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Research Report

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Economic Effect of Regulatory Reforms in Korea

Jungwook Kim

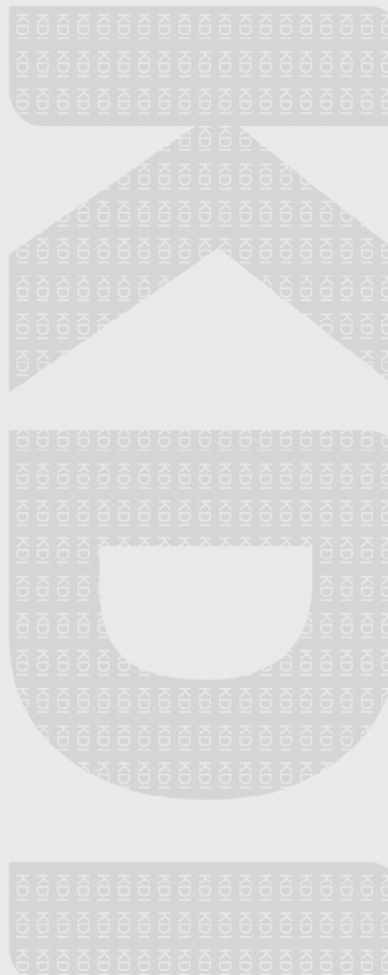
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Policy Study 2016-01

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| Preface |

Korea is currently navigating its way to boost the economy through regulatory reforms and allocate much effort to detect regulations imposing more burden for industries and those industries. Diverse measures were taken into account under ambitious national plans. To maximize the impact of regulatory reforms, however, we need to quantify regulatory burdens on companies and design innovation plans effectively.

Regulatory cost on industries is involved with each steps of business cycle: price and quantity determination, positioning, wage and dividend setting and so forth. Also, regulatory burden can affect business decision making. Therefore, measuring regulatory cost and benefit itself takes comprehensive studies. In this study, the authors conducted economic assessment on marginal effects of regulatory reforms. On the other hand, they tried to distribute the total regulatory costs to large, medium-sized, and small firms. We expect that it gives policy implications to impose 'fair' regulations especially on small and medium-sized firms.

This study was conducted to verify and measure regulatory cost in Korea and its distribution over cooperates. I would like to thank Dr. Jungwook Kim and Soobok Chae for this meaningful work. I express gratitude for Dr. Mark Crain and Dr. Nicole Crain from Lafayette College for giving valuable insights as well as introducing their research methods in detail. Also, Suhyeon Wi, as a research associate, helped this study with administrative works.

Joon-Kyung KIM
President of KDI

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Summary

This paper adapts the World Bank Regulatory Quality Index (RQI) which is produced annually to have better understandings on effects of regulatory reforms, instead of the Production Market Regulation (PMR) indicators published every 5 years. Firstly, this analysis indicates that GDP per capita will be raised by 16.3~29.8% when the index increases by one unit. Secondly, we find that 9.9 to 32.2 billion USD worth of regulatory cost could be reduced, if the regulatory quality in Korea improves to the level of the OECD average considering that the total burden of regulation in Korea is estimated 2.2 to 357.4 billion USD. The estimate of regulatory cost reduction takes roughly 0.76 to 2.47% of Korea's GDP in 2013, underscoring the importance of regulatory reforms for the Korean economy.

CHAPTER 1

Introduction

In Korea, reforming regulation is among the top national priorities to achieve economic growth. Various measures have been undertaken for facilitating and enhancing regulatory reforms. The Korean government has launched an ambitious regulatory reform agenda as a part of its Three Year Economic Innovation Plan (March 2014~February 2017). The agenda includes a focus on both:

- Improving or eliminating regulations in order to promote employment and investment, with a view towards accelerating economic growth (i.e. the “what”) – with a focus on health, education, tourism, finance, software, culture and logistics industry; and
- Institutional improvement to facilitate regulatory reform (i.e. the “how”) – with a focus on introduction of the cost-in, cost-out system, establishment of regulatory reform principles, and disclosure of regulatory information.

Many countries including Korea tend to set their policy focus on regulatory reform during economic stagnation. Since early 1980, Korean administrations have tried to reform regulation, nevertheless there are critiques that actual outcome was enough (Lee *et al.*, 2008). To maximize the effect of regulatory reform, we need to detect regulations with more burdens and industries with those regulations. Through the process of introducing and repealing regulations, we need economic

impact analysis on social cost and benefit from those regulations. In this study, we have a focus on measuring costs and benefits of regulation in monetary terms instead of the number of regulations.

Regulatory costs occur relatively implicitly unlike most fiscal actions taken by government. Crain and Crain (2010) gives an example where activities, products, and services consumed by a ordinary household on one day. Costs of government regulations get involved with the indistinct mixture of countless economic forces that determine prices, costs, designs, locations, profits, losses, wages, dividends, and so forth. Isolating the contribution of regulations requires more than simply looking at the sales receipts. A comprehensive list of regulatory influences is indeed extensive and overwhelming to track or sum up. Still, Crain and Crain (2010) asserts that knowledge of the cumulative consequences of regulatory actions provides important information to assess and evaluate the performance of a political-economic social system.

