: Aggregate and Invidiual Governance Indicators 1996-2007*.

Lopez-Ponton E., F. Steiner (2008), "Patterns of the Regulatory management System Indictors", prepared for the Organisation for Economic Co-operation and Development (OECD), Regulatory Policy Division, Directorate for Public Governance and Territorial Development, Paris.

Nardo M., M. Saisana, A. Saltelli and S.Tarantolo (2005), *Tools for Composite Indicators Building*, European Commission, Reference EUR 21682EN.

Nardo M., M. Saisana, A. Saltelli, S. Tarantolo, A. Hoffman, and E. Giovannini (2008), *Handbook on constructing composite indicators: Methodology and User Guide*, Joint OECD EC/JRC publication.

Nicoletti, G., and S. Scarpetta (2005), "Regulation and Economic Performance: Product Market Reforms and Productivity in the OECD", *OECD Economics Department Working Paper*, No. 460, OECD, Paris.

OECD (2003), *The Sources of Growth in OECD Countries*, OECD, Paris.

OECD (2005), *OECD Guiding Principles for Regulatory Quality and Performance*, Paris

OECD (2008), *Implementing Regulatory Reform: Building the case through results*, Paris.

Wölfl A., Wanner I., Kozluk T. Nicoletti G. (2009), "Ten Years of Product Market Reform in OECD Countries – Insights from a revised PMR indicator", *OECD Economics Department Working Papers*, No. 695.

World Bank (2004), *Doing Business in 2004*.

World Bank (2005), *Doing Business in 2005*.

World Bank (2006), *Doing Business in 2007.*

World Bank (2007), *Doing Business in 2008.*

World Economic Forum (2006), *The Global Competitiveness Report 2005-06.*

World Economic Forum (2007), *The Global Competitiveness Report 2007-08.*

TABLE OF CONTENTS OF ANNEX A1 TABLES

Table A1.1. 2005 Data Correlation Matrix

Variables	EXPL_POL	COHER	CLAR_PROC	COMMUNI	JUSTIF_ALTER	COMPL_ENFOR	CON-SULT	RIA_PROCESS	RIA_EXTENT	FACIL_LICEN	REDUC_BURD	TRAIN-ING	INSTIT_CAP	PARLIAM	LEVEL_GVT	REVIEW_EVAL
EXPL_POL	1.00	0.03	0.15	0.02	0.27	0.26	-0.03	0.13	0.14	0.25	0.27	0.09	0.61	0.30	0.04	-0.02
COHER	0.03	1.00	0.53	0.22	0.30	0.19	0.06	0.04	0.27	-0.06	0.13	0.31	0.21	0.15	0.20	-0.19
CLAR_PROC	0.15	0.53	1.00	0.55	0.55	0.30	0.26	0.24	0.43	-0.13	-0.02	0.32	0.35	0.45	0.32	0.13
COMMUNI	0.02	0.22	0.55	1.00	0.45	0.31	0.35	0.27	0.42	-0.01	0.18	0.47	0.28	0.05	0.42	0.30
JUSTIF_ALTER	0.27	0.30	0.55	0.45	1.00	0.43	0.46	0.61	0.69	-0.05	0.24	0.52	0.42	0.36	0.43	0.35
COMPL_ENFOR	0.26	0.19	0.30	0.31	0.43	1.00	0.58	0.50	0.54	0.05	0.23	0.33	0.61	0.39	0.44	0.39
CONSULT	-0.03	0.06	0.26	0.35	0.46	0.58	1.00	0.42	0.54	-0.24	0.09	0.30	0.25	0.33	0.52	0.47
RIA_PROCESS	0.13	0.04	0.24	0.27	0.61	0.50	0.42	1.00	0.70	0.18	0.16	0.45	0.43	0.28	0.43	0.61
RIA_EXTENT	0.14	0.27	0.43	0.42	0.69	0.54	0.54	0.70	1.00	-0.20	0.31	0.54	0.51	0.46	0.57	0.43
FACIL_LICEN	0.25	-0.06	-0.13	-0.01	-0.05	0.05	-0.24	0.18	-0.20	1.00	0.24	-0.09	0.21	-0.05	-0.02	0.30
REDUC_BURD	0.27	0.13	-0.02	0.18	0.24	0.23	0.09	0.16	0.31	0.24	1.00	0.26	0.21	0.20	0.36	0.39
TRAINING	0.09	0.31	0.32	0.47	0.52	0.33	0.30	0.45	0.54	-0.09	0.26	1.00	0.51	0.38	0.61	0.29
INSTIT_CAP	0.61	0.21	0.35	0.28	0.42	0.61	0.25	0.43	0.51	0.21	0.21	0.51	1.00	0.49	0.51	0.18
PARLIAM	0.30	0.15	0.45	0.05	0.36	0.39	0.33	0.28	0.46	-0.05	0.20	0.38	0.49	1.00	0.36	0.41
LEVEL_GVT	0.04	0.20	0.32	0.42	0.43	0.44	0.52	0.43	0.57	-0.02	0.36	0.61	0.51	0.36	1.00	0.46
REVIEW_EVAL	-0.02	-0.19	0.13	0.30	0.35	0.39	0.47	0.61	0.43	0.30	0.39	0.29	0.18	0.41	0.46	1.00

Table A1.2. 2005 Linked Data Correlation Matrix

Variables	EXPL_POL	COHER	CLAR_PROC	COMMUNI	JUSTIF_ALTER	COMPL_ENFOR	CONSULT	RIA	FACIL_LICEN	REDUC_BURDEN	TRAINING	INSTIT_CAP	REVIEW_EVAL
EXPL_POL	1.00	0.41	0.23	-0.10	0.28	0.13	-0.16	0.18	0.25	0.31	-0.19	0.53	-0.08
COHER	0.41	1.00	0.44	0.23	0.48	-0.10	-0.03	0.22	0.29	0.28	0.05	0.50	-0.10
CLAR_PROC	0.23	0.44	1.00	0.50	0.50	-0.08	0.06	0.39	-0.10	0.06	0.39	0.34	0.32
COMMUNI	-0.10	0.23	0.50	1.00	0.42	0.06	0.33	0.36	-0.12	0.18	0.33	0.00	0.30
JUSTIF_ALTER	0.28	0.48	0.50	0.42	1.00	0.06	0.26	0.70	-0.05	0.26	0.44	0.27	0.41
COMPL_ENFOR	0.13	-0.10	-0.08	0.06	0.06	1.00	0.18	0.06	0.00	0.15	-0.08	0.01	-0.09
CONSULT	-0.16	-0.03	0.06	0.33	0.26	0.18	1.00	0.20	-0.18	-0.06	0.20	0.27	0.18
RIA	0.18	0.22	0.39	0.36	0.70	0.06	0.20	1.00	0.02	0.24	0.37	0.37	0.52
FACIL_LICEN	0.25	0.29	-0.10	-0.12	-0.05	0.00	-0.18	0.02	1.00	0.42	-0.33	0.17	0.17
REDUC_BURDEN	0.31	0.28	0.06	0.18	0.26	0.15	-0.06	0.24	0.42	1.00	0.02	0.10	0.40
TRAINING	-0.19	0.05	0.39	0.33	0.44	-0.08	0.20	0.37	-0.33	0.02	1.00	0.03	0.23
INSTIT_CAP	0.53	0.50	0.34	0.00	0.27	0.01	0.27	0.37	0.17	0.10	0.03	1.00	0.02
REVIEW_EVAL	-0.08	-0.10	0.32	0.30	0.41	-0.09	0.18	0.52	0.17	0.40	0.23	0.02	1.00

