Modernising Public Administration and Economic Growth

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Abstract

The links between public administration modernisation, efficiency of public spending, governance and growth are examined for a sample of 38 developed countries (the OECD plus EU countries). Efficiency and governance are shown to be correlated. Also, different measures of governance are significantly correlated to labour productivity. Results suggest that some governance features are more important for growth, namely, the law and order (including judicial system and control of corruption) and regulation quality.

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Modernising public administration and economic growth

1. Introduction	3
2. Public administration modernisation and efficiency	5
2.1 Methodological issues	5
2.2 Some results on education	6
2.3 Some results on health	7
2.4 Efficiency and governance	9
3. Government, governance and growth in developed countries	10
3.1 The data	10
3.2 Regression results with World Economic Forum indexes	15
3.3 Governance and cluster analysis with World Economic Forum data	17
3.4 Governance regression results with World Economic Forum based data	22
3.5 Governance regression results with World Bank based data	23
4. Conclusions	25
References	26
Appendix	28

1. Introduction

A strand of recent economic literature has emphasised the importance of institutions and governance as a deep determinant for growth. In one influential paper, Olson, Sarna and Swamy (2000) claim that differences in "governance" can explain why some developing countries grow rapidly, taking advantage of catching up opportunities, while others lag behind. In these authors assessment, the quality of governance explains in a straightforward manner and in empirical terms, something that neither standard endogenous or exogenous growth models do - why a (small) number of developing countries converge towards higher income levels and therefore display high growth rates.

In this literature strand, "governance" is measurable and reflects the quality of institutions and economic policies. For example, Olson, Sarna and Swamy (2000) have used the ICRG (International Country Risk Guide) as a source, and governance is measured by the risk of expropriation, the risk of repudiation of contracts, and by three variables reflecting administrative effectiveness and the rule of law - the quality of bureaucracy, the level of corruption and the "degree to which the citizens of a country are wiling to accept the authority of established institutions to make and implement laws and adjudicate disputes" (p. 348).

Acemoglu, Johnson and Robinson (2001) is another important reference in the literature, both in methodological terms and for results attained. The authors provide empirical evidence favouring the idea that current institutions have a strong influence on current economic performance of countries with a colonial past. These institutions, measured by the average protection against expropriation risk, are shaped by the way settlement occurred in the past, "extractive states" being opposed to "neo-Europe" colonies. The authors note that the findings of positive and significant correlation between institutions (or "governance") and economic performance are not a sufficient condition for causality from the former to the latter. Reverse causation could be at work - it could be the case that countries afford better institutions as they become richer. The reverse causation problem is circumvented in econometric terms by resorting to

instrumental variables - the "European settler mortality" is used as an instrument, as it is correlated to institutions but not directly to current GDP per head.

Kaufmann and Kraay (2002) examine the reverse causality effect. Using the World Bank world-wide governance indicators, they conclude that the positive correlation between the quality of governance and per capita incomes reflects a strong positive causation from better governance to higher per capita income and a weak and even negative causal link from income to governance.

In this paper we are particularly concerned with the links between public administration modernisation and economic growth in developed countries. In our view, public administration modernisation is related to two important outcomes - more efficiency in providing services, and better governance. As previously stated, the link between better governance and economic growth has been established in the recent literature². From our point of view, there are also good reasons to suppose that efficiency in providing services from the part of the public administration is also positively related to growth.

As explained in more detail in the next section, efficiency measurement in public provision is based on a comparison between inputs and outputs. More efficiency is achieved when either more output is provided using the same inputs, or fewer inputs are used in providing given outputs. Some outputs provided by public administrations are very likely to impinge positively on productivity and growth. This is the case of education, research and development, or the legal system. Moreover, even when efficiency is achieved by reducing inputs used, resources are being liberated for other uses, and crowding in may occur inducing more investment and growth.

This paper is organised as follows. In the next section, some previous results on efficiency in public provision of health and education are presented, and some evidence of a link between efficiency and governance is discussed. Section 3 covers the empirical results linking governance and labour productivity in developed countries. We present some new results using different governance indicators, using data from the

² Other references include Gradstein (2004), Rivera-Batiz (2002) and Wodon (2005).

World Economic Forum and from the World Bank. Section 4 concludes. An appendix contains several tables with data.

2. Public administration modernisation and efficiency

2.1 Methodological issues

Afonso and St. Aubyn (2006a, 2006b) measure efficiency in education and health provision using a two stage DEA (data envelopment analysis).

Figure 1 illustrates the basic idea behind a two-stage approach. In a simplified one output and one input DEA problem, A, B and C are found to be efficient and are represented on the production possibilities frontier, while D is an inefficient decision making unit (a country).





The output score for country D equals $(d_1+d_2)/d_1$, and is higher than one, denoting inefficiency. However, country D inefficiency may be partly ascribed to a "harsh environment" – a number of perturbing environmental factors may imply that country D produces less than the theoretical maximum, even if discretionary inputs are efficiently

used. In our example, and if the environment for country D was more favourable (e. g. similar to the sample average), then we would have observed D_c . In other words, country D would have produced more and would be nearer the production possibility. The environment corrected output score would be $(d_{1c}+d_{2c})/d_{1c}$, lower than $(d_1+d_2)/d_1$, and closer to unity.