The current paper firstly aims to measure the regulatory cost in Korea. Note that we measure regulatory cost by comparing with other advanced countries instead of 'zero' regulatory environments. Previous research estimating the cost of regulation is available and country-level estimates are not rare. For instance, Crain (2005) and Crain and Crain (2010) estimate regulatory cost in the U.S., and Lee, Kim and Park (2008) estimate the cost in Korea. Inaccuracy of regulatory cost estimates is an issue when establishing or repealing regulations. This is firstly because most of ex ante studies cannot capture uncertainty and instability of policies and secondly there occur optimism bias. Nevertheless, we consider economic analysis result importantly as one of criteria to select a best regulation because it makes most of policy decisions easier.

On the other hand, we need to take into account fairness of regulations between diverse groups. This is because regulations may affect firms differently depending on their size. In the U.S., the Regulatory Flexibility Act was revised to ensure fairness for small to mid-size firms in 1980. This act also required reviews of all the regulations for any unfairness. The Small Business Regulatory Enforcement Fairness Act, established in 1996, reduces punishments for

small to mid-size firms when they violate regulations (Lee, 2012). The former British Prime Minister, Tony Blair, emphasized the significance of voice from small to mid-size firms and regulations' effect on them in different scale. A program named 'Think Small First' of EU supports small to mid-size firms by paying attention to their perspectives and reflecting the evaluations of their costs and benefits from regulations to enhance regulation quality. Therefore, this paper also aims to introduce a proper methodology to measure regulatory costs on small and medium sizes firms, while reviewing and comparing findings on how regulatory cost differs by size of firms.

The paper proceeds as follows. Chapter 2 reviews previous research on the attempt to estimate the cost of regulations and offers some constructive criticisms that may improve the reliability of the cost estimates. Chapter 3 provides the empirical results of how regulation quality and level affect GDP per capita. Chapter 4 evaluates the behavior of regulatory costs across industries and firm sizes by introducing a novel methodology. Chapter 5 concludes.

CHAPTER 2

Literature and Method

Much of the literature utilizes Product Market Regulation (PMR) indicators as a proxy for regulatory status in countries. Crain (2005) uses PMR indicators in OECD member countries and estimates that a unit increase in PMR indicators reduces US GDP by 1,343 USD per capita. Lee *et al.* (2008) estimate the cost of regulation in Korea to be 951 USD per capita. When applied to the Korean economy as a whole, the aggregate cost from regulation is estimated at roughly 65 Billion USD that accounts for 7.7% of GDP (in 2006 price) as shown in Table 1.

The current paper tries to improve the assessment by utilizing improved data, although the available indices of regulation are correlated. PMR indicators are published only once every 5 years, so a small sample problem can arise, which may affect the robustness of the results. In addition, the PMR index is only available for OECD members and partner countries, which restricts the data availability

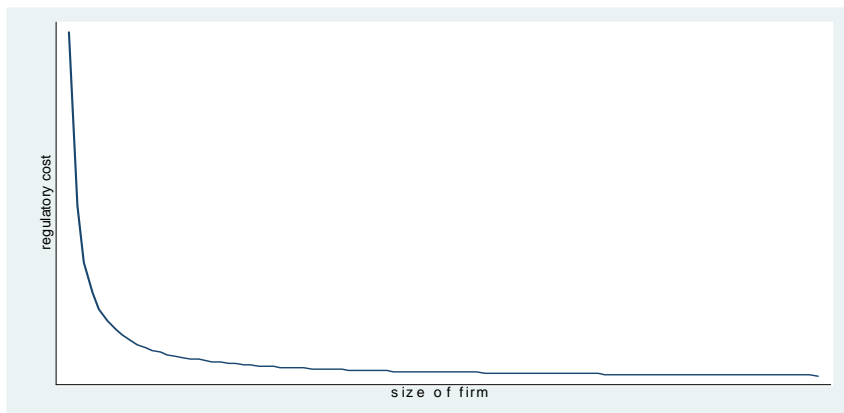
Table 1 | Opportunity Cost of Market Regulation

①	②	③	④	⑤
PMR of Korea	Cost per 1 unit of regulation (per capita)	=①*②	= ③/GDP per capita	= ④*population
1.5	\$ 951	\$ 1,427	7.7%	65 Trillion Won

Note: GDP per capita from ②, ③, ④ is constant 2000. Nominal GDP in 2006 is 847 trillion won.

Source: Lee *et al.* (2008).

Figure 1 | Regulatory Cost per Unit Depending on Firm Size



further. As PMR mainly deals with regulation in the domestic goods market, important regulations pertaining to labor or international trade may not be fully captured. Hence, the current paper uses the Regulatory Quality Index in World Governance Index by the World Bank in order to refine the analysis.

This research also estimates the regulatory cost of South Korea and offers methods to examine how the burden of regulations vary by firm size and across industries. Figure 1 depicts a negative relationship between the firm size and average cost, which derives from the concept of economies of scale. Fixed costs from complying with environmental regulations and any additional inspections or accountings are burdens borne by all firms regardless of size. This means that small and mid-size firms bear a higher unit burden from the fixed cost in comparison to larger firms.