Table A1.3. 1998 Data Correlation Matrix

Variables	EXPL_ POL	COHER	CLAR_ PROC	COMMUN I	JUSTIF_ ALTER	COMPL_ ENFOR	CONSUL T	RIA	FACIL_ LICEN	REDUC_ BURDE N	TRAININ G	INSTIT_ CAP	REVIEW _EVAL
EXPL_POL	1.00	0.23	-0.02	0.07	0.29	-0.06	0.24	0.21	-0.01	0.02	0.30	0.37	0.26
COHER	0.23	1.00	-0.04	0.01	0.11	0.02	-0.04	0.11	-0.25	-0.11	0.18	-0.07	0.10
CLAR_PROC	-0.02	-0.04	1.00	0.47	0.47	-0.18	0.39	0.47	0.40	-0.04	0.50	0.47	0.43
COMMUNI	0.07	0.01	0.47	1.00	0.55	-0.26	0.36	0.40	0.07	-0.02	0.47	0.08	0.40
JUSTIF_ALTER	0.29	0.11	0.47	0.55	1.00	-0.09	0.57	0.71	-0.21	0.11	0.47	0.31	0.52
COMPL_ENFOR	-0.06	0.02	-0.18	-0.26	-0.09	1.00	0.19	0.14	-0.44	0.24	-0.10	0.04	0.06
CONSULT	0.24	-0.04	0.39	0.36	0.57	0.19	1.00	0.58	0.02	0.23	0.48	0.44	0.46
RIA	0.21	0.11	0.47	0.40	0.71	0.14	0.58	1.00	-0.14	0.04	0.54	0.37	0.69
FACIL_LICEN	-0.01	-0.25	0.40	0.07	-0.21	-0.44	0.02	-0.14	1.00	-0.04	0.19	0.16	-0.08
REDUC_BURDE N	0.02	-0.11	-0.04	-0.02	0.11	0.24	0.23	0.04	-0.04	1.00	0.12	0.07	0.01
TRAINING	0.30	0.18	0.50	0.47	0.47	-0.10	0.48	0.54	0.19	0.12	1.00	0.19	0.52
INSTIT_CAP	0.37	-0.07	0.47	0.08	0.31	0.04	0.44	0.37	0.16	0.07	0.19	1.00	0.46
REVIEW_EVAL	0.26	0.10	0.43	0.40	0.52	0.06	0.46	0.69	-0.08	0.01	0.52	0.46	1.00

Table A1.4. Principal components for 2005 data analysis

Variables	_ AXE1 _					_ AXE2 _					_ AXE3 _					_ AXE4 _				
Ident.	COORD	CTR	RCTR	CO2	QLT	COORD	CTR	RCTR	CO2	QLT	COORD	CTR	RCTR	CO2	QLT	COORD	CTR	RCTR	CO2	QLT
EXPL_ POL	0.3	1.5	15	9.1	9.1	0.43	10.2	4	18.9	28	0.67	27.2	1	44.9	72.9	-0.24	4.9	8	5.7	78.6
COHER	0.33	1.8	14	11	11	-0.49	12.9	2	23.7	34.7	0.47	13.6	3	22.4	57.1	0.31	8	5	9.3	66.4
CLAR_ PROC	0.58	5.7	11	34.1	34.1	-0.48	12.6	3	23.2	57.3	0.32	6.3	6	10.4	67.7	0.08	0.5	14	0.6	68.4
COMM UNI	0.57	5.4	12	32.6	32.6	-0.29	4.5	7	8.2	40.8	-0.06	0.2	12	0.3	41.2	0.47	18.6	1	21.7	62.8
JUSTIF_ ALTER	0.78	10.1	2	60.2	60.2	-0.14	1.1	12	2	62.2	0.05	0.1	13	0.2	62.5	0.03	0.1	16	0.1	62.6
COMPL_ ENFOR	0.71	8.4	5	50.5	50.5	0.13	1	13	1.8	52.3	-0.01	0	16	0	52.3	-0.27	6.1	7	7.1	59.4
CONSULT	0.64	6.7	8	40.4	40.4	-0.15	1.2	10	2.3	42.7	-0.45	12.1	5	20	62.6	-0.29	7.2	6	8.4	71
RIA_ PROCESS	0.72	8.5	4	51.1	51.1	0.22	2.7	9	4.9	56.1	-0.27	4.4	7	7.3	63.3	-0.03	0.1	15	0.1	63.5
RIA_ EXTENT	0.84	11.8	1	70.6	70.6	-0.13	0.9	14	1.6	72.3	-0.13	1	11	1.6	73.9	-0.1	0.9	13	1.1	74.9
FACIL_ LICEN	0.02	0	16	0	0	0.73	28.5	1	52.6	52.6	0.19	2.2	8	3.7	56.3	0.42	14.9	3	17.4	73.7
REDUC_ BURD	0.39	2.6	13	15.3	15.3	0.42	9.7	6	18	33.3	0.05	0.1	14	0.2	33.5	0.42	15.3	2	17.8	51.3
TRAIN-ING	0.7	8.3	6	49.6	49.6	-0.15	1.2	11	2.2	51.8	0.03	0.1	15	0.1	51.9	0.2	3.5	9	4.1	56
INSTIT_ CAP	0.7	8.2	7	49	49	0.25	3.3	8	6.1	55.1	0.46	12.8	4	21.1	76.2	-0.2	3.3	10	3.9	80
PARLIAM	0.6	6	9	35.6	35.6	0.08	0.4	15	0.7	36.3	0.17	1.8	10	2.9	39.2	-0.4	13.6	4	15.8	55.1
LEVEL_ GVT	0.74	9.2	3	55	55	-0.01	0	16	0	55	-0.18	1.9	9	3.1	58.1	0.15	1.9	11	2.2	60.3
REVIEW_EV AL	0.58	5.7	10	34.1	34.1	0.43	9.9	5	18.3	52.5	-0.52	16.2	2	26.7	79.2	0.11	1.1	12	1.3	80.4