In Afonso and St. Aubyn (2006a, 2006b), inputs and outputs are chosen for both 6education and health, and non-discretionary (or "environment") inputs are considered. Results for education and health are briefly presented in the next section.

2.2 Some results on education

Table 1 summarises variables used in equation efficiency measurement. Two discretionary inputs were considered – teachers per 100 students and hours per year in school. Output is measured by student results in the international OECD assessment program known as PISA. Parents' education attainment and GDP per capita are the non-discretionary or environment factors.

	Mean	Standard	Minimum	Maximum
		deviation		
PISA (2003)	490.5	41.4	374.6	545.9
			(IND)	(FI)
Teachers per 100	7.7	1.7	5.1	11.5
students (2000-02)			(KOR)	(PT)
Hours per year in	946.5	121.2	740.9	1274.0
school (2000-02)			(SW)	(IND)
Parent education	65.0	24.4	19.0	94.0
attainment (2001-02)			(THA)	(JP)
GDP per capita, PPP	22267.1	9327.9	3364.5	37063.4
USD (2003)			(IND)	(NO)

Table 1
Summary statistics on education dat
(25 countries)

Note: FI – Finland; IND – Indonesia; JP – Japan; KOR – Korea; NO – Norway; PT – Portugal; THA – Thailand. Source: Afonso and St. Aubyn (2006a).

Table 2 displays output efficiency scores before correction and after correcting for the influence of environment factors. A richer country score where parents are highly educated is corrected upwards (as for Norway). The contrary happens to poorer countries where educational attainment is lower (as in Indonesia).

	Laucation	concerca output	t entitlenely set	0105	
	Bias corrected	GDP correction	Education attainment	Fully corrected	Rank
	(1)	(2)	(3)	(4)=(1)+(2)+(3)	
Australia	1.047	0.037	-0.007	1.077	3
Austria	1.104	0.040	0.030	1.174	22
Belgium	1.063	0.033	-0.001	1.095	7
Czech Republic	1.083	-0.041	0.046	1.087	6
Denmark	1.108	0.048	0.028	1.184	23
Finland	1.037	0.027	0.035	1.100	8
France	1.082	0.028	0.005	1.115	14
Germany	1.104	0.029	0.037	1.170	21
Greece	1.191	-0.015	-0.010	1.167	20
Hungary	1.115	-0.058	0.024	1.082	4
Indonesia	1.528	-0.257	-0.075	1.196	24
Ireland	1.094	0.068	-0.002	1.159	19
Italy	1.160	0.026	-0.028	1.159	18
Japan	1.044	0.032	0.052	1.127	17
Korea	1.075	-0.030	0.023	1.068	2
Netherlands	1.066	0.038	0.009	1.112	13
New Zealand	1.068	-0.007	0.026	1.087	5
Norway	1.131	0.069	0.046	1.246	25
Portugal	1.172	-0.026	-0.080	1.067	1
Slovak Republic	1.131	-0.068	0.045	1.108	10
Spain	1.140	0.000	-0.035	1.105	9
Sweden	1.052	0.024	0.039	1.116	15
Thailand	1.348	-0.146	-0.082	1.120	16
Turkey	1.343	-0.162	-0.072	1.109	12
Uruguay	1.296	-0.134	-0.053	1.109	11
Average	1.143	-0.018	0.000	1.126	

Table 2

Education - corrected output efficiency scores

Source: Afonso and St. Aubyn (2006a).

2.3 Some results on health

In what health is concerned, the output is measured by three variables; life expectancy, the infant mortality rate and potential years of life lost. The number of doctors, nurses, hospital beds and magnetic resonance imaging units are the considered inputs. Data on outputs and inputs is summarised in table 3.

Summary s	Summary statistics on health data							
	Mean	Standard	Minimum	Maximum				
		deviation						
Life expectancy (in years) 1/	77.5	2.8	68.4	81.5				
			(TUR)	(JAP)				
Infant mortality rate (deaths per	4.5	6.5	2.4	36.3				
1000 live births) 2/			(ICE)	(TUR)				
Potential years of life lost (All	4083	981.2	2917	7056				
causes - <70 year,/100 000) 2/			(JAP)	(HU)				
Practising physicians, density per	2.8	0.8	1.4	4.4				
1000 population 2/			(TUR)	(GRC)				
Practising nurses, density per 1000	8.0	3.4	1.6	14.7				
population 2/			(KOR)	(IRE)				
Acute care beds, density per 1000	4.2	1.8	1.0	9.1				
population 2/			(MEX)	(JAP)				
MRI units, per million population	6.8	6.4	0.2	32.3				
2/			(MEX)	(JAP)				

Table 3

Summary statistics on health data

Notes: 1/ Average for 2000 and 2003. 2/ Average for 2000-2003.

TUR – Turkey; JAP – Japan; ICE – Iceland; HU – Hungary; GCR – Greece; KOR – Korea; IRE – Ireland; MEX – Mexico.

Source: Afonso and St. Aubyn (2006b).

People health is determined not only by the quality of the health car system, but also by important behavioural variables. Efficiency scores were therefore corrected considering the incidence of tobacco consumption and obesity. GDP per head and education attainment were also included in non-discretionary inputs. Health output efficiency scores and their correction are presented in table 4.