Crain (2005) and Crain and Crain (2010) argue that regulatory costs per worker decreases as the firm size increases, meanwhile cost from economic regulation for each firm increases (see Table 2). Crain (2005) and Crain and Crain (2010) rely on a regulatory accounting approach that uses the number of employees as a common denominator, that is, regulatory cost per worker. In this case, productivity will increase as the firm size increases, thus leaving smaller firms with heavier regulatory

Table 2 | Regulatory Cost of per Worker in US

Industry	Type of Regulation	All Firms	Firm Size by Number of Workers		
			<20	20~499	500+
Manufacture	Total	14,070	28,316	13,504	12,586
	Economic	6,004	4,454	5,481	6,952
	Environmental	7,211	22,594	7,131	4,865
	Tax	233	444	205	219
	OSHHS	622	824	687	550
Logistics	Total	5,289	5,453	6,242	4,753
	Economic	4,079	3,673	4,866	3,823
	Environmental	-	-	-	-
	Tax	616	1,013	737	418
	OSHHS	594	767	639	511
Service	Total	7,235	7,106	6,274	7,815
	Economic	5,595	4,181	4,668	6,648
	Environmental	10	25	8	5
	Tax	1,014	2,113	944	637
	OSHHS	616	786	655	524
Health Care	Total	4,221	5,375	3,707	4,204
	Economic	3,148	3,318	2,725	3,366
	Environmental	75	203	64	44
	Tax	418	1,103	292	293
	OSHHS	633	772	643	514
Etc.	Total	14,992	21,906	12,878	11,964
	Economic	6,728	5,273	6,700	7,721
	Environmental	6,348	13,760	4,343	2,963
	Tax	1,283	2,101	1,192	765
	OSHHS	633	772	643	514
Total	Total	8,086	10,585	7,454	7,755
	Economic	5,153	4,120	4,750	5,835
	Environmental	1,523	4,101	1,294	883
	Tax	800	1,584	760	517
	OSHHS	610	781	650	520

Note: OSHHS means Occupational Safety and Health, and Homeland Security Regulations.

Source: N. Crain and M. Crain (2010).

Table 3 | Cost of Economic Regulation of per Worker in Korea

	Firm size			Total
	5~29 People	30~499	Over 500	
Cost (100 million Won)	288,031	350,827	141,813	780,670
Cost per Worker (10 Thousand Won)	1,045	1,170	1,428	1,157

Source: Lee *et al.* (2008).

burden as shown in Figure 1. Note that total regulatory cost per employee decreases as firm size increases because cost from environmental regulations, tax, or occupational stability were included meaning that small to mid-size firms will incur higher regulatory cost. However, the cost from economic regulation increases as the firm size increases as shown in Table 2.

On the other hand, Lee *et al.* (2008) counters by asserting the economic regulatory cost burden increases as the firm’s size increases (see Table 3). This is because Lee *et al.* (2008) proposed to estimate the regulatory cost from market regulations in the procedure. Based on this procedure, Lee *et al.* (2008) conclude that small firms bear a disproportionate burden of regulatory costs.

Previous studies find relationships between regulatory indices and GDP. Lee *et al.* (2008) bases their research on Crain (2005) by analyzing how the Product Market Regulation Index (PMR) affects GDP per capita. Crain (2005) stated that one unit increase of PMR index in 1998 will decrease GDP per capita by \$1,343 whereas Lee *et al.* (2008) concluded the same analysis with a different result at \$951 decrease from 1 unit PMR increase. According to these estimates, Korea’s cost (constant 2006) from federal regulations is 65 trillion Won, nearly 7.7% of GDP.

Crain (2005) and Lee *et al.* (2008) are criticized for the robustness of their analysis due to the small sample data. The dataset is small for many reasons. The PMR index is released every 5 years for OECD countries and the cooperating partners. Moreover, the data of countries before they joined OECD is not provided. Not only has the PMR index

reflected domestic goods market excluding labor and foreign regulations, but also industries for which PMR is provided is limited. This requires separate estimations of regulatory cost for industries not specified (Crain and Crain, 2010). Crain and Crain (2010) resolves the small data issue by including international and factor market regulations and regulatory costs of more specific industries. The World Bank's Regulation Quality Index (RQI) is utilized for in their subsequent analyses.