Table A1.5. Principal components for 2005 linked data analysis

Variables	_ AXE1 _					_ AXE2 _					_ AXE3 _					_ AXE4 _				
Ident.	COORD	CTR	RCTR	CO2	QLT	COORD	CTR	RCTR	CO2	QLT	COORD	CTR	RCTR	CO2	QLT	COORD	CTR	RCTR	CO2	QLT
EXPL_POL	0.36	3.5	10	12.8	12.8	0.71	22.4	1	50.3	63.1	-0.22	3.2	7	4.7	67.8	0.11	1	8	1.3	69.1
COHER	0.57	8.8	5	32.5	32.5	0.49	10.7	4	24	56.5	-0.33	7.4	5	10.9	67.4	-0.18	2.7	5	3.4	70.8
CLAR_PROC	0.71	13.8	3	51	51	-0.1	0.4	11	1	52	-0.28	5.2	6	7.6	59.7	-0.28	6.1	3	7.6	67.2
COMMUNI	0.58	9.2	4	34	34	-0.39	6.7	7	15.1	49.1	0.07	0.3	12	0.5	49.6	0.02	0	12	0.1	49.6
JUSTIF_ALTER	0.85	19.6	1	72.1	72.1	-0.1	0.4	12	0.9	73	-0.03	0	13	0.1	73.1	0.02	0	13	0	73.1
COMPL_ENFOR	0.04	0	13	0.2	0.2	0.06	0.2	13	0.4	0.5	0.13	1.2	9	1.8	2.3	0.81	52.2	1	65.2	67.5
CONSULT	0.31	2.6	11	9.6	9.6	-0.39	6.8	6	15.2	24.8	-0.09	0.5	11	0.8	25.6	0.6	29.2	2	36.5	62.1
RIA	0.78	16.4	2	60.6	60.6	-0.12	0.6	10	1.4	62	0.13	1.2	8	1.8	63.8	0.07	0.3	10	0.4	64.2
FACIL_LICEN	0.08	0.2	12	0.7	0.7	0.67	20	2	44.9	45.7	0.47	14.7	3	21.7	67.3	-0.08	0.5	9	0.6	68
REDUC_BURDEN	0.42	4.8	9	17.7	17.7	0.38	6.6	8	14.7	32.4	0.62	25.9	2	38.2	70.6	0.03	0.1	11	0.1	70.7
TRAINING	0.47	6	8	22.2	22.2	-0.57	14.3	3	32	54.2	-0.12	0.9	10	1.3	55.6	-0.18	2.6	6	3.2	58.8
INSTIT_CAP	0.52	7.4	7	27.3	27.3	0.44	8.5	5	19.1	46.4	-0.42	11.8	4	17.4	63.8	0.22	3.8	4	4.8	68.6
REVIEW_EVAL	0.53	7.6	6	28	28	-0.23	2.3	9	5.3	33.2	0.64	27.6	1	40.7	73.9	-0.13	1.5	7	1.8	75.7

Table A1.6. Principal components for 1998 data analysis

Variables	_ AXE1 _					_ AXE2 _					_ AXE3 _					_ AXE4 _				
Ident.	COORD	CTR	RCTR	CO2	QLT	COORD	CTR	RCTR	CO2	QLT	COORD	CTR	RCTR	CO2	QLT	COORD	CTR	RCTR	CO2	QLT
EXPL_POL	0.38	3.2	9	14.2	14.2	0.18	1.7	8	3.1	17.3	-0.23	3.9	7	5.4	22.7	0.71	42.7	1	50.7	73.4
COHER	0.11	0.3	11	1.1	1.1	0.32	5.5	4	10.3	11.4	-0.69	34	1	47	58.5	0.2	3.4	5	4.1	62.5
CLAR_PROC	0.69	10.9	6	47.6	47.6	-0.46	11.2	3	20.8	68.4	0.13	1.2	10	1.7	70.1	-0.09	0.7	9	0.8	70.9
COMMUNI	0.62	8.8	7	38.6	38.6	-0.27	3.8	6	7.1	45.7	-0.23	3.7	8	5.1	50.8	-0.44	16.2	3	19.3	70.1
JUSTIF_ALTER	0.81	14.9	2	65.1	65.1	0.14	1.1	10	2.1	67.2	-0.15	1.6	9	2.2	69.4	-0.2	3.2	6	3.8	73.2
COMPL_ENFOR	-0.04	0	13	0.2	0.2	0.75	29.8	2	55.6	55.7	0.39	11.2	3	15.5	71.2	-0.06	0.3	10	0.3	71.5
CONSULT	0.74	12.5	4	54.4	54.4	0.17	1.5	9	2.9	57.3	0.31	6.9	5	9.6	66.9	-0.01	0	13	0	66.9
RIA	0.83	15.7	1	68.5	68.5	0.23	2.7	7	5.1	73.6	-0.03	0.1	13	0.1	73.7	-0.13	1.5	7	1.8	75.5
FACIL_LICEN	0.06	0.1	12	0.3	0.3	-0.83	36.6	1	68.3	68.6	0.26	4.7	6	6.5	75.1	0.25	5.3	4	6.3	81.4
REDUC_BURDEN	0.11	0.3	10	1.2	1.2	0.29	4.4	5	8.2	9.4	0.56	22.5	2	31.2	40.6	-0.09	0.7	8	0.8	41.5
TRAINING	0.74	12.4	5	54	54	-0.11	0.7	12	1.3	55.3	-0.13	1.2	11	1.6	57	-0.03	0.1	12	0.1	57.1
INSTIT_CAP	0.56	7.2	8	31.7	31.7	-0.04	0.1	13	0.2	31.8	0.35	8.8	4	12.2	44	0.55	25.7	2	30.5	74.5
REVIEW_EVAL	0.78	13.8	3	60.4	60.4	0.13	1	11	1.8	62.2	-0.05	0.2	12	0.2	62.4	0.04	0.1	11	0.2	62.6

Description of external indicators

Doing Business Indicator (DBI)

The Doing Business database indicates the regulatory costs of business. Economies are ranked on their ease of doing business, from 1 to 175, with first place being the best. In 2008, the aggregate indicator on "Ease of Doing Business" is an average of the country's percentile rankings on the following ten topics:

1. Starting a business: identifies bureaucratic and legal hurdles an entrepreneur must overcome to incorporate and register a new firm.

2. Dealing with licences: tracks the procedures, time, and costs to build a warehouse, including obtaining necessary licences and permits, completing required notifications and inspections, and obtaining utility connections.

3. Employing workers: measures the flexibility of labour regulations.

4. Registering property: examines the steps, time, and cost involved in registering property

5. Getting credit: explores two sets of issues, credit information registries and the effectiveness of collateral and bankruptcy laws in facilitating lending.

6. Protecting investors: measures the strength of minority shareholder protections against misuse of corporate assets by directors for their personal gain.

7. Paying taxes: addresses the taxes and mandatory contributions that a medium-size company must pay or withhold in a given year, as well as measures of administrative burden in paying taxes.

8. Trading across borders: looks at the procedural requirements for exporting and importing a standardised cargo of goods.

9. Enforcing contracts: looks at the efficiency of contract enforcement by following the evolution of a sale of goods dispute and tracking the time, cost, and number of procedures involved from the moment the plaintiff files the lawsuit until actual payment.

10. Closing a business: identifies weaknesses in existing bankruptcy law and the main procedural and administrative bottlenecks in the bankruptcy process.

The methodology has been expanded and adapted over time. Therefore, some of the single scores are not always directly comparable from year to year.

Global Competitiveness Index (GCI)

The variables are organised into 12 pillars in 2008, with each component representing an area considered to be an important determinant of competitiveness:

Basic requirements

1. *Institutions*. This includes public and private institutions. Questions are related to property rights, diversion of public funds, wastefulness of government spending, organised crime, strength of auditing and accounting standards, among other issues.

2. *Infrastructure*. Deals with overall infrastructure quality, telephone lines, among others.

3. *Macroeconomic stability*. Questions are related to government surplus and deficit, inflation, among others.

4. *Health and primary education*. Examines life expectancy, primary enrolment rates among other issues.

Efficiency enhancers

5. *Higher education and training*. Deals with secondary and tertiary enrolment rates, quality of the educational system, among others.

6. *Goods market efficiency*. Questions are related to the extent of staff training, extent and effect of taxation, prevalence of trade barriers, exports, hiring and firing practices, pay and productivity, financial market sophistication, soundness of banks, FDI and technology transfer.

7. *Labour market efficiency*.

8. *Financial market sophistication*.

9. *Technological readiness*. Measures internet users.

10. *Market site*.

Innovation and sophistication factors

11. *Business sophistication*. Questions are related to local supplier quality and quantity, extent of marketing, nature of competitive advantage.

12. *Innovation*. Examine quality of scientific research institutions, company spending on R&D, availability of scientist and engineers, utility patents.