Table	4
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	Bias	GDP	Education	Obesity	Tobacco	Fully	Rank
	corrected	correction	correction	correction	correction	corrected	
	scores					scores	
	(1)	(2)	(3)	(4)	(5)	(6)=(1)+(2)+	
						(3)+(4)+(5)	
Australia	1.141	0.440	0.840	-1.447	1.657	2.630	15
Canada	1.489	0.564	1.129	-0.062	2.491	5.611	19
Czech Republic	1.637	-1.159	-0.960	-0.156	0.376	1.000	1
Denmark	1.416	0.669	-0.827	0.836	-0.785	1.309	9
Finland	1.066	0.252	-0.071	0.219	0.942	2.407	13
France	1.158	0.260	-0.716	0.855	-0.487	1.069	8
Germany	1.318	0.289	-0.471	0.200	0.317	1.652	12
Hungary	4.564	-1.497	-0.294	-0.904	-2.513	1.000	1
Italy	1.175	0.232	-1.272	1.023	0.346	1.505	11
Japan	1.063	0.344	0.973	2.015	-1.470	2.926	16
Korea	1.129	-0.921	0.707	2.015	-1.500	1.430	10
Luxembourg	1.427	2.588	-1.227	-0.829	-2.274	1.000	1
Poland	2.049	-2.130	-0.716	0.481	-0.666	1.000	1
Slovak Republic	2.757	-1.718	-1.183	-1.578	0.317	1.000	1
Spain	1.057	-0.313	0.306	0.163	-0.815	1.000	1
Sweden	1.043	0.191	0.240	0.799	2.342	4.614	18
Switzerland	1.205	0.538	0.084	1.173	-0.428	2.572	14
United Kingdom	1.188	0.237	0.573	-1.690	-0.190	1.000	1
United States	1.055	1.134	2.885	-3.113	2.342	4.302	17
Average	1.523	0.000	0.000	0.000	0.000	2.054	

Health - Corrected output efficiency scores

Note: the fully corrected scores do not always add up to the indicated sum since for the cases were the result was below one we truncated it to the unity.

Source: Afonso and St. Aubyn (2006b).

2.4 Efficiency and governance

Efficiency scores from the first stage DEA are highly correlated to output per head, and this correlation shows up in second stage regressions that allow for the GDP correction included in tables 3 and 4. In table 5 we present results from the simple regression of (uncorrected) efficiency scores in one of the governance indicators to be used in section 3 (the principal component of World Bank indicators).

The correlation of education scores and governance is highly significant. In what concerns health, the relationship seems to be less clear-cut.

Table 5									
Regres	Regression results – efficiency and governance								
	Intercept PC(WB) Number of Ad								
				countries					
Education equation	Coefficient	1.119	-0.0198						
	t-stat	96.872	-3.749	22	0.383				
	Prob.	0.000	0.001						
Health equation	Coefficient	1.584	-0.078						
	t-stat	8.498	-1.821	19	0.114				
	Prob.	0.000	0.086						

Note: PC(WB), principal component of World Bank governance indicators.

Interpretation of these results is not straightforward. On the one hand, governance is correlated to income per head, and income per head is one discretionary input shown to be significant by Afonso and St. Aubyn (2006a, 2006b). On the other hand, one could sensibly expect that countries with better governance can also be countries where provision of health and education is more efficient. Disentangling these two causal links seems to be an interesting avenue for further research.

3. Government, governance and growth in developed countries

3.1 The data

We want to empirically assess whether there is a statistically significant link between so called "institutional" or "governance related" variables and the economic performance of a nation, reflected in labour or total factor productivity.

Our sample of countries includes all European Union and OECD countries, if data was available. Labour productivity was computed as a percentage of the US in purchasing power parity terms, using raw data from the AMECO database, updated in the spring of 2007. Total factor productivity was also estimated using the same database and assuming an aggregate Cobb-Douglas production function with a capital share equal to $1/3^3$. An average from 2000 to 2006 was taken in order to smooth cyclical differences.





As can be seen from figure 2, almost all countries considered have lower labour productivity than the US, the exceptions being Norway and Luxembourg. The sample includes 38 countries. 16 of them exhibit a relative labour productivity figure smaller than two thirds. Incidentally, all new EU members are included in this set.

³ Computation details are available from the author on request.

Figure 3



Total productivity and labour productivity relative to the US average 2000-2006

Total factor productivity can only be computed if capital stock figures are available. This limited this series to 21 countries only. Figure 3 compares relative total factor productivity to labour productivity. Figures are strikingly similar, so that we decided to use the labour productivity series instead, as the number of countries covered is much larger.

The World Economic Forum publishes regularly a Global Competitiveness Report, which includes a Global Competitiveness Index (GCI)⁴. This index construction is described in detail by Sala-i-Martin and Artadi (2004). Here, we provide the essential features, as it will be used extensively in the next sections.

The GCI covers 125 countries or economies. An Executive Opinion Survey and hard data from several sources allows the quantification of 134 factors, which are listed in the appendix (table A.4). In almost all these factors, each country is given a figure between 1 (low competitiveness) and 7 (high competitiveness)⁵. These factors are organised within nine pillars:

⁴ Porter, Schwab, Lopez-Claros and Sala-i-Martin (2006) contain all data referred here as the "World Economic Forum data." See also table A.3 in the appendix.