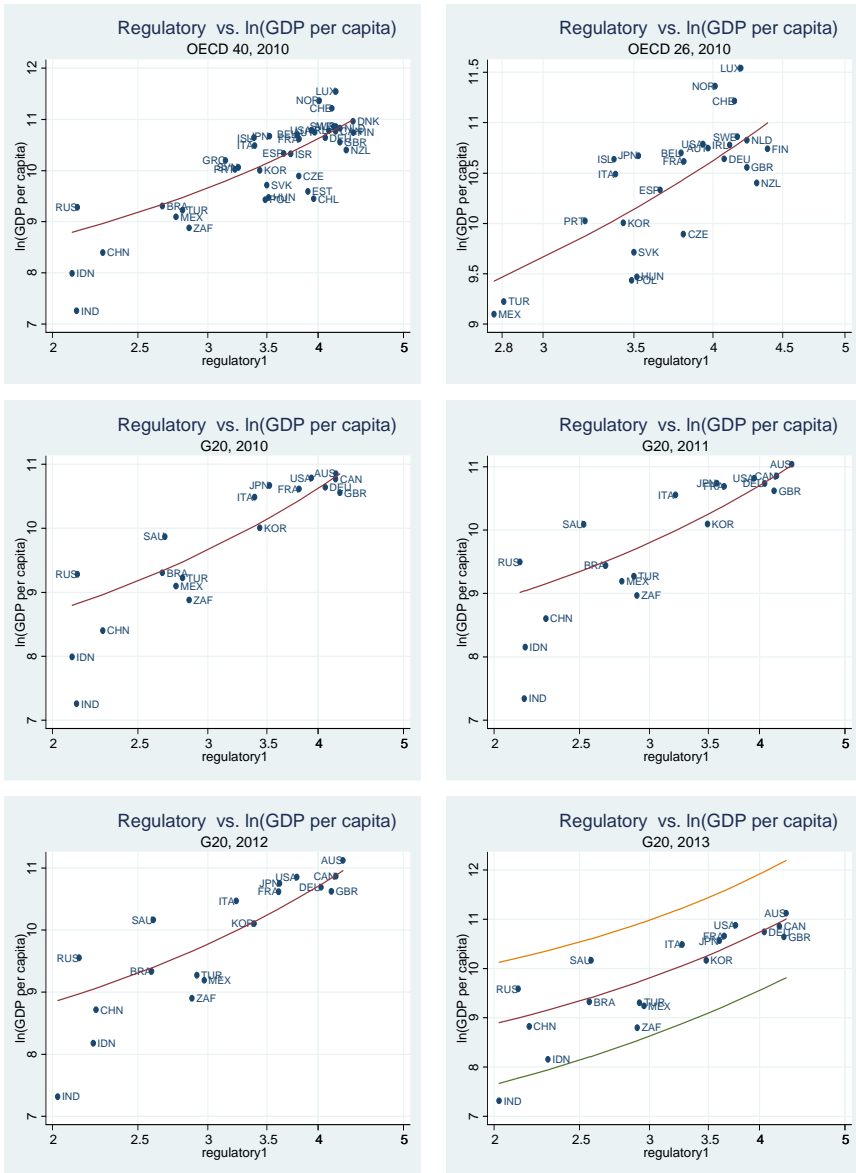
CHAPTER 3

Regulatory Cost

1. The Relationship between GDP per Capita and RQI

Figure 2 shows the relationship between GDP per capita and the RQI for individual countries. The fitted line is upward sloping meaning that better regulatory environments are aligned with higher GDP. Countries that are above the fitted line have higher GDP per capita for their regulatory level because other factors affecting their income level (other than the quality of the regulatory environment) have stronger effects. The other factors have positive effects for GDP per capita for the countries above the fitted line and negative for the ones below. Thus, countries such as Korea, Brazil, Germany, Canada, and Australia near the line more strongly support the argument that the quality of regulations influences GDP per capita. India, on the other hand, falls outside of the 95% confidence level. Additionally, countries with stronger regulation such as Russia, Indonesia, China, South Africa, and Saudi Arabia have a tendency to be closer to the fitted line than less strictly regulated countries. This means that RQI has more explanatory power with respect to GDP per capita for countries that are more regulated compared to relatively less regulated countries.

Figure 2 Relationship between GDP per Capita and RQI in OECD Countries



Note: regulatory1 = regulatory quality index (RQI) + 2.5

Source: World Bank (2013).

2. Estimation Model and Data

This research explores the effect of regulation on GDP per capita while accounting for other significant variables. Equation (1) is from Crain and Crain (2010) and Lee *et al.* (2008) which are also based on the economic growth model of Barro (1997). The variable measuring regulation is from the Worldwide Governance Indicators (WGI) that the World Bank provides for 215 countries. However, the WGI subcategory indicators are highly correlated to each other as shown in Table 4, which could raise multicollinearity issues. Thus, only Regulatory Quality Index (*rq*) is included in the analysis.

$$\ln(\text{GDP per capita})_{i,t} = \beta * \text{Regulatory Level}_{i,t} + \phi \ln(X)_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

Regulatory Level	World Bank Regulatory Quality Index (RQI)
X	Control Variable - trade: dependency upon foreign trade - bb: internet diffusion level - priedu: enrollment rate of primary school - pop: population - life: life expectancy
α_i	fixed country effect
γ_t	fixed time effect

Table 4 | Correlation of Worldwide Governance Index

	<i>rq</i>	<i>voice</i>	<i>ge</i>	<i>politics</i>	<i>law</i>	<i>corrupt</i>
Regulatory Quality	(<i>rq</i>)	1.000				
Voice of Accountability	(<i>voice</i>)	0.789	1.000			
Gov't Effectiveness	(<i>ge</i>)	0.937	0.776	1.000		
Political Stability and Absence of Violence	(<i>politics</i>)	0.630	0.674	0.674	1.000	
Rule of Law	(<i>law</i>)	0.895	0.820	0.932	0.779	1.000
Control of Corruption	(<i>corrupt</i>)	0.871	0.774	0.932	0.729	0.939

Note: Correlation within 215 countries.

Source: World Bank (2013).

In addition, regulation as measured by the RQI may affect GDP differently in developing versus developed countries. Developing countries tend to be more sensitive to the explanatory variables than developed countries. As a consequence, regulation's relationship to income estimated over the entire 215 country dataset may overestimate the effect of regulation on GDP in developed countries. Thus, the sample is refined by categorizing countries into different groups by economic performance and analyzing them separately.

Table 5 presents the summary statistics. Figure 2 shows that the relationship between RQI and GDP per capita is different for each performance group, therefore it means that these estimates differ from previous studies. Table 6 presents the results using the different subsamples.

Lastly, a conservative approach is needed when estimating different levels of groups. Since the standard deviation affects the regulatory burden per capita (see Table 7), depending on the sample, a single value cannot be provided by this study. Note that Table 7 depicts different estimation results depending on the period; one with 2002~2008 and the other with 2002~2012. Thus, the possibility of overestimation was taken in consideration when calculating the regulatory burden (Simpson, 2014).

