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Economic Effects of Regulatory Reform in Korea

By JUNGWOOK KIM AND SU BOK CHAE*

This paper adapts the World Bank Regulatory Quality Index (RQI), which is produced annually to provide a better understanding of the effects of regulatory reforms, instead of the Production Market Regulation (PMR) indicators, which are published every five years. We find that 9.9 to 36.0 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 to range from 2.2 to 357.4 billion USD. The estimated reduction in the regulatory cost accounts for roughly 0.76 to 2.47% of Korea's GDP in 2013, underscoring the importance of regulatory reforms for the Korean economy. This paper introduces a new method with which 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, specifically that small firms typically bear a disproportionate regulatory burden.

Key Word: Regulatory Quality Index, Regulatory Reform,
Economic Impact Analysis
JEL Code: K20, L25, O43

I. Introduction

In Korea, regulatory reforms are among the top national priorities to achieve economic growth. Various measures have been undertaken in an effort to facilitate and enhance such 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 improving or eliminating regulations in order to promote employment and investment, with a view towards accelerating economic growth (i.e., the "what") –

* Kim: (first author) Senior Fellow, Korea Development Institute (e-mail: awaker2@kdi.re.kr); Chae: (coauthor) Senior Research Associate, Korea Development Institute (e-mail: sbchae@kdi.re.kr)
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with a focus on health, education, tourism, finance, software, culture and logistics industry; and institutional improvements to facilitate regulatory reform (i.e., the "how"), with a focus on the introduction of a cost-in-cost-out system, the establishment of regulatory reform principles, and the disclosure of regulatory information.

Many countries, including Korea, tend to set their policy focus on regulatory reform during periods of economic stagnation. Since the early 1980, Korean administrations have attempted to reform regulations, though whether the reforms went far enough remains debatable (Lee *et al*., 2008). To maximize the effects of regulatory reform efforts, it is necessary to detect more burdensome regulations and to determine which industries are affected by those regulations. Through the process of introducing and repealing regulations, we must undertake an economic impact analysis of the social costs and benefits of the regulations. In this study, we focus on measuring the costs and benefits of regulations in monetary terms instead of the number of regulations.

Regulatory costs occur relatively implicitly, unlike most fiscal actions taken by governments. Crain and Crain (2010) provide an example involving the activities, products and services consumed by an ordinary household on one day. The costs of government regulations exist within an indistinct mixture of countless economic forces that determine the prices, costs, designs, locations, profits, losses, wages, dividends, and other factors. Isolating the contribution of regulations requires more than simply looking at sales receipts. A comprehensive list of regulatory influences is indeed extensive and overwhelming to track or summarize. Nonetheless, Crain and Crain (2010) assert that knowledge of the cumulative consequences of regulatory actions provides important information with which to assess and evaluate the performance of a political-economic social system.

The current paper initially aims to measure regulatory costs in Korea. Note that we measure regulatory costs via comparisons with other advanced countries instead of with 'zero' regulatory environments. Previous research undertaken to estimate these types of costs is available and country-level estimates are not rare. For instance, Crain (2005) and Crain and Crain (2010) estimate regulatory costs in the U.S., and Lee *et al*. (2008) estimate such costs in Korea. Inaccuracies in regulatory cost estimates become an issue when establishing or repealing regulations. This occurs firstly because most of ex ante studies cannot capture uncertainty and instability as these factors relate to policies and secondly because optimism bias can arise. Nevertheless, we consider economic analysis results as important given that they are among the criteria used to select the best regulation with a view toward simplifying policy decisions.

On the other hand, we need to take into account regulatory fairness with regard to diverse groups, as regulations can 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 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). Former British Prime Minister Tony Blair emphasized the significance of the voices of those who operated small to mid-size firms and the effects of regulations on them considering their different scale. The program 'Think Small First' in the EU supports small to mid-size firms by paying attention to their perspectives and reflecting evaluations of their costs and benefits due to regulations to enhance the quality of regulations. Therefore, this paper also aims to introduce a proper methodology to measure regulatory costs borne by small and medium-sized firms while reviewing and comparing findings about how regulatory costs differ depending on the firm size.