The lower the index, the better the position of a given country around a given indicators. Many of the published sources include a mix of external data, sometimes including OECD sources for OECD countries. A detailed set of data tables presents the underlying data used for the main composite indicator. The methodology again may have changed slightly from year to year, with constant adaptations and improvements.

Worldwide Governance Indicators (WGI)

The indicator is based on sub-indicators that are measured in units ranging from -2.5 to 2.5, with higher values corresponding to better governance outcomes:

- *Government effectiveness:* The quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

- *Regulatory quality*: The ability of the government to formulate and implement sound policies and regulations promoting private sector development.

- *Rule of law:* The extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence.

- *Control of corruption:* The extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

- *Voice and accountability:* The extent to which country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

- *Political stability and absence of violence:* The perceptions of the likelihood that the government will be destabilised or overthrown by unconstitutional or violent means, including domestic violence and terrorism.

Product Market Regulation (PMR) indicator

The OECD indicators of Product Market Regulation (PMR) provide a comprehensive and internationally comparable set of indicators that measure the degree to which policies promote or inhibit competition in areas of the product market where competition is thought to be viable. They measure the regulatory and market environments in OECD countries in 1998 and 2003 and are consistent across time. The PMR indicators summarise a large set of formal rules and regulations that have a bearing on competition in OECD countries. In particular:

- *State control*: Assess the impact of public ownership (through the scope and size of public enterprise sector, and the direct control over business enterprises) and the involvement in business operation (through price controls and use of command and control regulations).

- *Barriers to entrepreneurship*: Licences, permits system, communication and simplification of rules and procedures, administrative burdens for corporations, for sole proprietor firms and for specific sectors, antitrust exemptions and legal barriers measure the regulatory and administrative opacity as well as the administrative burdens on start-ups.

- *Barriers to trade and investment*: Examine foreign ownership barriers, discriminatory procedures, tariffs and other regulatory barriers.

The scale goes from least restrictive (0) to most restrictive (6).

The OECD Regulatory Management System indicator

The Principal Component Analysis allows obtaining some weights for the different categories measuring regulatory quality. The PCA aggregates the 16 (or 13) sub-indicators that are slightly interrelated and correlated. Therefore it reduces the number of sub-indicators, as well as the correlation among the different sub-indicators. These newly created variables are called the principal components. The advantages of using PCA for the construction of a composite indicator are:

- the construction of the composite no longer depends upon the number of dimensions of the dataset but instead upon the broader characteristics of the data itself;
- redundant information is reduced: if for instance two different variables both having a weight of 1 measure the exact same information, these two variables will not receive a total weight of 2 together but instead be weighed together with a weight of 1 by an indicator based on PCA;
- the underlying principle is to account for the highest possible variation in the variables using the smallest possible number of components.

The methodology used is similar to the one described and recommended in the European Commission Paper "Tools for Composite Indicators Building".[1] The construction of the composite indicator was also based on the methodology of the "Handbook on constructing composite indicators".[2]

The first principal components explain a large share of the total variance within the dataset (approximately a third to close to 40% in the current sample). The weights used for constructing the aggregate indicator are based on the first four principal components. The first two of these components are presented in detail in the first section of the note. Characteristics of the components are presented below.

The composite indicator is constructed by using the squared factor loadings, *i.e.* the squared coordinates for each of the variables, measuring regulatory quality. Each variable has a specific factor loading for each component, which is calculated as part of the PCA aggregation procedure. The reason for using squared factor loadings is that they represent the proportion of a components variance (*i.e.* information), which is explained by a specific variable. This procedure permits to retain four factor loadings for each variable, which are used as basic weights. Hence each weight corresponds to the degree that a variable can explain of the information available in the four components that allow for meaningful interpretation.

Final weights for each of the variables measuring the different aspects of high quality regulation are obtained by summing up the four basic weights. Each of the four basic weights for a variable corresponds to the variation of a specific principal component that can be explained by that variable. Therefore the final weight for a variable can be interpreted as the part of the overall meaningful variance, which can be explained by that variable. The preceding procedure gives 16 final weights for the different categories measuring high quality regulation. In order to obtain the final scores for an individual country, each of these 16 weights is multiplied with the country's corresponding score for the category measured by an individual weight and then the weighted scores are added for each country. The sensitivity of the scores obtained can be tested with random weights simulation techniques, called Monte Carlo simulation techniques. This offers a range of uncertainty.

1. "Tools for Composite Indicators Building" by Michela Nardo, Michaela Saisana, Andrea Saltelli and Stefano Tarantolo published by the European Commission 2005 Reference: EUR 21682EN.
2. "Handbook on constructing composite indicators: Methodology and User Guide" by Michela Nardo, Michaela Saisana, Andrea Saltelli and Stefano Tarantola (EC/JRC) and, Anders Hoffman and Enrico Giovannini (OECD).

Table A1.7. Correlations of RMS with World Bank Doing Business Indicators

	RMS1_05	RMS2_05	IND_AV05	IND_AG05	RMS1_05lk	RMS2_05lk	IND_AV05lk	IND_AG05lk
DB05 Ease of doing business rank in 2005	**-0.43**** 0.02 29	0.28 0.14 29	-0.31 0.10 29	-0.29 0.13 29	**-0.38**** 0.05 27	**0.52***** 0.01 27	-0.13 0.52 27	-0.10 0.61 27
DB05_SB DB05 : Starting a business rank	-0.30 0.11 29	0.25 0.18 29	-0.18 0.35 29	-0.15 0.42 29	-0.25 0.21 27	**0.51***** 0.01 27	0.01 0.97 27	0.03 0.87 27
DB05_SBP DB05 : Starting a business (Number of procedures)	-0.24 0.20 29	**0.41**** 0.03 29	-0.11 0.58 29	-0.09 0.63 29	-0.15 0.45 27	**0.66***** 0.00 27	0.14 0.49 27	0.17 0.41 27
DB05_SBT DB05 : Starting a business (Time in days)	**-0.35***** 0.06 29	0.25 0.19 29	-0.25 0.19 29	-0.23 0.23 29	**-0.34*** 0.09 27	**0.35*** 0.08 27	-0.14 0.50 27	-0.11 0.58 27
DB05_DL DB05 : Dealing with licences rank	-0.21 0.28 29	0.04 0.85 29	-0.14 0.46 29	-0.14 0.47 29	-0.21 0.30 27	0.30 0.13 27	-0.07 0.71 27	-0.04 0.85 27
DB05_DLP DB05 : Dealing with licences (Number of procedures)	0.02 0.92 29	-0.07 0.72 29	0.01 0.94 29	0.01 0.97 29	0.00 0.98 27	0.09 0.67 27	0.01 0.97 27	0.03 0.89 27
DB05_DLT DB05 : Dealing with licences (Time in days)	**-0.44**** 0.02 29	0.16 0.40 29	-0.31 0.10 29	-0.31 0.11 29	**-0.46**** 0.01 27	**0.39**** 0.04 27	-0.26 0.18 27	-0.22 0.28 27
DB05_EW DB05 : Employing workers rank	**-0.40**** 0.03 29	0.24 0.21 29	**-0.35*** 0.07 29	**-0.32*** 0.09 29	-0.27 0.18 27	**0.34*** 0.08 27	-0.08 0.68 27	-0.06 0.75 27
DB05_RP DB05 : Registering property rank	-0.25 0.19 29	**0.41**** 0.03 29	-0.13 0.49 29	-0.12 0.52 29	-0.22 0.27 27	**0.35*** 0.07 27	0.01 0.96 27	0.02 0.92 27
DB05_CB DB05 : Closing a business rank	-0.15 0.44 29	0.06 0.76 29	-0.07 0.72 29	-0.07 0.73 29	-0.15 0.46 27	0.30 0.13 27	-0.03 0.87 27	-0.03 0.88 27