Table 5 | Summary Statistics

Variable	Definition	Mean	Min	Max
All 52 Countries				
gdp	Real GDP per capita	26,156.950	410.818	113,738.700
rq	Regulatory Quality Index(-2.5~2.5)	1.000	-0.781	2.247
trade	Trade per GDP	93.557	14.933	439.657
bb	Internet Diffusion per 100	11.868	0.000	43.009
priedu	Primary Education	102.775	82.518	147.514
pop	Population (million)	81.700	0.269	1,360.000
life	Life Expectancy	76.314	51.557	83.096

Table 5 | (Continued)

Variable	Definition	Mean	Min	Max
OECD 40 Countries (Members & Partners)				
gdp	Real GDP per capita	26,209.280	410.818	113,738.700
rq	Regulatory Quality Index (-2.5~2.5)	1.064	-0.781	2.077
trade	Trade per GDP	81.120	14.933	371.440
bb	Internet Diffusion per 100	13.118	0.000	43.009
priedu	Primary Education	102.998	92.168	147.514
pop	Population (million)	105.000	0.269	1,360.000
life	Life Expectancy	76.334	51.557	83.096
OECD I (30 Countries)				
gdp	Real GDP per capita	32,178.410	3,052.959	113,738.700
rq	Regulatory Quality Index (-2.5~2.5)	1.281	0.031	2.077
trade	Trade per GDP	85.825	18.756	371.440
bb	Internet Diffusion per 100	15.204	0.000	43.009
priedu	Primary Education	102.339	92.168	122.389
pop	Population (million)	38.900	0.269	316.000
life	Life Expectancy	78.263	67.586	83.096
G20				
gdp	Real GDP per capita	19,535.620	410.818	67,524.760
rq	Regulatory Quality Index (-2.5~2.5)	0.650	-0.781	2.023
trade	Trade per GDP	51.845	14.933	110.000
bb	Internet Diffusion per 100	10.290	0.000	38.792
priedu	Primary Education	104.236	91.017	147.514
pop	Population (million)	222.000	18.300	1,360.000
life	Life Expectancy	74.132	51.557	83.096

Note: 1) All 52 countries (G52) include 34 OECD members, 6 OECD partner countries, and Arab Emirate, Bahrain, Bahamas, Cyprus, Oman, Kuwait, Malta, Puerto Rico, Qatar, Macao(China), Saudi Arabia, Singapore that have more than 20,000 dollars of GDP per capita.

2) OECD I includes 30 countries out of 40 OECD members without 6 OECD partners and 4 countries such as Estonia, Israel, Chile, and Slovenia that had joined OECD after 2010.

3) OECD II indicates 25 countries covered in Crain (2010) excluding Australia, Canada, Greece, and Denmark. Statistics appear to be similar as shown in Crain (2010). Crain (2010) does not suggest 25 countries specifically, but it seems to have covered 26 countries with balanced panel without missing values in control variables.

Table 6 Panel Regression for Determinants of GDP per Capita (Fixed Effect)

	ln(real_gdp)						
	I	II	III	IV	V	VI	VII
	G52	OECD	OECD I	OECD II	G20	Non-G20	Non-G8
rq	0.217*** (5.56)	0.199*** (4.55)	0.216*** (5.32)	0.170*** (4.07)	0.163** (2.08)	0.283*** (6.78)	0.298*** (7.23)
ln(trade)	-0.724*** (-11.91)	-0.808*** (-11.88)	-0.646*** (-8.60)	-0.642*** (-7.84)	-0.916*** (-9.82)	-0.340*** (-4.04)	-0.561*** (-8.28)
ln(priedu)	0.399** (2.20)	0.720*** (3.17)	-0.219 (-0.74)	-0.453 (-1.53)	1.215*** (3.82)	0.109 (0.52)	0.919*** (4.75)
ln(bb)	0.0702*** (9.31)	0.0721*** (8.93)	0.0490*** (6.29)	0.0559*** (6.72)	0.0855*** (6.56)	0.0549*** (6.08)	0.0613*** (7.63)
ln(pop)	-0.372*** (-3.78)	-1.211*** (-4.45)	-0.868*** (-3.07)	-1.448*** (-4.98)	-0.167 (-0.34)	-0.417*** (-4.71)	-0.519*** (-5.39)
ln(life)	5.253*** (5.78)	5.268*** (5.67)	4.518*** (3.61)	5.746*** (4.54)	6.233*** (4.89)	3.820*** (2.90)	3.175*** (3.18)
time F.E				YES			
N	550	472	380	339	201	349	447

Note: 1) T-statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01.

2) Sample from 1996 to 2013.

Table 7 Panel Regression for Determinants of GDP per Capita (Fixed Effect)

	ln(real_gdp)					
	I		IV		V	
	①	②	①	②	①	②
regulatory	0.173*** (3.82)	0.243*** (5.71)	0.0920* (1.97)	0.230*** (5.45)	0.174* (1.96)	0.295*** (3.40)
ln(trade)	-0.612*** (-8.06)	-0.712*** (-10.11)	-0.583*** (-6.55)	-0.439*** (-5.32)	-0.732*** (-6.45)	-0.810*** (-7.48)
ln(priedu)	-0.0940 (-0.48)	0.265 (1.44)	-0.370 (-1.18)	-0.330 (-1.12)	0.832** (2.62)	0.964*** (3.04)
ln(bb)	0.0845*** (9.31)	0.0929*** (10.03)	0.0912*** (8.29)	0.0870*** (7.94)	0.140*** (8.38)	0.142*** (8.22)
ln(pop)	-0.493*** (-4.49)	-0.372*** (-3.93)	-2.227*** (-6.45)	-1.403*** (-4.89)	-1.445** (-2.18)	-1.030* (-1.91)

Table 7 | (Continued)

	ln(real_gdp)					
	I		IV		V	
	①	②	①	②	①	②
regulatory	0.173***	0.243***	0.0920*	0.230***	0.174*	0.295***
	(3.82)	(5.71)	(1.97)	(5.45)	(1.96)	(3.40)
ln(life)	3.130***	3.448***	4.397**	1.855	5.242***	3.479***
	(2.71)	(3.60)	(2.57)	(1.29)	(3.35)	(2.64)
time F.E	YES					
N	396	473	233	281	138	168

Note: 1) T-statistics in parentheses, ** p<0.10, ** p<0.05, *** p<0.01*.