The paper proceeds as follows. Chapter II reviews previous research in an attempt to estimate the costs of regulations and offers some constructive criticism that may improve the reliability of cost estimates. Chapter III provides the empirical results of how the quality and level of regulations affect GDP per capita. Chapter IV evaluates regulatory cost trends across industries and firm sizes by introducing a novel methodology. Chapter V concludes the paper.

II. 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 the PMR indicator reduces US GDP by 1,343 USD per capita. Lee *et al*. (2008) estimate the cost of regulations in Korea to be 951 USD per capita. When applied to the Korean economy as a whole, the aggregate cost from regulation is estimated to be roughly 65 billion USD, accounting for 7.7% of GDP (in 2006 prices), as shown in Table 1.

The current paper attempts to improve the assessment by utilizing improved data, although the available regulation indices are correlated. PMR indicators are published only once every five years; hence, the problem of a small sample may arise, thus affecting the robustness of the results. In addition, the PMR index is only available for OECD members and partner countries, which restricts data availability further. As the PMR mainly deals with regulations 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 of the World Governance Index by the World Bank in order to refine the analysis. The Regulatory Quality Index captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.[1] As this index is published annually for countries and

TABLE 1—OPPORTUNITY COST OF MARKET REGULATION

(1)	(2)	(3)	(4)	(5)
PMR of Korea	Cost per unit of regulation (per capita)	(1)*(2)	(3)/GDP per capita	(4)*GDP
1.5	$951	$1,427	7.7%	65 trillion won

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

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

[1] Kaufmann, Kraay, and Mastruzzi (2010), p.3.

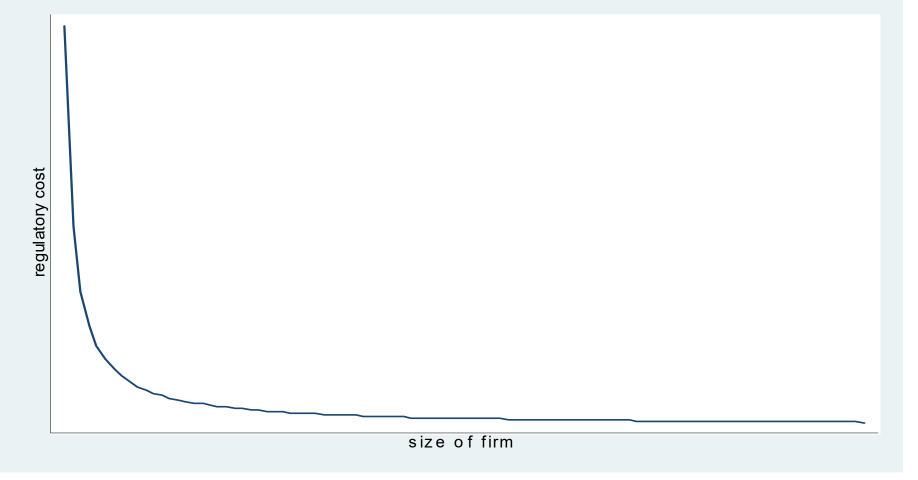

FIGURE 1. REGULATORY COST PER UNIT DEPENDING ON FIRM SIZE

not limited to product market regulation, utilizing this instead of the PMR is expected to improve quality of analysis.

This research also estimates the regulatory costs borne by South Korea and offers methods to examine the how the burden of regulations varies depending on firm size and across industries. Figure 1 depicts the negative relationship found between firm size and the average cost, which is derived from the concept of economies of scale. Fixed costs which arise when complying with environmental regulations and any additional inspections or accounting costs are burdens borne by all firms regardless of their size, indicating that small and mid-size firms bear a greater burden per unit due to fixed costs in comparison with larger firms.