⁵ In cases where figures are in a different scale, a conversion algorithm to the 1-7 scale is applied.

- institutions,
- infrastructure,
- macroeconomy,
- health and primary education,
- higher education and training,
- market efficiency,
- technological readiness,
- business sophistication,
- and innovation.

Institutions, infrastructure, the macroeconomy and health and primary education are subsumed in the *basic requirements* subindex. Higher education and training, market efficiency and technological readiness constitute the *efficiency enhancers* subindex while the business sophistication and innovation pillars form the base of the *innovation and sophistication* factors subindex.





The three subindexes make up the global index, which is plotted in figure 4 for our sample of 38 countries. By construction, no country could achieve more than 7 or less than 1. As one could expect, our sample includes a good number of very high achievers. Among the 20 best achievers in the complete list of 125 economies, only

three (Singapore, Hong Kong and Taiwan) are not included in our sample. However, the sample also includes countries that are ranked in the second half of the world table, as is the case of Romania (68th) or Bulgaria (75th).





The three subindexes are graphed in figure 5. Visual inspection allows one to grasp that even if high achievers in one subindex tend to be high achievers in another subindex, there is also significant unevenness.

Kaufmann, Kray and Mastruzzi (2006), from the World Bank, present worldwide governance indicators for 213 economies. Based on hundreds of variables from several sources, six indicators are listed for six different dimensions of governance: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. There is a time series of indicators from 1996 to 2005.

Figure 6 displays the World Bank indicators for our sample of 38 countries, ordered by the principal component of the six sub-indicators, after taking the average from 2000 to 2005⁶. As one could probably expect, top and worse performers are more or less the same as when one inspects the World Economic Forum data.

⁶ The principal component series can be found in table A.3 (appendix).

Figure 6

World Bank Governance Indicators



3.2 Regression results with World Economic Forum indexes

Table 6									
	Regression results with aggregated indexes								
	Intercept Global BR EE IF Adj. R ²								
Model 1	Coefficient	-0.883	0.312				0.508		
	t-stat	-3.538	6.261						
	Prob.	0.001	0.000						
Model 2	Coefficient	-1.011		0.263	-0.014	0.076	0.560		
	t-stat	-3.507		2.229	-0.103	0.974			
	Prob.	0.001		0.033	0.918	0.337			
Model 3	Coefficient	-1.143		0.342			0.569		
	t-stat	-4.431		7.065					
	Prob.	0.000		0.000					

Notes: Global - Global Competitiveness Index; BR - Basic requirements index; EE - Efficiency enhancers index; IF - Innovation factors index.

Table 6 presents the basic results concerning three regression models where labour productivity is the dependent variable and the global index or the three subindexes. Note, first, that the global index is highly significant in model 1, a simple regression, the p-value being smaller than 0.1%. In model 2, when the three subindexes are considered in a multiple linear regression, only the basic requirements variable is found to be significant, with a p-value equal to 3.3%. In model 3, only the significant basic requirements explanatory variable is retained. The variable is highly significant, and the overall fit of the model, as given by the adjusted R^2 , is the highest in the table.



The three basic requirement pillars



Recall that the basic requirements subindex is based on four pillars - institutions, infrastructure, the macroconomy and health and primary education. The three first of those pillars are plotted in figure 7. Note that some Nordic countries, like Finland, Iceland and Denmark excel in what institutions are concerned, while others like Germany, Switzerland and France take the lead when one considers infrastructures.

In a regression model where these three pillars are correlated to labour productivity, the macroeconomy variable does not show up as significant (see model 4, in table 7). A better specification is retained in model 5, where only institutions and infrastructure are included. This last variable is slightly more significant than the latter (a p-value of 2.1% compared to 7.0%).

Regression results with basic requirements								
		Intercept	Ins	Inf	Ma	Adj. R ²		
Model 4	Coefficient	-0.380	0.103	0.114	-0.002			
	t-stat	-1.603	1.800	2.375	-0.029	0.558		
	Prob.	0.118	0.081	0.023	0.977			
Model 5	Coefficient	-0.385	0.102	0.114				
	t-stat	-2.523	1.867	2.419		0.571		
	Prob.	0.016	0.070	0.021				

 Table 7

 Regression results with basic requirements

Notes: Ins - Institutions index; Inf - Infrastructure index; Ma - Macroeconomy index.

3.3 Governance and cluster analysis with World Economic Forum data

A careful examination of all 134 factors considered for the Global Competitiveness Index led us to select a subset of 48 which we considered to be more directly related to the governance concept (see table A.4 for the full list of indicators). In a somewhat impressionistic mode, we considered that a factor like "the impact of legal contributions to political parties on public policy" than, for example, "financial market sophistication". These 48 factors are listed in table 9.

Pair wise examination of these 48 factors lead us to realize that cross-country correlations were considerable. In order to both reduce data dimension for further empirical uses and to provide a possibly interesting classification of factors on its own right, we performed cluster analysis across factors.

Cluster analysis proceeds by sequentially associating similar cases into groups or clusters. Each case is characterised by a vector with specific values for variables. There are several methods for measuring similarity and for clustering cases. Here, we have used the Euclidean distance to the group average. In our application, each factor is a case, and each country is a variable⁷. In intuitive terms, two factors will be classified in the same cluster if country scores for each country in those factors are similar.