2) ① is with the sample in year of 2002~2008, ② is with 2002~2012.

3. Reviewing and Comparing Various Models and Trends

The variable a_i cannot be observed in equation (1) but represents individual effects that encompass characteristics that affect each country's economic growth. For this reason, included is a fixed effect variable.¹

The data used for the results in Table 6 ranged from 1996 to 2013. RQI was only provided biannually before 2002 so the moving average method was used from 1996 to 2002. The results suggest that a one unit rise in the regulatory level increases GDP per capita by 16.3~29.8%. In other words, a one unit improvement in regulatory quality has profound effects.

¹ For panel data estimation, a random effects model is implemented when the individual effects are thought to be random. A random effects model does not allow the explanatory variables to be correlated with the individual effect. However, a fixed effects model allows such relationship because α_i is assumed to be a fixed effect. Thus, random effect estimators are more accurate when explanatory variables and individual effects are assumed to be independent. Conversely, fixed effect estimators are better when the two are dependent. Individual units could be considered as dummy variables without any risk of incidental parameter problems for researches that use aggregate data for panel analysis. In addition, a Hausman test also suggested fixed effect analysis instead of random effect.

This result is much higher than 9.4% estimated by Crain & Crain (2010). Even estimates using the same model (17% from Model IV – OECD II, Table 6) differ significantly from Crain and Crain (2010). This could be because of different grouping methods and time period. In Table 7, ① considers the time period from 2002 to 2008 whereas ② analyzes 2002 to 2012. But the estimate from Model IV-① from Table 7 shows a similar result (9.2%) to the Crain analysis. Crain dropped the range where there were missing values and only used 2002 to 2008. Also, Table 7 provides a comparison to Table 6, showing that coefficient estimates are sensitive to the time period selected. It is worth pointing out that regardless of the time period selected, RQI is consistently significant and positively correlated with GDP per capita in each specification. That is, the results suggest that regulatory quality affects GDP per capita but that the magnitude of the estimated effect may change depending on the time period.

As mentioned above, developing countries are more sensitive to regulations than developed countries. Model I in Table 6 considers OECD countries plus 12 countries with over \$20,000 of GDP per capita. Most countries in that group besides Macao and Singapore had RQI below 1, resulting in relatively high cost estimators for regulations. The effect of regulations on income level is lower when less developed countries are excluded (OECD II and G20 groupings) than when they are included. Models VI, VII suggest that GDP per capita is highly sensitive to RQI. These groups only consist of developing countries. The effect of regulation on GDP per capita is from 28.3 to 29.8% for those two models.

The control variables are likewise sensitive to the time period included. In Table 7, only Models I, IV, and V were estimated with different time periods. Comparing the values from Table 7 with Table 3, the negative effect of trade is lower. Trade estimator value from Model ① for all three models in Table 7 is closer to the values from Table 3 than those from Model ② except for OECD 26 countries (Model IV). For primary education rate (*priedu*), setting a different time period made a significant difference in estimators as inferred by comparing Table 6 and Table 7. Some estimators were significant in Table 6 but not in Table 7. Even the signs for the estimators changed depending on the

time period. Broadband had a more important role in determining the income level in Table 7 than Table 6 especially for Model IV and V. The results in both tables indicate that population has a negative correlation with GDP per capita. Lastly, life expectancy is positively correlated with income level and Table 6 shows more sensitively than Table 7.

So far, the analysis focuses on the level of regulatory quality. But, it is imperative to consider the optimal level of regulation for South Korea as well. As Table 6 depicts, 0.478 was the value of regulatory quality for South Korea in 1996. It drastically fell during the Financial Crisis of 1997 and 1998 but started to recover in 1999. Between 1999 and 2013, the index approximately doubled. Compared with the regulatory index of the 90s, it has increased by nearly 250%. There was a sudden surge in the mid-2000s of regulatory quality from 0.775 (the average index value in the early 2000s) to 1.27. Since then, there was no precipitous increase in the index.

The RQI value for South Korea was 0.982 in 2013, the latest year for which data are available. That value places Korea at 28th place out of 52 countries. This value is 0.018 lower than the average of 52 countries, 0.083 lower than the OECD 40 countries' average, 0.300 lower than OECD 30, 0.275 lower than OECD 26, 0.139 lower than G8. South Korea's value is a 0.918 difference from the three most regulated countries, and higher than the average of G20.