Crain (2005) and Crain and Crain (2010) argue that regulatory costs per worker decrease as the firm size increases; meanwhile, the costs of economic regulations for each firm increase (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, the regulatory cost per worker. In this case, productivity will increase as the firm size increases, thus leaving smaller firms with a heavier regulatory burden, as shown in Figure 1. Note that the total regulatory cost per employee decreases as the firm size increases because the costs associated with environmental regulations, taxes, or occupational stability were included, meaning that small to mid-size firms will incur higher regulatory costs. However, the costs stemming from economic regulation increase as the firm size increases, as shown in Table 2.

On the other hand, Lee *et al*. (2008) counter by asserting that the economic regulatory cost burden increases as the firm size increases (see Table 3). Lee *et al*. (2008) propose that regulatory costs stemming from market regulations be taken into consideration in the estimation procedure. Based on their suggestion, they conclude that small firms bear a disproportionate burden of regulatory costs.

TABLE 2—REGULATORY COSTS PER WORKER IN THE 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 is an acronym for Occupational Safety and Health, and Homeland Security Regulations.

TABLE 3—COSTS OF ECONOMIC REGULATIONS 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).

Previous studies find relationships between regulatory indices and GDP. Lee *et al*. (2008) base their research on Crain (2005) by analyzing how the Product Market Regulation Index (PMR) affects GDP per capita. Crain (2005) stated that a one unit increase in the PMR index in 1998 decreased GDP per capita by $1,343, whereas Lee *et al*. (2008) conducted the same analysis with a different result, showing a $951 decrease from a one unit PMR increase. According to these estimates, Korea's cost (constant 2006) stemming 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 size. The dataset is small for many reasons. The PMR index is released every five years for OECD countries and cooperating partners. Moreover, data from countries before they joined the OECD are not provided. Not only does the PMR index reflect the domestic goods market while excluding labor and foreign regulations, but also the industries for which the PMR is provided are limited. This requires separate estimations of the regulatory costs for industries not specified (Crain and Crain, 2010). Crain and Crain (2010) resolve the small sample issue by including international and factor market regulations and the regulatory costs of more specific industries. The World Bank's Regulation Quality Index (RQI) is utilized in their subsequent analyses.

III. Regulatory Costs

A. *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 levels of GDP. Countries that are above the fitted line have higher GDP per capita rates 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 with regard to GDP per capita the countries above the fitted line and negative effects for those 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 regulations, 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. Thus, RQI has more explanatory power with respect to GDP per capita for countries that are more regulated compared to the case for relatively less regulated countries.