Figure 8 is a dendogram resulting from cluster analysis. Cases are depicted in the vertical axe and distance horizontally. The algorithm proceeds by successive associations or linkages, where each cluster is represented by a horizontal dash and each association by a vertical one. Cases start all in a different cluster, i.e. in the beginning there are as many clusters as factors. In the end, all cases are associated in the same cluster. The number of clusters is therefore somehow arbitrary and dependent on the degree of dissimilarity within each cluster the researcher wants to tolerate.

Here, visual inspection of the dendogram leads us to consider six clusters, and the factors that belong to each of them are inside the same rectangle in figure 8. These

⁷ Note that we could have clustered countries instead. In that case, each country would be a case and each factor would be a variable. The reader interested in cluster analysis techniques may refer to Everitt, Landau and Leese (2001).

factors are also discriminated by cluster in table 9. The constitution of each cluster lead us to name them as following:

- **cluster 1** – **small government**, as a high score in any of these factors is somehow related to the size of government or its degree of interference in some activities (agriculture, labour market), more than to the quality of this interference.

- cluster 2 – fair government, because most factors here are connected to even treatment of agents or no favouritism. The expectations are "government success in ICT promotion" and "government procurement of advanced technology products".

- **cluster 3** – **openness and competition,** as factors here are clearly connected to external barriers to goods, labour and capital flows and to the prevalence of some internal shelters (e. g. the informal sector).

- cluster 4 - law, order and regulation. Factors assigned to this cluster by the algorithm are related to the police, to the prevalence of crime, of bribes, the working of the judicial system and the efficiency and enforcement of different types of regulation.

- **Cluster 5** - **irregular payments.** The name came after the three factors (out of four) that are connected to irregular payments in exports and imports, in taxes and in public utilities.

- **Cluster 6** – **labour market.** It includes only one factor, the flexibility of wage determination.

One can compute a score for each country in each of these clusters by taking the average score for the factors that fall within it. With this procedure, we have computed six new indices, which can be called "small government", "fair government", "openness and competition", "law, order and regulation", "irregular payments" and "labour market". A summary of results is presented in table 8. There, one can read the six countries better and worse classified in each of these new indexes. Cluster 2, 3, 4 and 5 are shaded because there are more akin than the other two⁸.

⁸ as implied by the dendogram.

Top sin and bottom sin countries in cacin 50 vernance chaster								
	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6		
	"small	"fair	"openness and	"law, order	"irregular	"labour		
	government"	government"	competition"	and	payments"	market"		
	-	-	-	regulation"				
Top six	IS, EE, CH,	DK, FI, IS,	FI, IE, UK,	DK, FI, DE,	DK, NZ, FI,	EE, JP,		
countries	LU, SK, IE	CH, NL, LU	LU, DK, SE	IS, NO, NZ	NO, SE, IS	SK, LT,		
						LV, UK		
Bottom	SE, BG, SI,	LT, CZ, MX,	CY, RO, TR,	IT, LT, MX,	MX, EL,	IT, SE,		
six	FR, BE, IT	IT, RO, BG	IT, PL, BG	PL, RO, BG	KO, TR,	EL, DE,		
countries					RO, PL	FI, AT		

Table 8Top six and bottom six countries in each governance cluster

Note that Finland and Denmark come out at the top positions in clusters 2 to 5. Romania appears at the bottom position in the same clusters. A country like Sweden is at the bottom position in what concerns "small government", or "labour market", and at the same time achieves top scores in "openness and competition" and "irregular payments".

Figure 8 Dendogram Cluster analysis applied to governance factors (Euclidean distance to group average)



Table 9
Cluster composition

	Governance sub-indexes included:
Cluster 1	1.07 - regulation
"small government"	6.01 - agriculture policy costs
-	6.03 - taxation
	6.12 - hiring and firing
Cluster 2	1.03 - public trust of politicians
"fair government"	1.05 - favouritism in decisions of government officials
	1.16 - effectiveness of law-making bodies
	1.19 - impact of legal contributions to parties on public policy
	6.25 - distortive effect of taxes
	7 10 - government success in ICT promotion
	9.04 - government procurement of advanced technology
	products
Cluster 3	113 - efficacy of corp boards
"openness and	6.09 - trade barriers
competition"	6.0 - foreign ownership restrictions
competition	6.10 red tane
	6.24 red upc
	6.31 - ease of hiring foreign labor
	7 03 - laws relating to ICT
	7.09 - govt prioritization of ICT
	7.09 - govi. prioritzation of real
Cluster 4	1.01 property rights
Cluster 4	1.01 - property rights
naw, or der and	1.02 – diversion public runds
regulation	1.04 – Judicial Independence
	1.09 – remaining of ponee
	1.10 - crime and violence
	1.11 - olg. clinic
	1.12 - etilical behavior films
	1.14 – protection minority shareholders
	1.15 - auditing and accounting
	1.17 – quarty of information on poncies and regulation
	1.18 – Inegal donations to parties
	1.25 - integular judicial decisions
	1.20 - Integular Judicial decisions
	1.27 - Offices
	1.20 - contuption
	6.23 - local equity market access
	6.25 - Ideal equity market access
	6.02 - efficiency legal framework
	6.07 - antitrust policy
	9.07 - intellectual property protection
	10.01 - stringent environment regulations
	10.02 - clear and stable regulations
Cluster 5	1 21 – press freedom
"irregular navmente"	1.21 press needoni
	1.22 integ payments in cyp and mip 1.23 – irreg payments in public utilities
	1.23 integ payments in public diffices
Cluster 6	6.13 - Flexibility wave determination
"labour markat"	0.15 Theriomy wage determination
labout market	

3.4 Governance regression results with World Economic Forum based data

In the same manner as with other indexes, we have performed regressions of labour productivity on these new indexes.