Figure 3 | Level of Regulation in Korea (RQI)

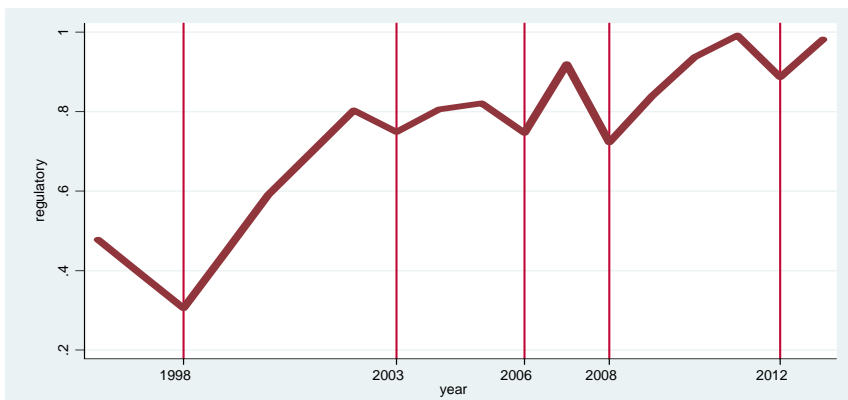


Table 8 | Regulatory Cost Estimation of Korea (in US Dollar, 2013)

(Unit: million dollars)

	All 52	OECD 40	OECD 30	OECD 26	G8	Top 3
Level of Regulatory Reform	0.018	0.083	0.300	0.275	0.139	0.918
I	5,229	23,397	84,879	77,890	39,352	260,070
I -①	4,156	18,595	67,460	61,906	31,276	206,699
I -②	5,846	26,160	94,905	87,091	44,000	290,789
II	4,801	21,483	77,935	71,519	36,133	238,795
III	5,212	23,319	84,598	77,632	39,222	259,208
IV	4,090	18,300	66,390	60,924	30,780	203,419
IV -①	2,215	9,912	35,959	32,998	16,672	110,179
IV -②	5,542	24,797	89,959	82,553	41,707	275,636
V	3,925	17,563	63,714	58,469	29,540	195,222
V -①	4,182	18,712	67,883	62,294	31,472	207,994
V -②	7,100	31,771	115,260	105,770	53,438	353,158
VI	6,812	30,481	110,579	101,475	51,267	338,816
VII	7,187	32,157	116,660	107,055	54,086	357,447

Note: Top 3 countries are three most under-regulated countries according to the average of each year.

The burden of regulation in South Korea is estimated at between 2.2~357.4 billion USD as shown in Table 8. This amount is 0.17~27.41% of total GDP (1,304.3 million dollars). If regulatory quality improves to the OECD average, 9.9~36.0 billion USD worth of regulatory cost is estimated to be reduced, which is 0.76~2.47% of 2013 GDP. Note that according to OECD's "Going for Growth" (2015), the goal of Product Market Regulations, a 20% improvement in the regulatory burden, would induce a 2.4% GDP gain for advanced economies, and a 3.4% level gain for emerging economies. Our estimation utilizes a different data set - Regulatory Quality Index, but the expected effect from regulatory reform is comparable.

CHAPTER 4

The Distribution of Regulatory Costs across Industries and Firm Sizes

In this study, we also introduce a method to measure and compare how the regulatory costs are distributed across different industries and among firms of different sizes. As Hwang (2012) assumes, a standard production function is suggested below; labor input is a factor of production. Let l stand for the total labor cost and f stand for fixed cost. We add the cost of regulatory compliance, f_A , which company should bear additionally, for example, to comply with environmental regulations. The marginal cost is denoted by a , and firm output is denoted by x . The relevant relationships follow equation (2) and (3).

$$l = f + fA + ax \quad (2)$$

$$\frac{l}{x} = a + \frac{f+fA}{x} \quad (3)$$

As shown in equation (3), the variable $\frac{l}{x}$ embeds the concept of economies of scale. As output grows (x increases), average cost of labor input decreases which implies economies of scale for production. Therefore, we can infer that the ratio of total labor cost to sales (as a proxy for the firm's total production and costs) can be a representative estimate of how regulatory cost varies across industries, in respect to

firm size. Specifically, if the ratio of labor costs to sales increases, it implies that the regulatory burden becomes relatively less important. Using the equations above, we are able to proxy how regulatory costs vary across industries and by firm size.

We compare the regulatory costs incurred by firms of different sizes in various industries by using equation (2) and (3). Table 9 illustrates that variation in the ratio of labor costs to sales. To reiterate, as this ratio increases, the relative regulatory burden declines. Min and Max in Table 9 indicate minimum regulatory cost (2.4257 trillion Won calculated in Table 8) multiplied with the ratio and maximum regulatory cost (386.7222 trillion Won) multiplied with the ratio.

We utilize company data from the Mining and Manufacturing Industries the 2010 Census Report issued every 5 years. On the other hand, we follow the criteria to divide large, medium, and small sized firms of Korea Standard Industrial Classification. The former report has more detailed classification standard; while the latter has three criteria based on the number of employees. Thus, construction companies, for example, with 4 employees categorized in the first group (1~4 employees) in the Census Report are distributed to small sized company category (1~49 employees) following the Standard Industrial Classification.

First, medium size firms in agriculture, forestry, and fishery, construction, wholesale and retail, transportation industries incurred relatively high regulatory costs. Second, except for the construction industry, medium size firms incurred the most regulatory cost while surprisingly the cost burdens were similar for small and big firms. Third, industries such as mining, electricity, gas, steam and water supply, and sewage and waste experienced higher regulatory cost as firm size increased as predicted. Notably, big firms in the mining industry had the highest regulatory burden. Finally, we find that, in manufacturing industry, the ratio shows decrease along with the firm size increasing. As shown in equation (3), an increase in output allows the average fixed cost smaller, resulting in the average total cost decreasing.