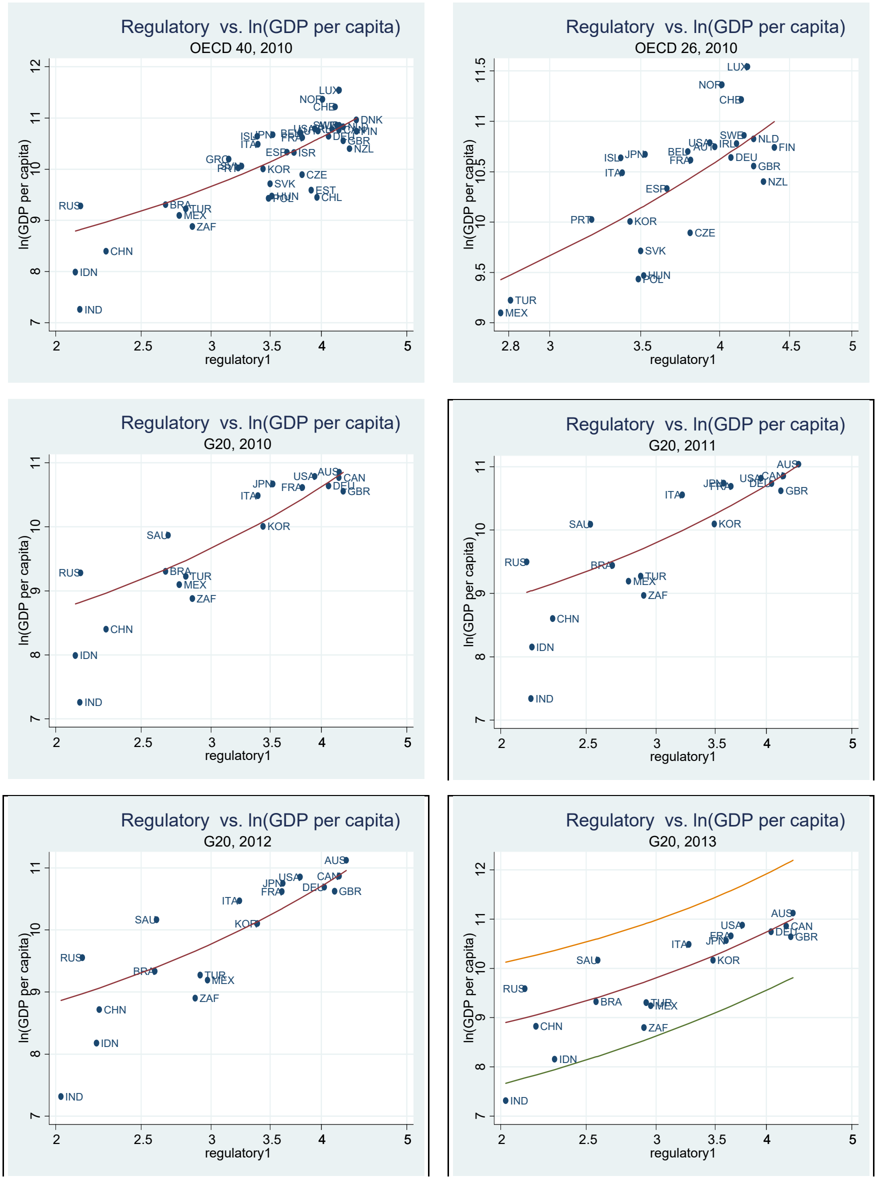

FIGURE 2. RELATIONSHIP BETWEEN GDP PER CAPITA AND RQI IN OECD COUNTRIES

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

Source: World Bank (2013).

B. *Estimation Model and Data*

This research explores the effects of regulations 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 the regulations is from the Worldwide

Governance Indicators (WGI) provided by World Bank for 215 countries. However, the WGI subcategory indicators are highly correlated with each other, as shown in Table 4, which could raise multicollinearity issues. Thus, only the Regulatory Quality Index (*rq*) is included in the analysis here.

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

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

Lastly, a conservative approach is needed when estimating different levels of groups. Because 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, with

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

Regulatory Level	World Bank Regulatory Quality Index (RQI)
X	Control Variable - trade: dependency upon foreign trade, ratio of trade per GDP - 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

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

Note: Correlation within 215 countries.

Source: World Bank (2013).

the periods being 2002~2008 and 2002~2012. Thus, the possibility of over-estimation 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
	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) encompass 34 OECD members, six OECD partner countries, along with UAE, Bahrain, Bahamas, Cyprus, Oman, Kuwait, Malta, Puerto Rico, Qatar, Macao (China), Saudi Arabia, and Singapore, all of which with GDP per capita exceeding 20,000 dollars.

2) OECD I includes 30 countries out of 40 OECD members without six OECD partners and the four countries of Estonia, Israel, Chile, and Slovenia, which joined OECD after 2010.

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

TABLE 6—PANEL REGRESSION FOR DETERMINANTS OF GDP PER CAPITA (FIXED EFFECTS)

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

	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(trade)	-0.612***	-0.712***	-0.583***	-0.439***	-0.732***	-0.810***
	(-8.06)	(-10.11)	(-6.55)	(-5.32)	(-6.45)	(-7.48)
ln(priedu)	-0.0940	0.265	-0.370	-0.330	0.832**	0.964***
	(-0.48)	(1.44)	(-1.18)	(-1.12)	(2.62)	(3.04)
ln(bb)	0.0845***	0.0929***	0.0912***	0.0870***	0.140***	0.142***
	(9.31)	(10.03)	(8.29)	(7.94)	(8.38)	(8.22)
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	Y E S					
N	396	473	233	281	138	168
ln(pop)	-0.493***	-0.372***	-2.227***	-1.403***	-1.445**	-1.030*
	(-4.49)	(-3.93)	(-6.45)	(-4.89)	(-2.18)	(-1.91)

Note: 1) T-statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01. 2) ①Denotes the sample in years 2002~2008; ②Denotes 2002~2012.

