Does Regulation Positively Impact Investment and Output in Infrastructure? Empirical analysis of OECD countries and Bangladesh

Goran Sumkoski

Abstract— The research confirms the positive impact of regulation on investment and delivery of services the infrastructure for developed OECD countries and finds that this claim is equally valid in a case of a developing country such as Bangladesh. The results support the notion that introducing market forces and competition into the infrastructure sectors such as energy, transport and telecommunications are conducive to increased investment and output of corresponding infrastructure sectors. The empirical research is conducted using specially reconstructed sets o infrastructure regulatory indicators for energy, transport and telecommunications for Bangladesh for the same period of 1975 – 2013 to exactly mirror the existing OECD infrastructure indicators datasets.

Index Terms— Keywords: regulation, investment, infrastructure, developing country, OECD.
JEL Classification: L51 Economics of Regulation; L52 Industrial Policy - Sector Planning Methods; L97 Utilities General; L98 Government Policy; K23 Regulated Industries and Administrative Law

1 INTRODUCTION

The aim of this paper is to explore how does regulation in infrastructure influence investment and output in infrastructure. Infrastructure provision has undergone major changes in the last several decades that is marked by moving away from the concept where only public sector was responsible for infrastructure provision. This de-statization of infrastructure delivery, that firstly begun in developed countries to be soon followed by developing countries, was facilitated by establishment of independent regulatory authorities that were mandated to allow introduction of competition in the infrastructure provision. Since the investment in infrastructure is most cases high and irreversible the aim of the independent regulatory authorities is to provide a balanced regulatory environment that will avoid cases of both public provision failure of under-provision of services and market failure of provision services that are priced above the social optimum. This balancing act between these two risks results puts a great emphasis on the role of regulation in infrastructure and puts responsibility on the independent regulatory agencies. The IRAs are tasked with ensuring a regulatory environment and incentives addressing the risk of the investors while at the same time ensuring provision of quality services at an acceptable price.

In order to address the questions of how these relatively recent regulatory changes affect the investment and output in infrastructure we focus our analyisis on the sectors of energy, transport and telecommunications. We test the hypothesis that improved infrastructure sector regulation results in improved investment and delivery of services in the corresponding infrastructure sectors. The empirical research is conducted on 25 OECD countries and we also extend the same analysis beyond the developed countries by testing it on a case of a developing country such as Bangladesh.

Proving that this notion is also valid for a developing country such as Bangladesh, as Loayza and Odawara (2010) do on a case of Egypt, can have a significant demonstrational effect reinforcing the message to the policy makers in developing countries that it is both possible and it is within their remit and mandate to improve or create better regulatory environment. By improving infrastructure regulations among other things they can, firstly, bring investment in the infrastructure sectors, and, secondly, increase the efficiency of the output resulting in improved output and delivery for the citizens at the same level of investment.

2 REGULATION, INVESTMENT AND OUTPUT IN INFRASTRUCTURE

2.1 Channels via which regulation affects economic growth and investment

Primary mechanism through which regulation affects growth is through the process of restructuring and factor reallocation that drives economic growth and is also widely known as Schumpeterian "creative destruction" (Schumpeter, 1942). This is a process of old products, services, technologies being replaced with newer and more efficient or completely different ones. This process permits economies to adapt to and to exploit new technological innovations and to evolve along with the changing economic environment (Aghion & Howitt, 2006; Caballero & Hammour, 2000). The process of growth through creative destruction has been researched by studying the relationship of the rate of economic growth and the amount of capital per efficiency unit of labor (Aghion & Ho-

witt, 2006). They produce a curves diagram showing that a higher rate of growth implies a faster rate of technological progress and therefore a faster-growing labor force (in efficiency units). Aghion and Howitt (2006) conclude that the level of research and development in the economy determines the rate of technological progress and therefore the long-run rate of economic growth. Caballero and Hammour (2000) argue that proper institutional environment is necessary in order for the creative destruction process to take place efficiently and that weak institutions and regulatory environment can slow or halt the creative destruction process allowing low-productivity units survive longer than they would have otherwise and in an efficient equilibrium. Low-productivity firms remaining longer in the market is either facilitated by regulation preventing entry of new firms or by existence of a less explicitly anti-competitive regulation such as price floors as elaborated by Carranza et al. (2009).

Another channel influencing the growth is the compliance cost and red tape costs relating to regulation where increased compliance costs can influence firms decision to invest or expand existing capacity. Additional channel through which regulation affects growth is its ability to impose a ceiling on the rate of return on capital which can in turn also influence the production decisions of firms. Averch and Johnson (1962) wrote that the rate ceilings on capital can affect the input mix, namely the demand for capital relative to labour. And finally, regulation, and for that sake privatization can disrupt the agency equilibrium (positively or negatively) by changing the ownership arrangement. Nicoletti and Scarpetta (2003) work claim that incentives for monitoring, cost efficiency, and innovation may be stronger for private firms since owners get the full benefit from each of these actions.

2.2 Regulations and investment output in infrastructure

Empirical research has insofar found a negative effect of excessive sector regulation on GDP, capital accumulation and multifactor productivity in infrastructure. The existing body of empirical studies has also focused mainly on the OECD countries (e.g. Alesina 2005; Wolfl 2010; Sunderland 2011) and this is simply due to the fact that such infrastructure regulatory indicators for infrastructure are only available and maintained for OECD countries. The existing sector-level empirical research generally confirms the theoretical postulates that growth in general and sector investment and output in particular are negatively impacted by regulation that is making entry of firms difficult, or, is not allowing proper competition and hence innovation in the economy. The impact of regulation on sector investment and output has been studied intensively by Nicoleti and Scarpetta 2003; Conway 2006; Grifith 2006; Aghion and Howwit 2006 with various independent variables used to test the relations between regulation and sector investment and output.