Table A1.8. Correlations of OECD RMS with WEF Global Competitiveness Indicators (2005)

	RMS1_05	RMS2_05	IND_AV05	IND_AG05	RMS1_05lk	RMS2_05lk	IND_AV05lk	IND_AG05lk
GCI05	-0.21	0.17	-0.13	-0.11	-0.21	0.32	-0.04	-0.02
Global competitiveness index rank in 2005	0.27	0.37	0.49	0.56	0.30	0.11	0.83	0.93
	30	30	30	30	27	27	27	27
RGCI05_I	-0.14	0.24	-0.04	-0.02	-0.14	**0.53*** **	0.08	0.10
Rank of GCI05_Institutions	0.47	0.21	0.85	0.91	0.49	0.00	0.70	0.61
	30	30	30	30	27	27	27	27
RGCI05_IB	-0.06	0.21	0.06	0.05	-0.06	**0.42****	0.12	0.12
Rank of GCI05_Inst_Burden of government regulation	0.77	0.27	0.77	0.78	0.78	0.03	0.57	0.53
	30	30	30	30	27	27	27	27
RGCI05_M	**-0.37****	0.25	-0.26	-0.23	**-0.37***	**0.44****	-0.15	-0.13
Rank of GCI05_Markets Efficiency	0.04	0.19	0.17	0.22	0.06	0.02	0.45	0.52
	30	30	30	30	27	27	27	27
RGCI05_ME	0.06	0.13	0.14	0.14	0.06	**0.41****	0.22	0.24
Rank of GCI05_Efficiency of Legal Framework	0.77	0.48	0.46	0.47	0.78	0.03	0.27	0.22
	30	30	30	30	27	27	27	27

Table A1.9. Correlations of OECD RMS with World Bank Governance Indicators (2005)

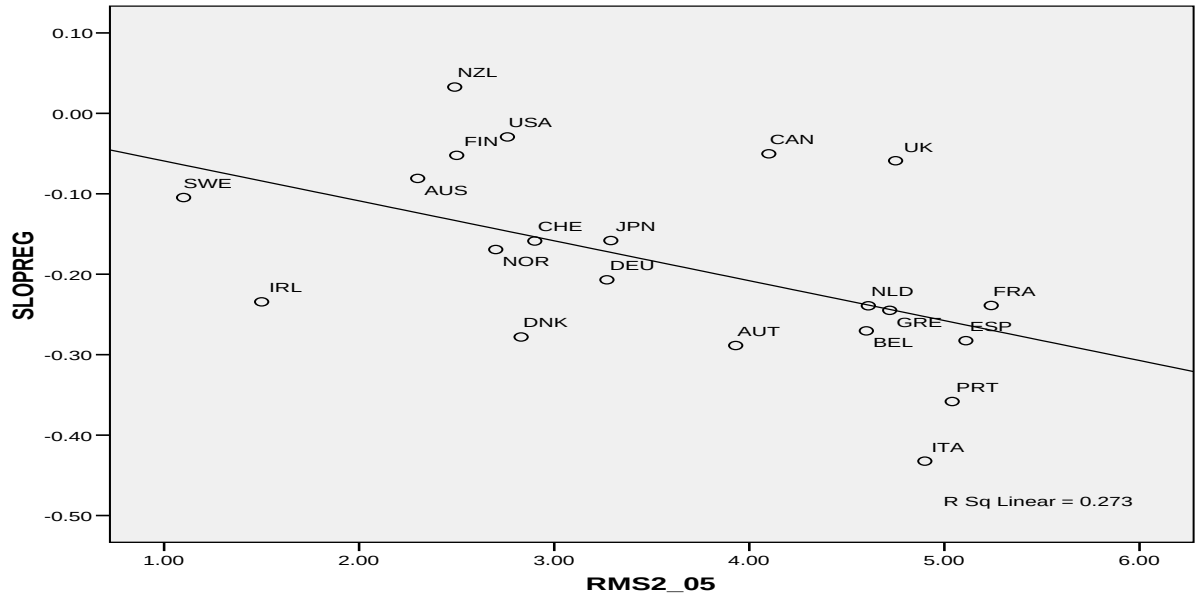
	RMS1_05	RMS2_05	IND_AV05	IND_AG05	RMS1_05lk	RMS2_05lk	IND_AV05lk	IND_AG05lk
WGI05_TO	0.03	-0.27	-0.09	-0.10	0.05	**-0.62*** **	-0.19	-0.21
World governance index in 2005	0.87	0.15	0.65	0.60	0.80	0.00	0.35	0.29
	30	30	30	30	27	27	27	27
WGI05_AV	0.05	-0.20	-0.05	-0.06	0.09	**-0.57*** **	-0.13	-0.15
World governance (average) index in 2005	0.78	0.30	0.78	0.73	0.66	0.00	0.51	0.45
	30	30	30	30	27	27	27	27
WGI_GE05	0.05	-0.18	-0.04	-0.05	0.07	**-0.57*** **	-0.13	-0.15
WGI_Government Effectiveness 05	0.79	0.33	0.84	0.78	0.73	0.00	0.53	0.47
	30	30	30	30	27	27	27	27
WGI_RQ05	0.10	-0.22	-0.03	-0.05	0.16	**-0.52*** **	-0.05	-0.07
WGI_Regulatory Quality 05	0.59	0.24	0.86	0.79	0.43	0.01	0.82	0.75
	30	30	30	30	27	27	27	27
WGI_RL05	0.07	-0.20	-0.02	-0.03	0.09	**-0.58*** **	-0.13	-0.15
WGI_Rule of Law 05	0.72	0.30	0.94	0.88	0.66	0.00	0.52	0.44
	30	30	30	30	27	27	27	27
WGI_CC05	0.12	-0.29	0.01	-0.01	0.07	**-0.60*** **	-0.16	-0.18
WGI_Control of Corruption 05	0.53	0.12	0.98	0.97	0.72	0.00	0.42	0.36
	30	30	30	30	27	27	27	27

Table A1.10. Correlations of OECD RMS with World Bank Governance Indicators (1998)