Model 6 in table 10 is a multiple regression where all clusters are used as explanatory variables. The most significant one is cluster 4, "law, order and regulation", with a p-value equal to 2.5 percent and a positive coefficient.

In model 7, we have included a principal components (PC) index. This is simply the first principal component of all 48 governance factors. PC is therefore a linear combination of the 48 factors that has the highest possible correlation to each of them⁹. Model 7 also includes the infrastructure pillar, which proved to be significant in other models as well. The PC variable displays a p-value equal to 7.9 percent, slightly above the traditional 5 percent cutting point.

Finally, model 8, which displays the highest R^2 , take in cluster 4, the "law, order and regulation" index, as an explanatory variable, together with the infrastructure pillar. The "law, order and regulation" index is significant below 5 percent, and the infrastructure p-value is now great than 10 percent (11.2 percent).

			Regress	sion resu	lts with	governa	ance inde	xes			
		Intercept	Cl. 1	Cl. 2	Cl. 3	Cl. 4	Cl. 5	Cl. 6	PC	Inf	Adj. R ²
Model 6	Coeff.	-0.134	0.027	-0.174	0.044	0.359	-0.071	-0.053			
	t-stat	-0.332	0.418	-1.334	0.344	2.360	-0.735	-1.732			0.578
	Prob.	0.742	0.679	0.192	0.733	0.025	0.468	0.093			
Model 7	Coeff.	0.116							0.019	0.111	
	t-stat	0.468							1.810	2.240	0.569
	Prob.	0.643							0.079	0.032	
Model 8	Coeff.	-0.435				0.128				0.088	
	t-stat	-2.740				2.112				1.630	0.582
	Prob.	0.010				0.042				0.112	

Table 10 egression results with governance index

Notes: Cl1, ..., Cl. 6 - Cluster 1, ..., Cluster 6 index. PC - Principal components index. Inf - Infrastructure index.

⁹ The interested reader may refer to Flury and Riedwyl (1988) for more on principal components analysis techniques.

Figure 9 depicts two alternative governance indexes used in the above mentioned regressions, the "law, order and regulation" (cluster 4) one and the principal component of all 48 factors. Although correlated as they must be, it is clear enough that rankings produced by one or the other are slightly different.



3.5 Governance regression results with World Bank based data

The World Bank governance indexes are quite correlated among them. In order to reduce dimension, we have computed the principal component of the six indexes (voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption.). The result is displayed in figure 10 and in table A.3).

Models 13, 12 and 15 are the ones with a higher fit – suggesting the importance of regulatory quality, government effectiveness and control of corruption.

Figure 10



 Table 11

 Regression results with World Bank governance indexes

		Intercept	PC	VA	PS	GE	RQ	RL	CC	Adj. R ²
Model 9	Coeff.	0.671	0.084							
	t-stat	29.058	8 2 7 9							0.646
	Prob	0,000	0.000							0.010
	1100.	0.000	0.000							
Model 10	Coeff	0 176		0 1 7 6						
110000110	t-stat	2 1 2 9		6 3 2 0						0.513
	Proh	0.040		0.000						0.010
	1100.	0.040		0.000						
	Coeff.	0.466			0.259					
Model 11	t-stat	7.463			3.877					0.275
	Prob.	0.000			0.000					
Model 12	Coeff.	0.295				0.294				0.708
	t-stat	6.609				9.529				
	Prob.	0.000				0.000				
Model 13	Coeff.	0.342					0.284			
	t-stat	8.865					10.006			0.728
	Prob.	0.000					0.000			
	Coeff.	0.195						0.401		
Model 14	t-stat	2.779						7.238		0.581
	Prob.	0.009						0.000		
	Coeff.	0.398							0.223	
Model 15	t-stat	10.128							8.481	0.657
	Prob.	0.000							0.000	

PC - Principal component, VA -voice and accountability, PS - political stability and absence of violence, GE - government effectiveness, RQ - regulatory quality, RL - rule of law, CC - control of corruption

4. Conclusions

Results presented in this paper suggest there is an important relationship between governance measures and labour productivity levels in more advanced economies (the "EU plus OECD countries"). This correlation is present for different governance measures. Namely, it is found both using the World Economic Forum and the World Bank governance indicators.

Using data from previous studies on the efficiency of spending on education and health, results presented here also suggest there is a relationship between efficiency and governance. Countries where spending is more efficient, i. e. where outputs are higher for given resources used, are countries with better governance indicators.

Disaggregating of World Economic Forum and World Bank data, and using cluster analysis across indicators, suggests that some governance features are more important for growth, like the law and order (including judicial system and control of corruption) and regulation systems. Successful countries seem to be characterized not so much by small government but much more by good quality governance.