Using unique questionnaire, Sutherland et al (2011) find a confirmation that beyond the introduction of competitive forces into the infrastructure sector, other regulatory environment aspects such as for example the independence of the regulatory agency plays similarly important role in attracting investment in infrastructure. Loayza and Odawara (2010) find significant and positive links in Egypt between sector regulation for electricity, telecommunication and transport and economic growth. Wolfl et al (2010) finds significant impact of sector regulation on growth while Bouis (2011) finds that regulations have negative impact on multifactor productivity (MFP). Wolfl et al (2010) investigates regulatory patterns in this extended set of countries as compared to the OECD countries and analyses the link between regulation and growth. However, their study only uses data for years 2003 and 2008 for which general PMR indicators are available using Country-Product-Dummy approach (Summers, 1973; Diewert, 2005; Prasada, 2005).

Arnold et al (2008) find evidence that reforms in service sector in India (telecommunication, transport and banking) have had significant effect on productivity of both local and foreign-owned manufacturing forms in India. Griffith and Harrison in (2004) use a two-step strategy in estimating the effect of the PMR with first step estimate the effect of PMR on level of rents with the second step being estimating the effect of variations in mark-up on factor accumulation R&D. In their work, which this research is extending into developing world, Alesina et al (2005) explore the sectors in OECD countries and try to test its links and impact on the investment in this sector. Alesina (2005) uses country and sector indicators from OECD of non-manufacturing sectors and test it effects on capital accumulation. They group the OECD ETRC Data for these 7 non-manufacturing sectors into: 1), electricity gas and water, 2) communication and post, and, 3) transport and storage. Tight PMR negatively affects investment with capital market imperfections and information asymmetries about substitutability between internal and external sources of finance affecting only SMEs and young firms and not companies that usually work in natural utilities sectors. Indirect impact on investment as opposed to the direct approach employed by Alesina, is adopted by Grifith who tests regulation impact on investment through the effect on the markup in service sectors. He tests the regulation directly on the investment which is in effect extension of approach by Blanchard and Giavazzi in (2003). Loyaza (2005) finds that PMR slows down the reallocation of resources following a shock to the economy. Both sets of research find that reduction in regulation has a sizable and positive effect on investment rate.

2.3 Operationalization of channels of impact into workable indicators

Operationalizing the theoretical channels of impact of regulation on infrastructure provision into workable indicators and datasets has been done by OECD that with its ETRC indicators captures the regulation and regulatory policy in several key areas.

Entry conditions: Regulatory barriers to entry affect the infrastructure investment and output through creating obstacles to efficient investment by allowing abuses of the existing

• *Goran Sumkoski is currently pursuing Ph.D. degree program in global economic governance at Meiji University, Tokyo, Japan. E-mail: goran@sumkoski.com*

firms' dominant position. While OECD economies have removed most of the barriers to entry that is not always the case for Bangladesh with an exception for its telecommunication sector where it more closely mirrors the lifting of entry restrictions similarly to most OECD countries. While, there was a notably slower progress in relaxing the entry conditions in energy and particularly gas sector in OECD countries they have still implemented regulation allowing third-party access. Bangladesh has not fully allowed entry in the areas electricity and gas even though the country is in a great need of investment and output in these areas something that is still hampering the potential for economic growth of the country.

Public ownership and provision of infrastructure: The decline of public ownership partly reflects recognition among OECD governments that it often contributes to either inefficient investment in infrastructure or at the other extreme, underinvestment. Public investment may also lead to the misallocation of resources across regions and sectors due to political rather than economic reasons. This issues are being addressed through also allowing private investment in infrastructure while regulating and monitoring that the provision of services and prices are not above the social optimum.

Unbundling and market structure: The vertical unbundling by creating markets and allowing market forces in them has been done by introducing accounting and legal separation, operation separation, ownership separation or by forming club ownership. This is done with a purpose of preventing strategic behavior of a vertically-integrated incumbent in infrastructure with a natural monopoly of networks that limits competitors' access to its regulated infrastructure. Most OECD countries have to various extent introduced vertical unbundling in transport, telecommunication and energy in order to create greater competitive pressure for efficient infrastructure investment while Bangladeshis still lagging behind.

OECD ETRC database

The most complete database for infrastructure regulation are the OECD ETRC infrastructure regulatory indicators for seven infrastructure sectors (Gas, Electricity, Airlines, Roads, Railways, Post and Telecoms) that are available and maintained by the OECD for its member states for the period between 1975 and 2013 (Appendix 1). Key characteristics (Table 1) that the OECD-style sector regulations capture are: a) allowing competition by allowing entry, b) creating equal playing ground for public and private investors, and, c) creating markets by unbundling vertically integrated monopolies. Due to their nature in the research these seven sectors are often combined in three general infrastructure sectors: Energy (Gas and Electricity), Transport (Airlines, Railways and Roads) and Telecommunications (Post and Telecom). There should be another distinction made that some of them are concerning with both the building and the usage/operation of the infrastructure (Energy, Telecommunications) while the other (Transport) has a shortcoming of only analyzing the usage of existing transport infrastructure and not the building of the transport infrastructure itself. The scale of ETRC infrastructure indicators ranges from 0 (least restrictions) to 6 (most restrictions). Sub-indicators are measured and then an aggregate indicator for sectors is constructed according to the weighting formulae. It should be noted that the OECD infrastructure indicators while capturing regulatory policy they do not capture firstly, the regulatory governance processes and institutions, and, secondly, they are also de jure indicators with lack of insight of the enforcement of the adopted policies which is particularly important as shown here for a developing country such as Bangladesh where enforcement of regulation is lacking.

Table 1: OECD ETRC (Energy, Transport, and Communications) indicators

Regulation Sub-Indicator	Definition	Applies to	Measurement
Entry barriers	Indicators for entry regulation focus on terms and conditions for third party access (TPA) and the extent of choice of supplier for consumers.	Airlines, telecoms, electricity, gas, post, rail, road	Legal conditions to entry, liberalization of domestic markets, restrictions in number of competitors.
Public ownership	Indicators for public ownership record the prevailing ownership structure in the various segments of the sectors, ranging from fully private to fully public.	Airlines, telecoms, electricity, gas, post, rail	Percentage of shares of companies owned by government, ownership structure of largest companies in the market
Vertical integration	Indicators for vertical integration focus on whether competitive activities such as generation, production, physical network and supply of goods and services to the final consumer are separated from natural monopoly activities such as the national grid and/or local distribution.	Electricity, gas, rail	Degree of vertical integration in an industry, degree of separation across segments of an industry (e.g. supply from distribution of gas).
Market structure	An indicator of market structure in the sector records the market shares of the largest companies in the various segments of the industry	Telecoms, gas, rail	Market share of largest company, market share of new entrants, maximum number of competitors in an area.