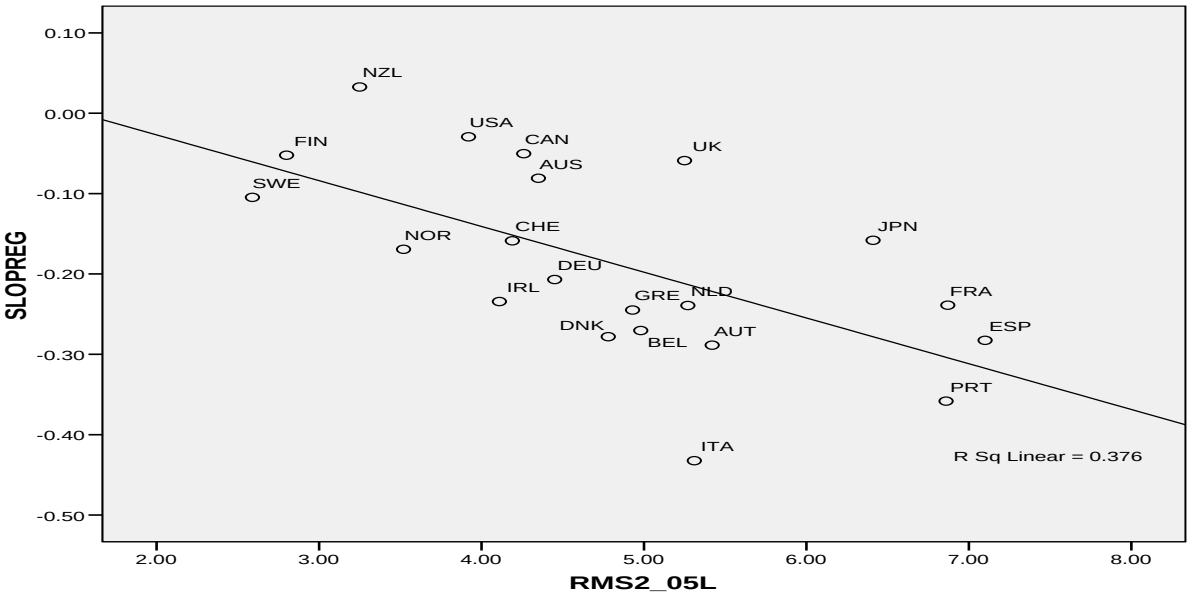
	RMS1_98	RMS2_98	IND_AV98	IND_AG98
WGI98_TO WGI98_TOTAL	0.27 0.17 27	0.22 0.26 27	-0.01 0.98 27	-0.01 0.94 27
WGI98_AV WGI98_AVERAGE	0.30 0.13 27	0.20 0.31 27	0.05 0.81 27	0.04 0.85 27
WGI_GE98 WGI_Government Effectiveness 98	0.16 0.42 27	0.20 0.32 27	-0.04 0.84 27	-0.04 0.84 27
WGI_RQ98 WGI_Regulatory Quality 98	0.35* 0.07 27	0.17 0.39 27	0.13 0.53 27	0.12 0.56 27
WGI_RL98 WGI_Rule of Law 98	0.27 0.18 27	0.21 0.28 27	0.00 0.98 27	-0.01 0.96 27
WGI_CC98 WGI_Control of Corruption 98	0.23 0.24 27	0.15 0.45 27	-0.02 0.91 27	-0.03 0.88 27

Figure A1.1 Trends in Product Market Regulation and Administrative Simplification Policies

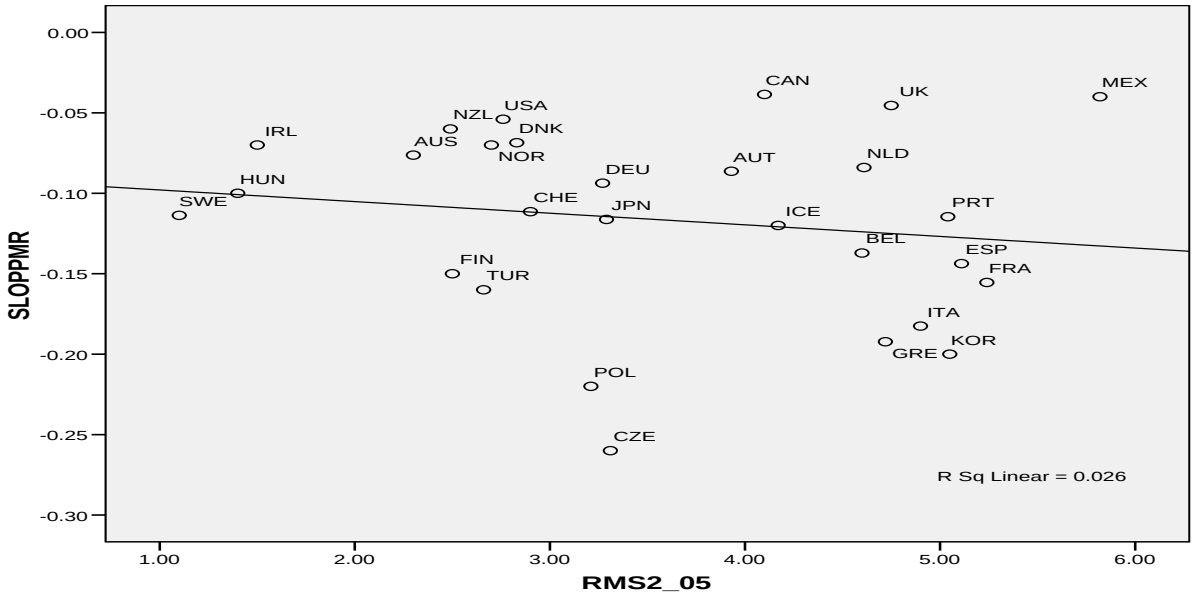
Correlation between trends in REGREF 1998-2005 and RMS2_05 in 2005



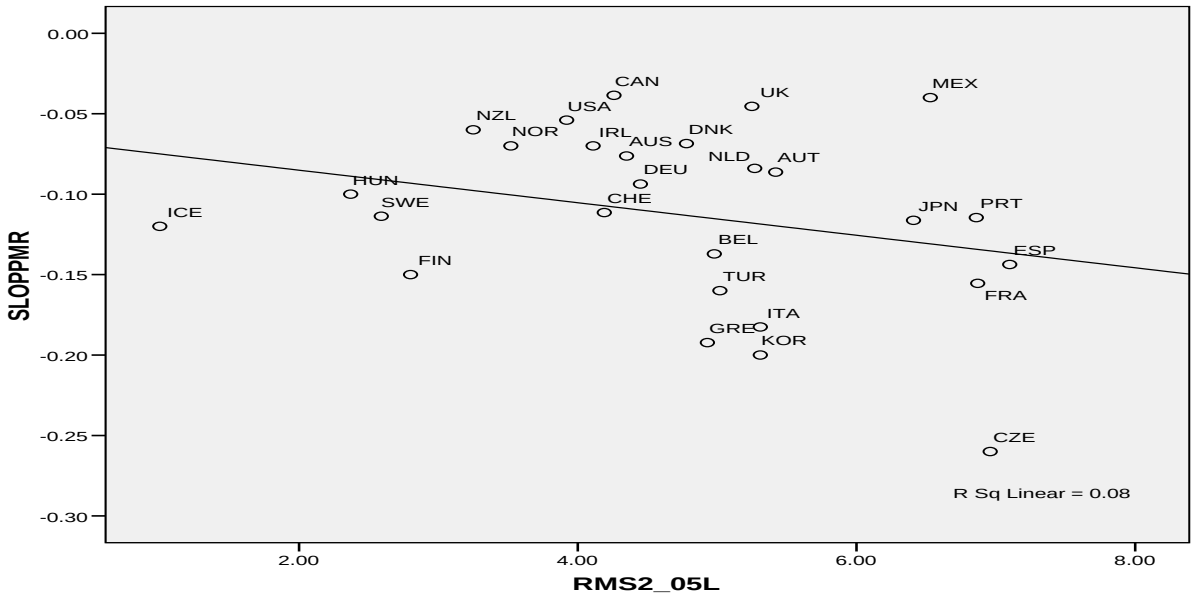
Correlation between trends in REGREF 1998-2005 and RMS2_05 linked data in 2005