Prospects for further work include:

i) more research on the links between efficiency, governance and income levels, disentangling two possible causal links (from efficiency to governance and income or from governance and income to efficiency).

ii) more research on the causal links between governance and growth, probably resorting to instrumental variables.

ii) the performance of robustness tests, namely by including more conditioning variables on the regressions (e. g. education or human capital)

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Appendix

country	code	country	code
		T . •	
Australia	AU	Latvia	LV
Austria	AT	Lithuania	LT
Belgium	BE	Luxembourg	LU
Bulgaria	BG	Malta	MT
Canada	CA	Mexico	MX
Cyprus	CY	Netherlands	NL
Czech Republic	CZ	New Zealand	NZ
Denmark	DK	Norway	NO
Estonia	EE	Poland	PL
Finland	FI	Portugal	PT
France	FR	Romania	RO
Germany	DE	Slovak Republic	SK
Greece	EL	Slovenia	SI
Hungary	HU	Spain	ES
Iceland	IS	Sweden	SE
Ireland	IE	Switzerland	CH
Italy	IT	Turkey	TR
Japan	JP	United Kingdom	UK
Korea, Rep	KO	United States	US

Table A.1 Country codes

country	labour productivity	country	labour productivity
AT	0.8663	JP	0.7129
AU	0.8224	КО	0.5369
BE	0.9671	LT	0.3679
BG	0.2359	LU	1.1900
CA	0.8009	LV	0.3249
СН	0.7546	MT	0.6425
CY	0.6004	MX	0.3125
CZ	0.4742	NL	0.8085
DE	0.7690	NO	1.0240
DK	0.7811	NZ	0.7807
EE	0.3875	PL	0.4281
EL	0.7123	PT	0.5055
ES	0.7362	RO	0.2582
FI	0.8186	SE	0.7873
FR	0.9004	SI	0.5612
HU	0.5139	SK	0.4566
IE	0.9571	TR	0.2903
IS	0.7493	UK	0.8054
IT	0.8452	US	1.0000

Table A.2 Labour productivity relative to the US

		World bank based data			
country	Global index	bal index Institutions pillar ''law, order and Governance		principal	
· ·			regulation"	principal component	component
AT	5.32	5.45	5.98	4.152	1.69
AU	5.29	5.51	5.99	4.011	1.94
BE	5.27	4.85	5.44	0.645	0.84
BG	4.00	3.07	3.41	-7.995	-3.77
CA	5.37	5.01	5.53	1.716	1.90
СН	5.81	5.73	6.14	5.012	2.69
CY	4.36	4.52	4.86	-2.028	-0.86
CZ	4.74	3.84	4.43	-4.706	-1.37
DE	5.58	5.69	6.29	5.209	1.32
DK	5.70	5.98	6.37	6.581	2.54
EE	5.12	4.70	5.07	-0.545	-0.52
EL	4.33	4.36	4.73	-3.018	-1.41
ES	4.77	4.37	4.82	-1.586	0.15
FI	5.76	6.05	6.37	6.774	3.11
FR	5.31	4.91	5.61	1.459	0.11
HU	4.52	4.18	4.72	-3.052	-0.87
IE	5.21	5.15	5.54	1.790	1.59
IS	5.40	5.98	6.27	6.487	2.82
IT	4.46	3.66	4.33	-5.178	-1.35
JP	5.60	4.97	5.72	2.205	-0.09
KO	5.13	4.18	4.59	-4.234	-2.17
LT	4.53	3.86	4.24	-4.838	-1.59
LU	5.16	5.45	5.78	3.510	2.73
LV	4.57	4.07	4.41	-4.172	-1.84
MT	4.54	4.59	4.96	-1.061	0.02
MX	4.18	3.68	4.01	-6.352	-4.58
NL	5.56	5.60	6.05	4.571	2.40
NO	5.42	5.71	6.17	5.255	2.16
NZ	5.15	5.95	6.16	5.626	2.45
PL	4.30	3.62	3.97	-7.112	-1.99
PT	4.60	4.83	5.36	1.046	0.36
RO	4.03	3.40	3.60	-8.548	-4.87
SE	5.74	5.51	6.14	4.870	2.40
SI	4.64	4.27	4.89	-1.498	-0.73
SK	4.55	4.03	4.46	-3.710	-1.82
TR	4.14	4.05	4.37	-4.336	-5.76
UK	5.54	5.38	6.04	3.612	1.61
US	5.61	4.84	5.28	-0.561	0.77

Table A.3Some governance and institutions data

Source: Kaufmann, D., Kraay, A. and M. Mastruzzi (2006)

Porter, M., K. Schwab, A. Lopez-Claros and X. Sala-i-Martin (eds.) (2006). Computations by the author (see main text for details).