3 Data Analysis

The empirical literature assessing the impact of regulation on

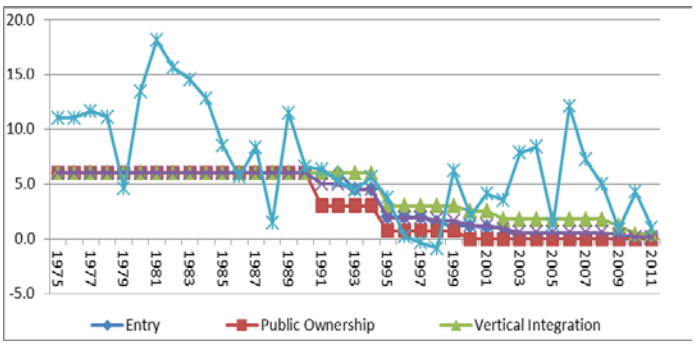
investment and output in infrastructure has been hampered by availability of data that can capture the regulatory policy in specific infrastructure sectors which has led to research being mostly based on case studies of particular country and on a single sector of infrastructure. For the purpose of extending this research beyond the developed OECD countries a same set of indicators have been uniquely reconstructed for Bangladesh for the infrastructure sectors (airlines, railways, roads, gas, electricity, telecommunications post) and for the same period between 1975 and 2013 in order to match the scope, depth and breadth of the current OECD infrastructure indicators. The OECD ETRC indicators are fully replicated for Bangladesh by collecting data from the primary sources such as ministries and agencies in charge of regulating infrastructure in Bangladesh.

In order to gain some insight from a historic perspective of how the infrastructure sector regulation developed over time and across countries we draw a timeline of how the ETRC infrastructure regulation indicators in these sectors developed worldwide. If we compare the curves for the same sectors Energy, Transport and Telecommunications for Bangladesh (Appendix 3: Figure 1, 2 and 3) we see a pattern that is common for many developing countries of starting this infrastructure regulation simplification process at a much later stage but having much sharper curve in an obvious effort to catch up with developed world. The graphs highlight the fact that the United States were the first country to begin reforming infrastructure regulation in the 1970ies. A number of other countries followed – notably the United Kingdom, Canada, New Zealand, while Japan and Sweden - commenced their reforms slightly later, starting from the late 1980ies and early 1990ies. In other European countries such as France and Italy the regulatory reforms in infrastructure began only in the mid 1990ies. The regulatory improvements in Bangladesh in all three infrastructure sectors here are obvious however they are still lagging beyond those of the developed countries. Compounding this problem is that even these regulatory improvements in Bangladesh are also to a significant extent de jure and to a much lesser extent fully enforced or implemented as yet in practice than it is the case in the OECD countries.

Another notable phenomena is that - even though it is tempting to think of regulatory simplification as facilitating and preceding the higher investment and growth - data in almost all countries shows that it is actually the fall in investment levels - that can regularly be seen between 1 to 5 years prior to an infrastructure regulatory reform (Figure 1) - that precipitates and necessitates regulatory reform as governments try to avert sustained disinvestments in infrastructure over a longer period.

This shows that it is more often not a matter of a choice or a vision, though it has many partial elements of all this, but it is also most likely coming out of the necessity for the governments to ensure continuous political goodwill and support by attracting or be seen as wanting to attract investment in the infrastructure thus improving services for citizens.

Figure 1 Historical levels of investment and regulation in US Energy sector (% increase over previous year)



Illustrating that this is not an easy process the data highlights another phenomena of an evident lack of immediate investment even after the reforms are implemented, meaning there are not droves of investors ready and waiting at the doors for a regulatory simplification to take place. This is in line with investors wanting to be sure that de jure regulatory improvement is indeed an improvement and wanting to see long-term commitment to sustaining the implemented reforms. They also want to see whether de-facto following through with the regulatory agency institutional and governance capacities is also taking place in order to support the perception of the real and tangible improvement to the regulatory environment. Maybe even more importantly this difference between de jure and de facto state of the affairs is a key obstacle for developing countries such as Bangladesh where we see less commitment, confidence and capacity to push through with full implementation once the regulatory legal improvements are adopted.

Regulatory Environment in Bangladesh

Despite the continuous economic growth, the administrative and political apparatus of Bangladesh is still overtly bureaucratic, clientilistic, prone to capture by interest groups and marked by major discrepancies between the de jure and de facto regulatory environment due to not fully enforcing the adopted regulations. Institutions including the IRA are usually staffed by generalists with little interest in specializing in the area of their work beyond the mastering general administrative and bureaucratic procedures since that is knowledge that is replicable in other institutions where they will be rotated to. At the level of IRAs governing the infrastructure in Bangladesh, the reasons for desired outcomes in the infrastructure provision not being produced as yet are both of institutional and governance nature as well as of technical nature such as existing capacity and expertize levels. All of this creates lack of predictability and uncertainty in the depth of regulatory commitments by the government.

The IRAs' institutional and governance level problems stem from the limited independence both from government and from special interests and lack of ability or political will to commercialize the regulated state-owned enterprises. This is compounded by the failure to provide de facto competitive

environment and lack of property rights protection. Lack of adequately providing and considering the public feedback on regulatory decisions similarly leads to lack of credibility of the regulator and mistrust of regulatory reforms.

At capacity level the issues hampering the IRA effectiveness are the limited resources, technical expertise, and capacity to fully use their regulatory powers. This is illustrated by lack of systematic data collection and analysis required for good quality regulatory decisions resulting in applying inappropriate benchmarks or standards. Another weakness is the proper use of regulatory methodologies and instruments for pricing, tariff, penalties and existence of unjustifiable cross-subsidies. There is also need to better articulate the social and other non-economic obligations being imposed on regulated enterprises and to provide openness and transparency for the general public on important documents such as power purchase agreements etc.