In addition, we can allocate regulatory cost depending on firm size

Table 9 | Sales and Labor Cost Depending on Firm Size

Industry		Small Size	Medium Size	Large Size
Agriculture, forestry and fishing (0.21)	Sales (A)	1,542,775	6,925,071	740,137
	Labor Cost (B)	129,421	671,001	55,961
	Ratio (B/A)	8.39	9.69	7.56
	Regulatory Cost (S_i)	32.72	37.79	29.49
	min (52)	17	19	15
	max (8,220)	2,689	3,106	2,424
Mining and quarrying (0.08)	Sales (A)	2,600,751	615,516	433,740
	Labor Cost (B)	311,968	95,198	204,143
	Ratio (B/A)	12.00	15.47	47.07
	Regulatory Cost (S_i)	16.10	20.75	63.15
	min (20)	3	4	13
	max (3,258)	524	676	2,058
Manufacturing (33.80)	Sales (A)	369,225,236	369,966,989	725,144,320
	Labor Cost (B)	41,360,093	34,270,469	45,648,679
	Ratio (B/A)	11.20	9.26	6.30
	Regulatory Cost (S_i)	41.86	34.62	23.52
	min (8,199)	3,432	2,838	1,929
	max (1,307,140)	547,173	452,472	307,495
Electricity, gas, steam and water supply (2.78)	Sales (A)	5,404,799	66,802,856	48,349,089
	Labor Cost (B)	148,712	2,399,853	2,165,851
	Ratio (B/A)	2.75	3.59	4.48
	Regulatory Cost (S_i)	25.42	33.19	41.39
	min (675)	172	224	279
	max (107,615)	27,357	35,719	44,539
Sewage, waste management, materials recovery and remediation activities (0.33)	Sales (A)	3,244,020	9,535,773	1,341,134
	Labor Cost (B)	327,110	1,634,373	245,094
	Ratio (B/A)	10.08	17.14	18.28
	Regulatory Cost (S_i)	22.16	37.67	40.17
	min (81)	18	31	33
	max (12,920)	2,863	4,867	5,190
Construction (6.26)	Sales (A)	105,548,638	55,405,753	110,109,538
	Labor Cost (B)	13,978,171	8,461,539	9,311,984
	Ratio (B/A)	13.24	15.27	8.46
	Regulatory Cost (S_i)	35.82	41.31	22.87
	min (1,518)	544	627	347
	max (241,965)	86,671	99,947	55,347

Table 9 (Continued)

Industry		Small Size	Medium Size	Large Size
Wholesale and retail trade (18.92)	Sales (A)	395,680,375	342,895,482	81,252,322
	Labor Cost (B)	16,543,598	19,554,823	4,398,731
	Ratio (B/A)	4.18	5.70	5.41
	Regulatory Cost (S_i)	27.33	37.28	35.39
	min (4,590)	1,255	1,711	1,624
	max (731,820)	200,017	272,818	258,984
Transportation (3.41)	Sales (A)	61,174,758	37,038,606	49,358,059
	Labor Cost (B)	6,485,688	7,916,742	5,535,120
	Ratio (B/A)	10.60	21.37	11.21
	Regulatory Cost (S_i)	24.55	49.49	25.96
	min (826)	203	409	215
	max (131,730)	32,336	65,191	34,203

Note: Sales and Labor Cost in million Won and Regulatory Cost in 100 million Won.

using the ratio $\frac{l}{x}$. We derived indexes SL, SM, and SS using the following equation (4) and (5). Relating the sum of each ratio, labor cost per output, depending on firm size to the total regulatory cost calculated in Table 8, SL, SM, and SS respectively represent regulatory cost of large, medium, and small size firms.

$$\frac{l_S}{x_S} + \frac{l_M}{x_M} + \frac{l_L}{x_L} = S \quad (4)$$

$$\frac{l_i}{x_i} = S_i \quad (i = S, M, L) \quad (5)$$

CHAPTER 5

Conclusion

This study argues that improving regulation quality has positive influences on economic growth. This finding is consistent with the previous literature such as Crain & Crain (2010), which finds a positive relationship between the quality of regulation and GDP per capita. Additionally through the empirical analysis, enhancing regulation quality incurs economic costs that vary depending on firm size and industry.

The results indicate that GDP per capita would increase by 16.3~29.8% when the RQI for a country increases by one unit meaning a better regulatory environment. The magnitude of the results differed depending on the sample and time period selected. However, the general result holds.

In 2013, Regulatory Quality Index of Korea was 0.982. To help setting realistic policy goals, this study suggests to recognize regulatory cost relative to the average amount for other countries. Here, the research estimates regulatory cost of Korea using the regression results. The burden of regulation in South Korea is between 2.2~357.4 billion USD, about 0.17~27.41% of total GDP (1,304.3 million dollars). If regulatory quality improves to the OECD average, 9.9~36.0 billion USD in regulatory costs are estimated to be reduced. This corresponds to around 0.76 to 2.47% of GDP of Korea in 2013, which underscores the importance of regulatory reforms for the Korean economy.

This paper presents the regulatory costs incurred by different firm

sizes so that improved regulations that ensure fairness among all the firms could be established. We introduce a new method to examine the distribution of regulatory costs across different industries and firm sizes. This alternative method is largely consistent with the conclusions reached by other studies, namely that small firms typically bear a disproportionate regulatory burden.

However, there are limitations to this new approach. The amount of fixed cost varies significantly among industries, which makes distinction of regulatory fixed cost and factors of production fixed cost difficult. Using the new method might not be suitable for comparing industries to industries. Policy makers need to be cautious implementing this variable to all of the industries.

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