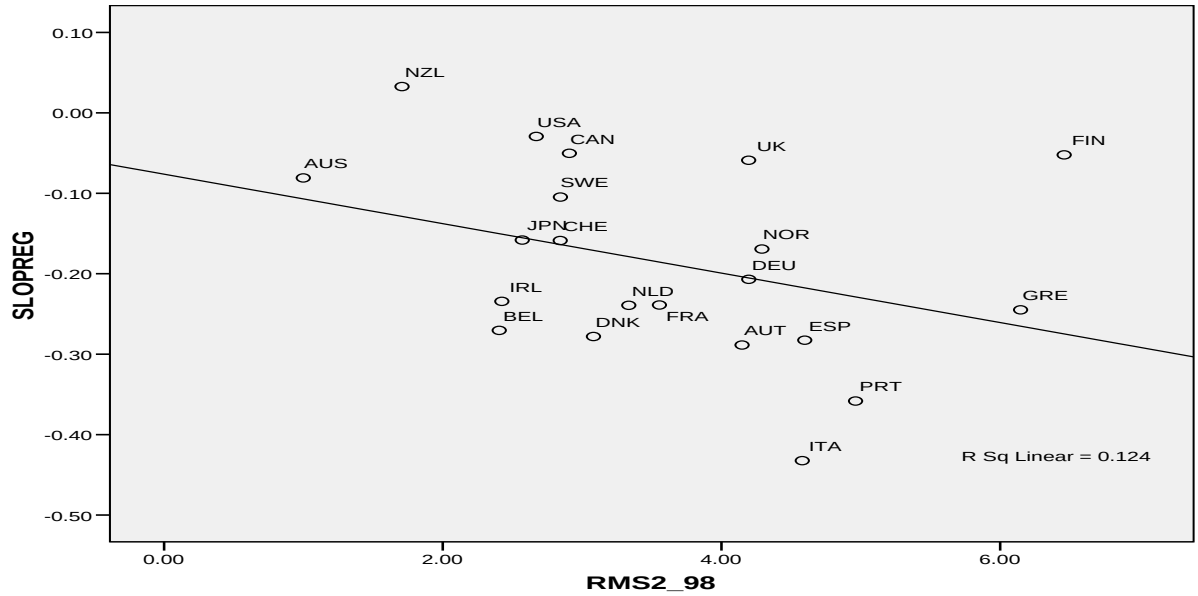
Correlation between trends in Product Market Regulation 1998-2003 and RMS2_05 linked data in 2005



Correlation between trends in Product Market Regulation 1998-2003 and RMS2_05 linked data in 2005



Correlation between trends in REGREF 1998-2005 and RMS2_98 in 1998



Correlation between trends in Product Market Regulation 1998-2005 and RMS2_98 in 1998

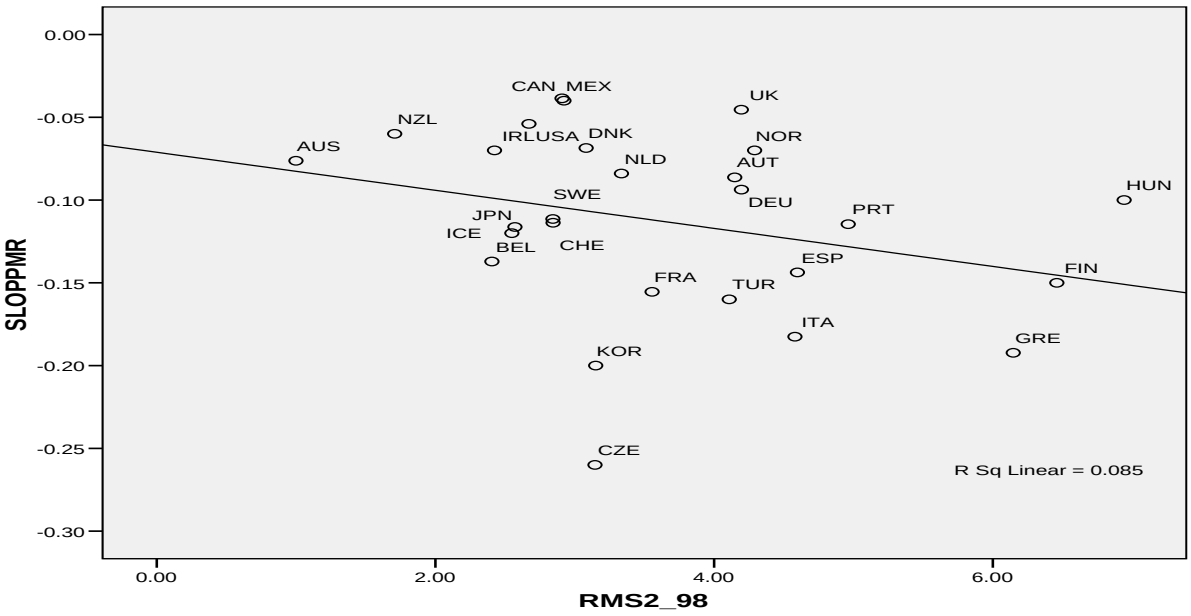


Table A1.11. Fixed effects regressions with RMS1 indicator

					Interpolated indicator			
	Total employment, business sector	**Total employment**	**Gdp, business sector**	**Labour productivity business sector**	**Total employment, Business sector**	**Total employment**	**Gdp, business sector**	**Labour productivity business sector**
RMS[1]	631252.2** (431638.8)	240730.9*** (69421.85)	1.32e+10 (1.09e+10)	0.023677** (0.0114452)	505542.4* (279393.1)	239058.6*** (61215.25)	1.31e+10 (1.04e+10)	0.0239024*** (0.0050503)
Constant	1.51e+07*** (2300224)	1.54e+07*** (369952.4)	6.66e+11*** (5.78e+10)	10.50025 (0.0621939)	1.62e+07*** (1488899)	1.53e+07*** (326219)	6.68e+11*** (5.56e+10)	10.51155*** (0.271418)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RSE[2]	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Heteroskedasticity Test	0.0002	0.0000	0.0000	0.6385	0.0000	0.0000	0.0000	0.8642
Observations	42	42	42	42	168	168	168	168
R-square	0.0550	0.0656	0.0102	0.1763	0.0331	0.0568	0.0107	0.1330

[1] RMS1: 1998 and 2005 (T=2); RMS1 links regulatory institutions and tools; [2] RSE: Robust standard errors, in parentheses where indicated; * significant at 10%; ** significant at 5%; *** significant at 1%

Table A1.12. Fixed effects regressions with RMS simple average indicator

					Interpolated indicator			
	Total employment, business sector	**Total employment**	**GDP, business sector**	**Labour productivity business sector**	**Total employment, business sector**	**Total employment**	**GDP, business sector**	**Labour productivity business sector**
RMS_av[1]	1027860* (593474.2)	401034.9*** (125159.4)	3.64e+10*** (1.26e+10)	0.0311715*** (0.0108126)	801667** (378128.5)	370628.2*** (110182.3)	3.55e+10*** (1.21e+10)	0.0315929*** (0.0048719)
Constant	1.36e+07*** (2803318)	1.48e+07*** (591199.4)	5.64e+11*** (5.95e+10)	10.47919*** (0.052302)	1.51e+07*** (1786117)	1.48e+07*** (520453.9)	5.70e+11*** (5.70e+10)	10.4897*** (0.0232519)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RSE[2]	Yes	Yes	Yes	No	Yes	Yes	Yes	no
Heteroskedasticity Test	0.0014	0.0000	0.0000	0.7025	0.0000	0.0000	0.0000	0.3826
Observations	42	42	42	42	168	168	168	168
R-square	0.1400	0.1748	0.0749	0.2936	0.0802	0.1314	0.0756	0.2236

[1] **RMS_av**: 1998 and 2005 (T=2), [2] RSE: Robust standard errors, in parentheses where indicated
* significant at 10%; ** significant at 5%; *** significant at 1%