4 METHODOLOGY

We conduct the empirical analysis for two separate dependent variables, Investment in Infrastructure Sectors (INVENE INTELE, INVTRANS), and, Infrastructure Sector Output (ENEOUT, TELEOUT, TRANSOUT). Data on investment in the given sector (1975–2013) is collected from OECD database and WDI, and directly from the infrastructure regulatory agencies in Bangladesh. Infrastructure sectors output is measured through energy production in MwH, telecommunication output in mobile phone subscribers, and transport output in tons of goods and number of passengers transported obtained from WDI and OECD STAN. Independent variables that we test here are obtained from the indicators database of the OECD ETRC Infrastructure Regulation Indicators: Entry (ENTRY), Public/Private Ownership (PUBPPRI), Vertical Integration (VERTIN) and/or Market Share/Structure (MARSTR). In addition to a year-on-year analysis we show the results of a 3-year lagged impact of the independent variables to allow for changes in the regulatory environment to trickle down to the investment and output since the investment and output in infrastructure are processes that require time to be operationalized in practice.

We first conduct a panel regression analysis to test the impact of the OECD ETRC infrastructure indicators on the investment and output in 25 OECD countries year-on-year and with a 3-year lag and we are then also conducting a separate the OLS analysis on a case of a developing country such as Bangladesh with the set of infrastructure indicators (Appendix 2). For additional robustness test we use the 2SLS method with additional independent variables known to have impact on investment and output in infrastructure such as GDPPC, GOVEXP, FDI and EDU introduced in the regression equation as instrumental variables as to test the robustness of the results of the original regression.

We test the assumption that infrastructure regulation positively impacts investment/output in Energy, Telecommunications and Transport using following empirical model:

$$[\ln\beta Inv]_{(t)} = \beta_0 + \beta_1 \ln\beta ENTRY + \beta_2 \ln\beta PUBPRI + \beta_3 \ln\beta[VERTIN/MARSTR] + \mu_{(t)} + \delta_{(t)} + \varepsilon_{(t)} \quad (1)$$

$$[\ln\beta Out]_{(t)} = \beta_0 + \beta_1 \ln\beta ENTRY + \beta_2 \ln\beta PUBPRI + \beta_3 \ln\beta[VERTIN/MARSTR] + \mu_{(t)} + \delta_{(t)} + \varepsilon_{(t)} \quad (2)$$

$\mu_{(t)}$, $\delta_{(t)}$ = Country and time specific unobserved effects

$\varepsilon_{(t)}$ = error term.

. Both IVs and DV are logged variables using natural logarithm ln for a better interpretability of the results where 1% increase in IV leads to intercept β % increase/decrease of DV. In particular, the specifications that exclude the contemporaneous value of the regulatory indicators are less open to criticisms about the endogeneity of the regulatory index itself due to deregulation occurring contemporaneously with a positive (or negative, for that matter) idiosyncratic shock to investment. The VIF results are showing no multicolinearity in most of the different regressions and show moderate multicolinearirty in two of them. The data met the assumption of independent errors (Durbin-Watson). Visual review of the scaterplot for each regression does not show presence of heteroskedasticity. Variables at level have unit roots but when converted to ln level they become stationary. Results are robust to several sensitivity checks with additional control variables and instrumental variables using 2SLS regression.

5 RESULTS AND ANALYSIS

We present here the results of a longitudinal analysis of the panel data for 25 OECD for the years between 1975 and 2011 and OLS regression analysis for Bangladesh for the period between 1975 and 2013. The results for both OECD countries and Bangladesh of three measures of regulations on infrastructure investment and output are given in Table 1 and Table 2. The results from the panel data regression for the 25 OECD countries show that both ENTRY and PUBPRI variables show statistical significant impact on both the investment and output in Transport including year on year as well as when independent variables are lagged for three years. In Energy sector in addition to ENTRY and PUBPRI, VERTINT is also found to have statistically significant and positive impact on investment and output.

In Telecommunications ENTRY fails to show statistically significant impact while PUBPRI and MARSTR both show statistically significant impact on investment and output year on year and when with a 3-year lag. All beta coefficients show the expected negative signs. The results confirm findings of the previous studies (e.g. Alesina 2005; Sutherland 2011; Wolfl 2010) that ENTRY, together with PUPBPRI is the most significant factor affecting investment in the key infrastructure sectors in OECD countries.

Table 1. Energy, Telecommunications and Transport Regulations OECD

	ENTRY	PUBPRI	VERTIN	MARSTR	RSq/Obs
INVENE	-0.31***	-0.64***	-0.27*		0.14
	(0.001)	(0.001)	(0.088)		747
INVENE 3YLAG	-0.04	-0.62**	-0.41*		0.04
	(0.737)	(0.011)	(0.066)		745
ENOUT	-0.10***	-0.25***	-0.16***		0.23
	(0.000)	(0.000)	(0.000)		602
ENOUT 3YLAG	-0.27***	0.18	-0.38***		0.11
	(0.000)	(0.177)	(0.003)		616
INVTELE	-0.017	-0.42***		-1.88***	0.21
	(0.817)	(0.000)		(0.000)	264
INVTELE 3YLAG	-0.01	-0.37***		-1.80***	0.22
	(0.905)	(0.000)		(0.000)	333
TELEOUT	-0.156	-1.13***		-8.29***	0.42
	(0.414)	(0.000)		(0.000)	331
TELEOUT 3YLAG	-0.26	-1.18***		-8.96***	0.34
	(0.262)	(0.000)		(0.00)	367
INVTRANS	-0.77***	-.49***			0.20
	(0.000)	(0.010)			787
INVTRANS 3YLAG	-0.56***	-0.51***			0.15
	(0.000)	(0.004)			780
TRANSOUT	-0.92***	-			0.17
	(0.000)	(0.005)			643
TRANSOUT 3YLAG	-0.46***	-0.38			0.05
	(0.000)	(0.103)			656

The β standardized coefficients are marked with (***), (**) and (*) marking statistical significance at 1%, 5% and 10% level respectively. p values given in brackets.