C. *Reviewing and Comparing Various Models and Trends*

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

The data used for the results in Table 6 ranges from 1996 to 2013. RQI was only provided biannually before 2002; hence, 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 the regulatory quality level has profound effects.

This result is much higher than the rate of 9.4% estimated by Crain and Crain (2010). Even estimates using the same model (17% from Model IV – OECD II, Table 6) differ significantly from the outcome in Crain and Crain (2010). This may stem from the different grouping methods and time periods. In Table 7, ① considers the time period from 2002 to 2008, whereas ② analyzes that from 2002 to 2012. However, the estimate from Model IV-① from Table 7 shows a result (9.2%) similar to that by Crain. Crain dropped the range in cases of missing values and only used 2002 to 2008. Table 7 also is provides a comparison to Table 6, showing that coefficient estimates are sensitive to the time period selected. It is important to note that regardless of the time period selected, RQI is consistently significant and positively correlated with GDP per capita for 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 noted above, developing countries are more sensitive to regulations than developed countries. Model I in Table 6 considers OECD countries plus 12 countries for which the GDP per capita exceeds $20,000. Most countries in that group besides Macao and Singapore had a RQI of less than 1, resulting in relatively high cost estimators of the regulations. The effect of regulations on income level is lower when less developed countries are excluded (OECD II and G20 groupings) as compared to when they are included. Models VI and 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 ranges 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 in Table 7 with those in Table 3, the negative effect of trade is found to be lower. The trade estimator value from Model ① for all three models in Table 7 is closer to the values in Table 3 than it is from those in Model ② except for the OECD 26 countries (Model IV). Regarding the primary education rate (priedu), setting a different time period made a significant difference in the 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 in Table 6, especially for Models 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 this relation more sensitively than Table 7.

Thus far, this analysis focuses on the level of regulatory quality. However, 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 the regulatory quality for South Korea in 1996. It fell drastically 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 1990s, it has increased by nearly 250%. There was a sudden surge in the mid-2000s in the regulatory quality from 0.775 (the average index value in the early 2000s) to 1.27. Since then, there has been 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 in 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, and 0.139 lower than the value for the G8. South Korea's value shows a difference of 0.918 from the three most regulated countries, and it is higher than the average of the G20.

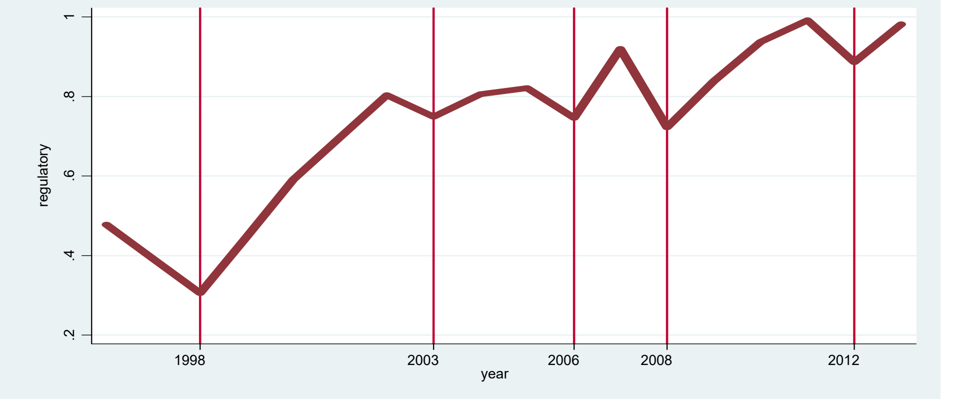

FIGURE 3. LEVEL OF REGULATIONS IN KOREA (USING RQI)

TABLE 8—REGULATORY COST ESTIMATION OF KOREA (IN US DOLLARS, 2013)

(Unit: million dollars)

		All 52	OECD 40	OECD 30	OECD 26	G8	Top 3
Regulatory Level 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: The top three countries are the three most under-regulated countries according to the average for each year.