Table A1.13. Fixed Effects regressions with RMS weighted aggregated indicator

					Interpolated indicator			
	Total Employment, Business Sector	Total Employment	GDP, Business Sector	Labour Productivity Business sector	Total Employment, Business Sector	Total Employment	GDP, Business Sector	Labour Productivity Business sector
RMS_ag[1]	78542.31** (40906.13)	33006.02*** (10326.82)	3.27e+09** (1.43e+09)	0.0023343*** (0.0007788)	62841.25** (27040.57)	30160.38*** (8970.336)	3.18e+09*** (1.36e+09)	0.0023611*** (0.0003526)
Constant	1.47e+07*** (1931120)	1.51e+07*** (487514.4)	5.81e+11*** (6.73e+10)	10.51623*** (0.384168)	1.59e+07*** (1276547)	1.51e+07*** (423476.8)	5.88e+11*** (6.41e+10)	10.52746*** (0.0169711)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RSE[2]	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Heteroskedasticity Test	0.0053	0.0000	0.0000	0.5822	0.0000	0.0000	0.0000	0.3009
Observations	42	42	42	42	168	168	168	168
R-square	0.1539	0.2229	0.1141	0.3099	0.927	0.1637	0.1144	0.2349

1RMS_ag: 1998-2005 (T=7), 2 RSE: Robust standard errors, in parentheses where indicated
* significant at 10%; ** significant at 5%; *** significant at 1%

Table A1.14. Random Effects regressions with interpolated RMS 1 indicator

	Total employment, business sector	Total employment	GDP, business sector	Labour productivity, business sector
Interpolated RMS[1]	517044.7**	240683.9***	1.39e+10*	0.0236398***
	(225254)	(80486.91)	(1.04e+10)	(0.0049524)
Constant	1.61e+07** (6934662)	1.53e+07** (6092609)	6.64e+11** (3.12e+11)	10.51295*** (0.059611)
Random Effects Test	0.5270	0.7160	0.0409	0.7907
Observations	168	168	168	168
R-square	0.0403	0.0335	0.0736	0.0213

[1]RMS interpolated between 1998 and 2005 to yield T=7; RMS1 links regulatory institutional and tools; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A1.15. Random effects regressions with interpolated RMS av indicator

	Total employment, business sector	Total employment	GDP, business sector	Labour productivity, business sector
Interpolated RMS_av[1]	807375.6*** (224394.3)	371392.2*** (78771.97)	3.59e+10*** (1.03e+10)	0.0315704*** (0.0048404)
Constant	1.51e+07** (6909027)	1.48e+07** (6086279)	5.68e+11** (3.11e+11)	10.4898*** (0.0582573)
Random Effects Test	0.6250	0.8366	Not asymptotic	0.9675
Observations	168	168	168	168
R-square	0.0328	0.0263	0.0566	0.0198

[1] RMS_av interpolated between 1998 and 2005 to yield T=7

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A1.16 Random effects regressions with interpolated RMS ag indicator

	Total employment, business sector	**Total employment**	**GDP, business sector**	**Labour productivity, business sector**
	Total Employment	Total Employment, Business Sector	GDP, Business Sector	Labour Productivity Business sector
Interpolated RMS_ag[1]	63117.77*** (16250.48)	30195.89*** (5634.643)	3.20e+09*** (7.33e+08)	0.0023614*** (0.000351)
Constant	1.59e+07** (6889079)	1.51e+07** (6095208)	5.87e+11** (3.11e+11)	10.52745*** (0.0561786)
Random Effects Test	0.7394	0.9018	asymptotic	0.9923
Observations	168	168	168	168
R-square	0.0227	0.0177	0.0396	0.0168

[1] RMS_ag interpolated between 1998 and 2005 to yield T=7
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table A1.17. Fixed effects regressions with PMR indicator

					Interpolated indicator			
	Total employment business sector	Total employment	GDP, business sector	Labour productivity business sector	Total employment, business sector	Total employment	GDP, business sector	Labour productivity business sector
Constant	8479435*** (444341.8)	1.06E+07*** (676065.6)	4.56E+11*** (4.14E+10)	10.833*** (0.029)	8449122*** (234972.2)	1.07E+07*** (423287.4)	4.63E+11*** (2.39E+10)	10.859*** (0.020)
PMR	-634986.2* (317619.4)	-1494733* (611511.1)	-9.84E+10 (3.84E+10)	-0.115*** (0.027)	-636816.8*** (202706.7)	-1580271*** (392958.6)	-1.00E+11*** (2.22E+10)	-0.119*** (0.017)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RSE^2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Heteroskedasticity Test	0.0006	0.000	0.000	0.0010	0.000	0.000	0.000	0.000
Observations	42	42	42	42	126	126	126	126
R-square	0.10	0.10	0.10	0.97	0.10	0.10	0.10	0.98

1RSE: Robust standard errors in parentheses; 4 PMR: 1998 and 2003 (T=2).

Table A1.18. Random effects regressions with interpolated PMR indicator

	Total employment, business sector	Total employment	GDP, business sector	Labour productivity, business sector
Constant	1.74e+07*** (5964533)	2.14e+07*** (6838939)	8.85e+11** (3.20e+11)	10.823*** (0.058)
PMR	-638293.4*** (189526.5)	-1595848*** (369975.9)	-1.01e+11*** (2.17e+10)	-0.118*** (0.016)
RSE	No	No	No	No
Random Effects Test	0.7703	0.5084	0.8251	0.9281
Observations	126	126	126	126
R-square	0.04	0.04	0.05	0.02

1 RSE: Robust standard errors in parentheses; 2PMR interpolated between 1998 and 2003 to yield T=5.

NOTE: FIXED VERSUS RANDOM EFFECTS

Consider the following model with a single explanatory variable:[3]

$$y_{it} = \beta X_{it} + a_i + u_{it},$$

where the error contains a time constant component, a_i.

Fixed Effects effectively removes the a_i prior to estimation. Fixed Effects consists in subtracting time averages from each variable, and performing least squares on the transformed model:

$$y_{it} - \bar{y}_i = \beta(x_{it} - \bar{x}_i) + u_{it} - \bar{u}_i.$$

Note that in addition to a_i, any time constant variables are also eliminated in this transformation.

Random Effects takes an alternative approach. It assumes that any unobserved individual heterogeneity only induces serial correlation in the error, and not between the errors and explanatory variables. Random Effects assumes:

$\text{cov}(x_{it}, a_i) = 0$ for all time periods, t.

Under this assumption, the aggregate error may be written as:

$$v_{it} = a_i + u_{it}$$

And the model becomes $y_{it} = \beta X_{it} + v_{it}$

The errors are now serially correlated across t:

$corr(v_{it}, v_{is}) = \dfrac{\sigma_u^2}{\sigma_u^2 + \sigma_a^2}$ for t different from s.

Estimation consists in making the GLS transformation:

$$y_{it} - \lambda\bar{y}_i = \beta(x_{it} - \lambda\bar{x}_i) + v_{it} - \lambda\bar{v}_i$$

Where $\lambda = 1 - \left(\dfrac{\sigma_u^2}{\sigma_u^2 + T\sigma_a^2} \right)^{\frac{1}{2}}$

It is worth noting that both Pooled OLS and Fixed Effects are limiting cases of Random Effects: when l = 0, Random Effects is Pooled OLS, while when l = 1, Random Effects is Fixed Effects.

3. This may be easily generalised to the case of multiple regressors.