The results from OLS regressions analysis for Bangladesh (Table 2) similarly to the OECD countries also show that the ENTRY, PUBPRI and VERTINT indicators are statistically significant for investment and output in the Energy sector in both year to year and 3-year lagged analysis, mirroring the same results from the OECD panel data. Similarly, though only in the 3-year lag case, ENTRY is statistically significant for investment and output in Telecommunications while PUBPRI and MARSTR show strong statistically significant impact in both infrastructure output and investment expect for the 3-year lagged investment. Investment in Transport sector that is generally very weak due to uncompleted transport network in Bangladesh shows to be statistically significantly affected by ENTRY and PUBPRI when independent variables are 3-year lagged while the transport output shows no statistically significant impact from both these variables.

Table 2. Energy, Telecommunications and Transport Regulations Bangladesh

	ENTRY	PUBPRI	VERTIN	MARST	R2/StEr
INVENE	-0.64***	2.14***	-2.13***		0.70
	(0.000)	(0.000)	(0.000)		.36856
INVENE 3YLAG	-0.48**	1.72**	-1.82**		0.54
	(0.023)	(0.003)	(0.006)		.38284
ENOUT	-0.36***	1.32***	-1.86***		0.90
	(0.000)	(0.000)	(0.000)		.31581
ENOUT 3YLAG	-0.52***	1.01***	-1.39***		0.92
	(0.000)	(0.001)	(0.000)		.25628
INVTELE	-0.43	0.62**		.69***	0.7483
	(0.111)	(0.039)		(0.000)	.39253
INVTELE 3YLAG	-0.4347*	0.3225		-0.22	0.7013
	(0.095)	(0.265)		(0.206)	.44648
TELEOUT	-0.26	-1.02***		0.25**	0.87
	(0.217)	(0.000)		(0.012)	1.5654
TELEOUT 3YLAG	-0.42**	-0.99***		0.36***	0.83
	(0.048)	(0.000)		(0.008)	1.6812
INVTRANS	-0.91***	0.13			0.62
	(0.000)	(0.495)			.76431
INVTRANS 3YLAG		-0.70***			0.48
		(0.000)			.85569
TRANSOUT	-0.36	-0.11			0.16
	(0.213)	(0.708)			1.0016
TRANSOUT (3YLAG)	0.14	-0.48			0.06
	(0.770)	(0.339)			.66867

The β standardized coefficients are reported and marked with (***), (**) and (*) marking statistical significance at 1%, 5% and 10% level respectively. p values given in brackets.

Main conclusion is that the results for all three sectors, Telecommunications, Energy and Transport, continue to show statistically significant impact similarly to the OECD countries though not in all sectors and with also marginally weaker links for Bangladesh than for the OECD countries. Results of the linear regressions of the time series data for Bangladesh lends further validity to hypothesis that infrastructure regulatory policy is also of a key importance for a developing country as the previous research on these links shows to be the case in the OECD countries.

2SLS robustness test with additional control variables

In order to check the robustness of the results 2SLS regressions is conducted where we add instrumental variables with GDP Per Capita (GDPCC) as endogenous on which the Government Expenditure (GOVXP), Foreign Direct Investment (FDI) and Education (EDU) variables are instrumented as standard variables that are conventionally used in the literature as instruments for GDPPC. We again analyze the three sectors: Energy, Telecommunications and Transport using following empirical model:

$$[\ln\beta INV]_{(t)} = \beta_0 + \beta_1 \ln\beta ENTRY + \beta_2 \ln\beta PUBPRI + \beta_3 \ln\beta[VERTIN/MARSTR] + \beta_4 \ln\beta GDPPC + \beta_5 \ln\beta GVXPN + \beta_6 \ln\beta FDI + \beta_7 \ln\beta[EDU] + \mu_{(t)} + \delta_{(t)} + \varepsilon_{(t)} \quad (1)$$

$$[\ln\beta SecOut]_{(t)} = \beta_0 + \beta_1 \ln\beta ENTRY + \beta_2 \ln\beta PUBPRI + \beta_3 \ln\beta[VERTIN/MARSTR] + \beta_4 \ln\beta GDPPC + \beta_5 \ln\beta GVXPN + \beta_6 \ln\beta FDI + \beta_7 \ln\beta[EDU] + \mu_{(t)} + \delta_{(t)} + \varepsilon_{(t)} \quad (2)$$

Results from the 2SLS linear regressions for both OECD countries and Bangladesh of regulations on infrastructure investment and output with GDPPC as exogenous and EDU as instrumental variable are given in Table 3 and Table 4.

Table 3. OECD 2SLS, GDPCC exogenous (GOVXP, FDI, EDU,

Instrumental Variables)

	ENTRY	PUBPRI	VER-TIN	MARS TR	GDPCC	Rsq /St.Er
INVENE	0.16*	0.02	0.10		4.03***	0.44
	(0.062)	(0.905)	(0.495)		(0.000)	542
INVENE (3YLAG)	0.34**	-0.13	-0.10		3.25***	0.13
	(0.016)	(0.667)	(0.684)		(0.000)	552
ENOUT	0.08***	-0.03	0.02		1.59***	0.81
	(0.000)	(0.316)	(0.365)		(0.000)	620
ENOUT (3YLAG)	-0.30***	0.35**	-0.13		0.95***	0.16
	(0.000)	(0.045)	(0.368)		(0.000)	615
INVTELE	0.10***	-0.20***		0.12	3.78***	0.82
	(0.008)	(0.000)		(0.652)	(0.000)	317
INVTELE (3YLAG)	0.09**	-0.24***		0.06	3.22***	0.75
	(0.022)	(0.000)		(0.823)	(0.000)	343
TELOUT	0.10	-0.49***		-0.87	18.16***	0.71
	(0.430)	(0.000)		(0.367)	(0.000)	237
TELOUT 3YLAG	0.07	-0.59***		0.34	17.22***	0.66
	(0.653)	(0.000)		(0.757)	(0.000)	291
INVTRANS	0.03	0.17			3.52***	0.42
	(0.754)	(0.342)			(0.000)	598
INVTRANS (3YLAG)	0.11	0.15			3.03***	0.34
	(0.272)	(0.408)			(0.000)	607
TRAN-SOUT	0.10	-0.02			2.89***	0.29
	(0.424)	(0.916)			(0.000)	649
TRAN-SOUT(3YLAG)	0.18*	-0.40**			1.49***	0.14
	(0.086)	(0.045)			(0.000)	639

The β standardized coefficients are reported and marked with (***), (**) and (*) marking statistical significance at 1%, 5% and 10% level respectively. p values given in brackets.