Table 8 provides an estimation of the effect of regulatory reforms. The 'level of regulatory reform' row indicates the difference between the regulatory quality of the targeted group and that of South Korea. For example, the value for the OECD 30 is 0.300 higher in terms of regulatory quality than that of South Korea, implying that the regulatory reform aims to reach this average by increasing the regulatory quality index by 0.300 in South Korea. The economic effect of this regulatory reform effort can be estimated by multiplying the suggested regulatory quality difference by the coefficients in Tables 6 and 7.

The burden of regulations in South Korea is estimated to be between 2.2 and 357.4 billion USD, as shown in Table 8. This amount is 0.17 ~ 27.41% of the total GDP (1,304.3 million dollars). If the regulatory quality improves to the OECD average, the estimated reduction in the regulatory cost would be 9.9 ~ 36.0 billion USD, which is 0.76 ~ 2.47% of the GDP for 2013. Note that according to the 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 dataset, the Regulatory Quality Index, but the expected effect from regulatory reform is comparable.

IV. Distribution of Regulatory Costs across Industries and Firm Sizes

In this study, we also introduce a method by which to measure and compare how regulatory costs are distributed across different industries and among firms of different sizes. As Hwang (2012) assumes, a standard production function, i.e., that labor input is a factor of production, is suggested below. Let l represent the total labor cost and f stand for fixed cost. We add the cost of regulatory compliance, fA, which a 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 equations (2) and (3).

$$l = f + fA + ax \tag{2}$$

$$\frac{l}{x} = a + \frac{f + f_A}{x} \tag{3}$$

As shown in equation (3), the variable $\frac{l}{x}$ embeds the concept of economies of scale. As output grows (x increases), the average cost of the labor input decreases, which implies economies of scale for production. Therefore, we can infer that the ratio of the total labor cost to sales (as a proxy for the firm's total production and costs) can be a representative estimate of how regulatory costs vary across industries, with regard to firm size. Specifically, if the ratio of labor costs to sales increases, the implication is 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 using equations (2) and (3). Table 9 illustrates this 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 the minimum regulatory cost (2.4257 trillion won calculated in Table 8) multiplied by the ratio and maximum regulatory cost (386.7222 trillion won) multiplied by the ratio.

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

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

In addition, we can allocate the regulatory cost depending on the firm size using the ratio $\frac{l}{x}$. We derived the indexes $S \neg L$, SM, and SS using the equations (4) and (5). Relating the sum of each ratio, the labor cost per output, depending on the firm size to the total regulatory cost calculated in Table 8, $S \neg L$, SM, and SS respectively represent the regulatory costs of large, medium, and small firms.

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

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

TABLE 9—SALES AND LABOR COSTS DEPENDING ON THE 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)	3,244,020	9,535,773	1,341,134
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
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: 1) Sales and labor costs in million won and regulatory costs in 100 million won. 2) Numbers in parentheses are the minimum and maximum of the total regulatory cost estimates for each industry.

V. Concluding Remarks

This study argues that improving the quality of regulations will have a positive effect on economic growth. This finding is consistent with those of earlier studies such as Crain & Crain (2010), who find a positive relationship between the quality of regulation and GDP per capita. Additionally, through an empirical analysis, enhancing the regulation quality levels incurs economic costs that vary depending on the firm size and on the 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 differs depending on the sample and the time period selected. However, the general result holds.