Table A.4
List of World Economic Forum Indicators (2006-2007)

	Basic Indicators
0.01	Total GDP (hard data)
0.02	Total population (hard data)
0.03	GDP per capita)PPP) (hard data)
	Section I: Institutions
1.01	Property rights
1.02	Diversion of public funds
1.03	Public trust of politicians
1.04	Judicial independence
1.05	Favoritism in decisions of government officials
1.06	Wastefulness of government spending
1.07	Burden of government regulation
1.08	Business costs of terrorism
1.09	Reliability of police services
1.10	Business costs of crime and violence
1.11	Organized crime
1.12	Ethical behavior of firms
1.13	Efficacy of corporate boards
1.14	Protection of minority shareholders' interests
1.15	Strength of auditing and accounting standards
1.16	Effectiveness of law-making bodies
1.17	Quality of information regarding changes in policies and regulation
1.18	Pervasiveness of illegal donations to political parties
1.19	Impact of legal contributions to political parties on public policy
1.20	Centralization of economic policymaking
1.21	Freedom of the press
1.22	Irregular payments in exports and imports
1.23	Irregular payments in public utilities
1.24	Irregular payments in tax collection
1.25	Irregular payments in public contracts
1.26	Irregular payments in judicial decisions
1.27	Bribes for influencing laws, policies, regulations, or decrees
1.28	Business costs of corruption
1.29	Impact of nepotism
	Section II: Infrastructure
2.01	Overall infrastructure quality
2.02	Railroad infrastructure development

2.03	Quality of port infrastructure
2.04	Quality of air transport infrastructure
2.05	Quality of electricity supply
2.06	Telephone lines (hard data)
2.07	Quality of roads
2.08	Quality of telephone/fax infrastructure
	Section IV: Macroeconomy
3.01	Government surplus/deficit (hard data)
3.02	National savings rate (hard data)
3.03	Inflation (hard data)
3.04	Interest rate spread (hard data)
3.05	Government debt (hard data)
3.06	Real effective exchange rate (hard data)
3.07	Recession expectations
3.08	Country credit rating (hard data)
	Section IV: Health and Primary Education
4.01	Medium-term business impact of malaria
4.02	Medium-term business impact of tuberculosis
4.03	Medium-term business impact of HIV/AIDS
4.04	Infant mortality (hard data)
4.05	Life expectancy (hard data)
4.06	Tuberculosis prevalence (hard data)
4.07	Malaria prevalence (hard data)
4.08	HIV prevalence (hard data)
4.09	Primary enrollment (hard data)
	Section V: Higher Education and Training
5.01	Secondary enrollment (hard data)
5.02	Tertiary enrollment (hard data)
5.03	Quality of the educational system
5.04	Quality of math and science education
5.05	Quality of management schools
5.06	Local availability of specialized research and training services
5.07	Extent of staff training
5.08	Quality of public schools
	Section VI: Market Efficiency
6.01	Agricultural policy costs
6.02	Efficiency of legal framework
6.03	Extent and effect of taxation

6.04	Number of procedures required to start a business (hard data)
6.05	Time required to start a business (hard data)
6.06	Intensity of local competition
6.07	Effectiveness of antitrust policy
6.08	Imports (hard data)
6.09	Prevalence of trade barriers
6.10	Foreign ownership restrictions
6.11	Exports (hard data)
6.12	Hiring and firing practices
6.13	Flexibility of wage determination
6.14	Cooperation in labor-employer relations
6.15	Reliance on professional management
6.16	Pay and productivity
6.17	Brain drain
6.18	Private sector employment of women
6.19	Financial market sophistication
6.20	Ease of access to loans
6.21	Venture capital availability
6.22	Soundness of banks
6.23	Local equity market access
6.24	Extent of bureaucratic red tape
6.25	Distortive effect of taxes and subsidies on competition
6.26	Presence of demanding regulatory standards
6.27	Extent of market dominance
6.28	Extent of regional sales
6.29	Breadth of international markets
6.30	Informal sector
6.31	Ease of hiring foreign labor
6.32	Recent access to credit
	Section VII: Technological Readiness
7.01	Technological readiness
7.02	Firm-level technology absorption
7.03	Laws relating to ICT
7.04	FDI and technology transfer
7.05	Cellular telephones (hard data)
7.06	Internet users (hard data)
7.07	Personal computers (hard data)
7.08	Prevalence of foreign technology licensing
7.09	Government prioritization of ICT
7.10	Government success in ICT promotion
7.11	Quality of competition in the ISP sector

7.12	Extent of business Internet use
7.13	Internet access in schools
7.14	Impact of rules on FDI
7.15	Internet hosts (hard data)
	Section VIII: Business Sophistication
8.01	Local supplier quantity
8.02	Local supplier quality
8.03	Production process sophistication
8.04	Extent of marketing
8.05	Control of international distribution
8.06	Willingness to delegate authority
8.07	Nature of competitive advantage
8.08	Value chain presence
8.09	Buyer sophistication
8.10	Local availability of process machinery
8.11	Degree of customer orientation
8.12	Extent of incentive compensation
	Section IX: Innovation
9.01	Quality of scientific research institutions
9.02	Company spending on research and development
9.03	University/industry research collaboration
9.04	Government procurement of advanced technology products
9.05	Availability of scientists and engineers
9.06	Utility patents (hard data)
9.07	Intellectual property protection
9.08	Capacity for innovation
	Section X: Environment
10.01	Stringency of environmental regulations
10.02	Clarity and stability of regulations
10.03	Protection of ecosystems by business
10.04	Impact of lack of clean air or clean water on business operations and
	decisions
10.05	Impact of natural disasters on business operations and decisions