We find that with the 2SLS analysis the results still remain strong and robust for both OECD and Bangladesh. Testing for the effect of GDPCC on infrastructure investment and output in addition to our original independent variables, we see that in the Energy sector results for OECD countries the ENTRY still remain statistically significant, PUBPRI is statistically significant in 3-year lagged energy output, while VERTINT loses its statistical significance. In the Telecommunication sector with 2SLS, PUBPPRI remain statistically significant in all variations while the ENTRY is significant for investment and MARSTR is not statistically significant in its impact on investment and output in telecom. In the Transport sector the ENTRY indicator is joined by PUBPRI as having statistically positively impact on TRANSOUT when 3-year lagged. GDPCC as expected shows positive and statistically significant impact on investment and output in infrastructure for both OECD countries as for the Bangladesh.

The results of the 2SLS analysis for Bangladesh where we also instrument the endogenous GDPCC with TRDOPN and EDU we see that the key infrastructure regulatory indicators, ENTRY, PUBPRI, VERTIN, MARSTR are mostly positive and significant for Bangladesh in either year on year or 3-year lag versions (Table 4).

Table 4. Bangladesh 2SLS, GDPCC exogenous (GOVXP, FDI, EDU, Instrumental Variables)

	ENTRY	PUBPRI	VERTIN	MARSTR	GDPCC	Rsq/ St. Er
INVENE	-1.89*	3.51**	-2.12***		0.31	0.73
	(0.095)	(0.000)	(0.000)		(0.801)	.34789
INVENE 3YLAG	0.71	2.32***	-0.85		3.18***	0.61
	(0.565)	(0.001)	(0.146)		(0.009)	.34959
ENOUT	0.08	3.12***	-2.17***		2.81***	0.96
	(0.899)	(0.000)	(0.000)		(0.000)	.20207
ENOUT 3YLAG	-1.21**	2.54***	-1.63***		2.94***	0.97
	(0.022)	(0.000)	(0.000)		(0.000)	.15334
INVTELE	-8.89**	157.01		238.16***	57.39	0.7734
	(0.043)	(0.175)		(0.000)	(0.557)	22.746
INVTELE 3YLAG	-0.12	5.99**		-2.13**	5.09*	0.6147
	(0.236)	(0.040)		(0.046)	(0.076)	.49423
TELOUT	-0.35*	-5.71		6.68***	12.50***	0.9469
	(0.075)	(0.220)		(0.000)	(0.001)	.98219
TELOUT 3YLAG	-0.48***	9.63*		2.98	29.94***	0.9501
	(0.006)	(0.067)		(0.105)	(0.000)	.89055
INVTRANS	1.07	-1.11			3.83***	0.74
	(0.430)	(0.061)			(0.009)	.34789
INVTRANS 3YLAG	-0.21				3.69***	0.62
	(0.806)				(0.003)	.71418
TRAN-SOUT	4.58**	-2.19**			5.05***	0.21
	(0.016)	(0.027)			(0.003)	.9581
TRAN-SOUT 3YLAG	3.15**	-1.59**			2.71**	0.08
	(0.042)	(0.047)			(0.018)	.65342

The β standardized coefficients are reported and marked with (***), (**) and (*) marking statistical significance at 1%, 5% and 10% level respectively. p values given in brackets.

In the Energy sector results for Bangladesh mirrors the results for OECD countries with all ENTRY, PUBPRI and VERTIN having statistically significant impact on both investment and output in energy sector in all variations. In the Telecom sector the 2SLS results for Bangladesh show that ENTRY, PUBPPRI and MARSTR remains same statistically significance in their impact on INVTELE and TELOUT as in the original regression. In the Transport sector in Bangladesh similarly as for the OECD countries in the 2SLS model the ENTRY is joined by PUBPRI as having statistically positively impact on TRANSOUT in the 3-year lagged version.

The results of this empirical research show that the infrastructure regulation is important factor conducive to both investment and output and beyond the OECD countries this is also a case for a developing country such as Bangladesh. Key areas that OECD-style infrastructure regulation policy indicators identify for improvement are: 1) allowing competition and creating equal playing ground for all investors through allowing entry and public and private ownership, and, 2) creating markets by unbundling vertically integrated monopolies. This research confirms the findings of Loayza and Odawara (2010) that in general, lower regulatory burden leads to higher investment and output and that the most critical sub-

components of this are the allowing entry and competitive forces into the infrastructure sector. Adding the GDP Per Capita, Government Expenditure, Education, and FDI confirms the robustness of the results of the impact of regulation on infrastructure investment and output.

However, in order to develop practical and operational recommendations about how such infrastructure regulatory environment outcomes that are conducive to investment and service delivery can be achieved, further research is required on what it takes for such a comprehensive and systematic infrastructure regulatory environment to be introduced and managed in a sustainable way. Such research, which should take into account key institutional factors such as accountability, transparency, inclusiveness and other institutional and governance handles, is of a crucial importance for introducing and maintaining such a good regulatory environment. It would be beneficial for the future research on policy lessons and recommendations to: a) further improve them to capture institutional and governance factors, and, b) for the OECD style infrastructure regulations indicators to be extended and maintained for developing countries too. Such reconstructed regulatory database, similarly to the WGI, Doing Business and other global indicators, will also have a significant standard setting role in terms of motivating government towards achieving these goals in infrastructure. Extending the research into capturing the institutional and governance factors affecting the regulation of infrastructure will in turn provide a platform for developing detailed policy recommendations for regulatory institutions, governance, policies, tools and instruments in developing countries. It is worth to yet again note here the shortcomings of OECD infrastructure regulatory indicators such as not capturing institutional and governance factors in achieving improved infrastructure regulations as well as lack of insight into proper use of regulatory tools and instruments. Nevertheless, and even though the indicators are capturing only regulatory policy aspects, they are still the only ones available and while presenting only a snapshot of legal and de-jure regulatory policy at given time, they also give general directions for both drawing policy lessons and recommendations for managing regulations in infrastructure in developing countries.