In 2013, the Regulatory Quality Index of Korea was 0.982. To help with the establishment of realistic policy goals, this study suggests recognizing the regulatory costs relative to the average amounts in other countries. Here, the regulatory cost for Korea is estimated using regression results. The burden of regulation in South Korea is between 2.2 and 354.7 billion USD, which represents approximately 0.17~27.41% of total GDP (1,304.3 million dollars). If the regulatory quality improves to the OECD average, a reduction in the regulatory costs in the range of 9.9~32.2 billion USD can be expected. This corresponds to approximately 0.76 to 2.47% of the GDP of Korea in 2013, which underscores the importance of regulatory reforms for the Korean economy.

The results here must be carefully interpreted, as an increase in the index does not necessarily mean deregulation. Deregulation may bring about a more positive business environment, but it may also have negative effects over the short term, and vice versa. For example, more investment opportunities may arise when there is capital inflow in the market due to deregulation. On the other hand, in the long run, such a situation can lead to a financial crisis.[2] The index here evaluates the overall business environment, and short- and long-run effects of introducing or abolishing regulations must be considered.

This paper presents the regulatory costs incurred by firms of different sizes such that improved regulations that ensure fairness among all firms can be established. We introduce a new method to examine the distribution of regulatory costs across different industries and firm sizes. The findings when using this alternative method are largely consistent with the conclusions reached by other studies, specifically that small firms typically bear a disproportionate regulatory burden.

However, there are limitations to this new approach. Fixed costs vary significantly among industries, making a distinction between regulatory fixed costs and fixed costs as they pertain to factors of production difficult. Using the new method may not be suitable when comparing industries to other industries. Policymakers must be cautious when implementing this variable to all industries.

[2]The authors thank the referee for the valuable comments about this.

APPENDIX

The following presents additional regression results with reference to the determinants of GDP per capita considering capital and the labor force. To check the original analysis results, the net capital stock volume (2010=100) and unemployment rates of OECD countries are included here.

TABLE A1—PANEL REGRESSION FOR THE DETERMINANTS OF GDP PER CAPITA (FIXED EFFECT, CAPITAL AND LABOR VARIABLES INCLUDED)

	ln(real_gdp)						
	I	II	III	IV	V	VI	VII
	G52	OECD	OECD I	OECD II	G20	Non-G20	Non-G8
Rq		0.122**	0.117**	0.072	0.146**	0.236***	0.253***
		(2.38)	(2.23)	(1.53)	(2.06)	(4.73)	(4.22)
ln(trade)		-0.687***	-0.573***	-0.549***	-0.503***	-0.368***	-0.541***
		(-8.34)	(-6.60)	(-5.53)	(-5.28)	(-3.23)	(-5.51)
ln(priedu)		-0.471	-0.504	-0.627**	-0.683	0.094	0.308
		(-1.60)	(-1.62)	(-2.07)	(-1.07)	(0.35)	(1.01)
ln(bb)		0.061***	0.072***	0.082***	0.027*	0.043***	0.061***
		(6.02)	(7.18)	(7.38)	(1.85)	(4.04)	(5.60)
ln(pop)		-1.013**	0.251	-1.053**	2.171***	-2.378***	-1.605***
		(-3.02)	(0.62)	(-2.29)	(4.32)	(-7.21)	(-4.38)
ln(life)		6.605***	5.336***	6.714***	4.616***	6.175***	4.772***
		(6.20)	(4.13)	(5.30)	(3.32)	(5.17)	(3.56)
ln(capital)		0.034***	0.034***	0.043***	0.041***	-0.003	0.008
		(4.11)	(4.02)	(5.05)	(4.73)	(-0.26)	(-0.58)
ln(unemployment rate)		-0.161***	-0.158***	-0.113***	-0.240***	-0.176***	-0.154***
		(-5.56)	(-5.00)	(-3.52)	(-4.22)	(-6.86)	(-5.09)
time F.E	YES						
N		284	253	212	115	169	195

Note: 1) T-statistics in parentheses, * $p<0.10$, ** $p<0.05$, *** $p<0.01$. 2) Sample from 1996 to 2013. 3) Net capital stock and unemployment rates are from OECD Stat.

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