Infrastructure regulation conducive to increased investment and output can be in countries like Bangladesh achieved and maintained if independent regulators are provided with relevant capacity and mandate is reducing the regulatory risk and uncertainty for investors. Guiding sectoral regulatory governance principles for IRA's should be to subscribe to the principles of effectiveness, efficiency and transparency as well as accountability, participation, inclusiveness, credibility and hence legitimacy. At policy level, such institutionally capable IRA should be able to implement policy of introducing competiveness into the sector by allowing entry, facilitating private and public ownership, vertically unbundling the integrated sectors, and, reigning in any potential for monopoly and promoting innovation. The pursuit of a consistent and efficient application of regulatory governance principles for IRAs be achieved through effective transfer of the regulatory powers to IRA and improving the their organizational design and institutional capacity. Capacity for use of regulatory tools, design of concessions, pricing mechanisms, formulating incentives, drafting contracts, monitoring and enforcement of regulation has to be improved in a sustainable manner. As importantly, developing systems for participatory regulatory approach providing transparency, accountability, inclusion and addressing social issues and adopting and implementing conflict resolution mechanisms are of key importance for successful regulatory governance in developing countries.

6 Conclusion

This empirical research confirms that both the theoretical predictions and the existing body of empirical evidence for OECD countries (Alesina 2005) that improved regulations in infrastructure lead to higher investment and higher output, are confirmed for OECD countries and are also found to be valid for a developing country and developing country in this case Bangladesh. The main conclusion of the research confirms that introducing market forces and competition into the infrastructure sectors such as energy, transport and telecommunications through allowing entry, private ownership and vertical unbundling of market sectors are key factors for increased investment in the sectors and for increased efficiency of the investment in the sectors shown through increased output for the same levels of investment. Even more importantly for the developing world, the findings of this empirical research confirm that the similar body of research for developed countries is equally valid for a case of a developing country such as Bangladesh. The rise of the independent regulatory agencies as a centerpiece of infrastructure provision in both developed world and more recently in the developing countries has led to changes in the regulatory and policy environments in infrastructure. This was necessitated by the experience showing that exclusive public sector ownership and provision led to inefficient investment. The findings presented in this article suggest that greater competition in the provision of infrastructure can boost investment and output in infrastructure. While most policies captured here appear to be conducive to higher investment and output, introducing competition through allowing entry and vertical unbundling of the infrastructure sectors appear to be more significant for increasing both investment and output. In general a competitive environment appears to be supportive of more efficient use of resources in infrastructure though this varies depending on the characteristics of the particular infrastructure sector. These results have important demonstrational effect sending a powerful message to the policy makers in developing countries that it is both possible and it is within their remit and mandate to improve or create regulatory environment that will both, firstly, bring investment in the infrastructure sectors, and, secondly, increase the efficiency of the output with the same level of investment resulting in improved infrastructure provision.

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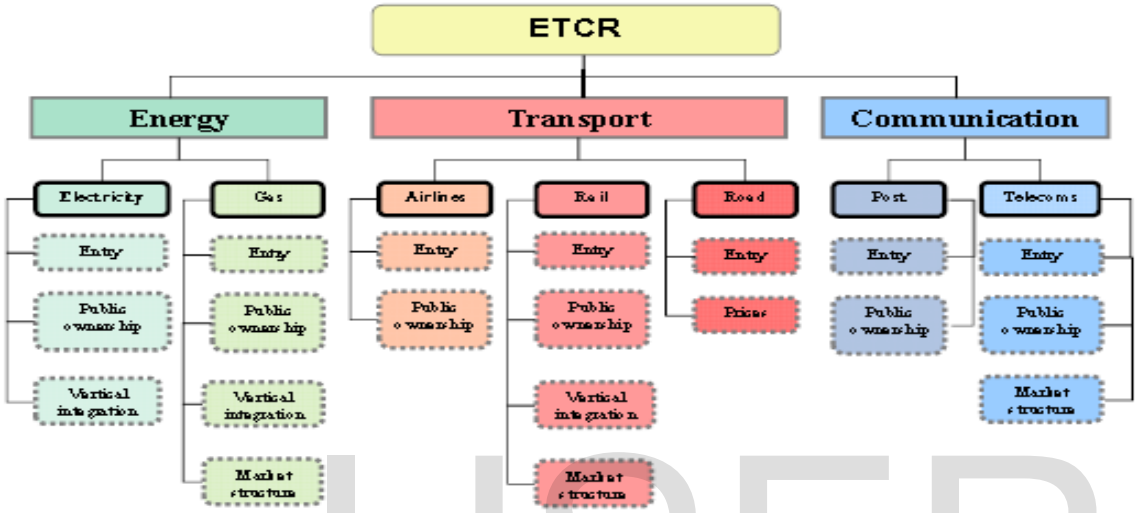
Appendix 1 - Construction of OECD Infrastructure Regulation Indicators

The OECD indicators of **regulation in energy, transport and communications (ETCR)** summarizes regulatory provisions in seven sectors: telecoms, electricity, gas, post, rail, air passenger transport, and road freight. The **ETCR indicators** have been estimated in a long-time series and are therefore well suited for time-series analysis. The trade-off, however, is that the range of regulatory provisions covered by the ETCR indicators is not as broad as that of the indicators of product market regulation (PMR). However, the **ETCR indicators** cover sectors in which anti-competitive regulation tends to be concentrated, given that manufacturing sectors are typically lightly regulated and open to international competition in OECD countries. The current tree structure of ETCR indicators:



Sectoral Indicator of regulatory reform: Electricity

	Weights by theme (b_j)	Question weights (c_k)	Coding of data					
Entry regulation:	1/3							
			Regulated TPA		Negotiated TPA		No TPA	
How are the terms and conditions of third party access (TPA) to the electricity transmission grid determined?		1/3	0		3		6	
			yes				no	
Is there a liberalised wholesale market for electricity (a wholesale pool)?		1/3	0				6	
			No threshold	<250 gigawatts	Between 250 and 500 gigawatts	Between 500 and 1000 gigawatts	More than 1000 gigawatts	No consumer choice
What is the minimum consumption threshold that consumers must exceed in order to be able to choose their electricity supplier ?		1/3	0	1	2	3	4	6
Public ownership:	1/3							
			Private	Mostly Private	Mixed	Mostly Public	Public	
What is the ownership structure of the largest companies in the generation, transmission, distribution, and supply segments of the electricity industry?		1	0	1.5	3	4.5	6	
Vertical Integration:	1/3							
			Separate Companies		Accounting separation		Integrated	
What is the degree of vertical separation between the transmission and generation segments of the electricity industry?		1/2	0		3		6	
			Unbundled		Mixed		Integrated	
What is the overall degree of vertical integration in the electricity industry?		1/2	0		3		6	
Country scores (0-6)			$\Sigma_j b_j \Sigma_k c_k$ answer$_{jk}$					

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Appendix 2 - Data matrix and yearly ranges of data availability per country

	Regulation - Dependent Variable	Insitutional Variables - ICRG							Alternative Institutional Variables for Robustness Check							Control Variables			
Country	Regulation - OECD	Buerocratic Quality	Corruption	Democratic Accountability	Law and Order	Government Stability	Political Risk	Investment Profile	Regulatory Quality -WGI	Property Rights - Heritage	Rule of Law - WGI	Corruption - Heritage	Accountabilty - Voice WGI	Government Effectiveness -WGI	Business Freedom - Heritage	Education - WDR	Government Expenditure - WDR	GDP Per Capita - WDR	Foreign Direct Investment - WDR
Australia	1975 - 2007	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Austria	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Bangladesh	1975 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Belgium	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Canada	1975 - 2008	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Czech Republic	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Denmark	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Finland	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
France	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Germany	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Hungary	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Ireland	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Italy	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Japan	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Korea, South	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Mexico	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Netherlands	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Norway	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Poland	1975 - 2008	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Portugal	1975 - 2007	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Slovakia	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Spain	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Sweden	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
Switzerland	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
United Kingdom	1975 - 2008	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013
United States	1975 - 2011	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1985 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1995 - 2013	1975 - 2013	1975 - 2013	1975 - 2013	1975 - 2013

Appendix 3 - Comparison of Historical Data on Regulation

Figure 1 OECD countries and Bangladesh Telecommunication Sector Regulation Historic Data

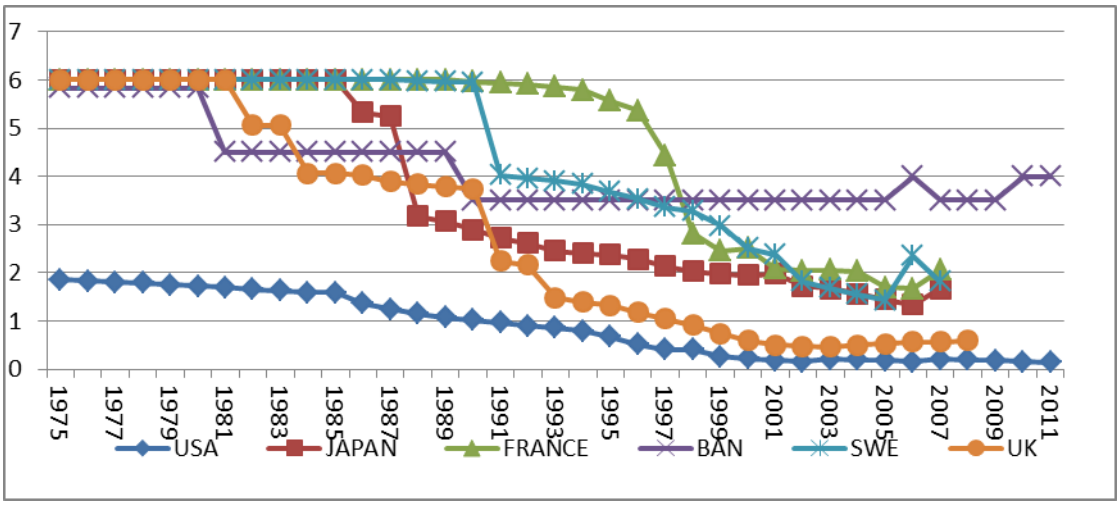

Figure 2 OECD countries and Bangladesh Energy Sector Regulation Historic Data

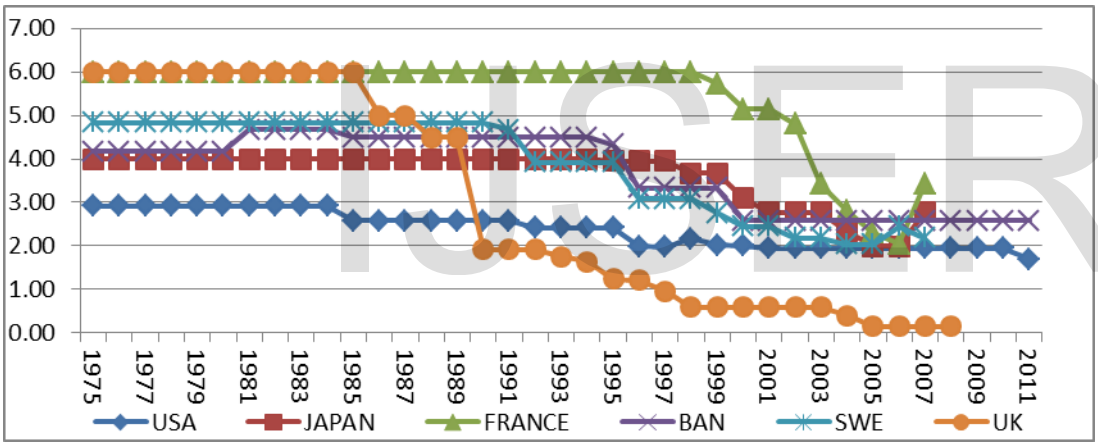

Figure 3 OECD countries and Bangladesh Transport Sector Regulation Historic Data