Colonies, Conflict, and Calculus: Education's Impact on Development

The political economy of development has been a longstanding puzzle. Since the inception of the concept of the nation-state, scholars have studied how countries expand their economies. In the field of comparative politics, the question is framed as such: why is it that some countries grow faster than others? What factors—either domestic or international—best explain development outcomes? Several theories have been generated to answer these questions, most of which claim that international factors are central to economic development. In this paper I will attempt to show that international factors are not as important to economic development as domestic factors, utilizing domestic education metrics as indicators of gross domestic product.

International Theories and Where They Fall Short

Literature concerning the political economy of development largely focuses on international factors. We can begin the discussion of international factors with the idea of relative backwardness—the notion that "backward" countries have development trajectories that are closely related to their well-developed counterparts[1]. Among other European countries, Russia can be studied as an example of serfdom's impact on development. Historically, Russia existed as a feudal agricultural society. Citizens did not own the land they tilled, and this backwardness persisted until the Emancipation Reform of 1861 (Gerschenkron 17).

By 1861, much of the western world had begun industrializing. Here lies the central claim of relative backwardness: because Russia had been backward for so long, they had the opportunity to observe development in other parts of the world. Through military conflict with the West, Russian economic development occurred in "fits and starts" as military necessities arose (17).

[1] Alexander Gerschenkron, *Economic Backwardness in Historical Perspective*, 1962.

I claim that Russia's economic progress being predicated upon conflict suggests that the country was still behind the times, despite beginning a period of development according to relative backwardness theory. While the rest of the developed and developing world focused on innovation, only wartime efforts could spur the Russian economy. Investment in education could have jump-started the economy through innovation, instead of relying on potentially costly wars.

Dependency theory, another international model, suggests that satellites develop fastest "if and when their ties to their metropolis are weak"[2]. Chile and Brazil are examples of countries that have been plagued by the "development of underdevelopment" (Frank 7). According to dependency theory, Chile has been subject to the "metropolis-satellite structure" for so long that it presently has trouble developing its own economy. Likewise, Brazil was subject to declining regional economic interest, and for this reason experiences underdevelopment today (8). However, one could argue particularly in the case of Chile that domestic factors are to blame as well. This will be explored in the next section by comparing Chile's industrialization effort with South Korea's.

While these theories center international influences as determinants development, they fall short in their acknowledgement of stateside factors. They do not give much detail on how these countries should build domestically now that they have seen examples of development around them (in the case of relative backwardness) or are independent of the metropolis-satellite structure (in the case of dependency theory). To shift our conversation to stateside development, we can expound upon a comparison between Chile and South Korea that was first introduced in lecture.

From Education to Industrialization: A Way Forward

Discussing the success of South Korea's domestic companies provides a transition away from international factors. The country's economic boom in the mid- to late-20th century centered around the

[2] Andre Gunder Frank, "The Development of Underdevelopment," *Monthly Review*, 1966.

chaebol, a set of large private enterprises and the economic elites who ran them[3]. These companies received investment from the government to spur development through education, technology, and manufacturing. Examples of *chaebol* that exist to this day include Samsung and Hyundai. At the mention of Hyundai, we can concentrate our discussion on the skilled workforce required to make the *chaebol*'s success possible.

South Korea's automobile industry found success on the shoulders of a domestically educated workforce. This workforce was well-educated, having been recipients of educational funding directly from the government.

Government intervention through planning, strategizing, and investment facilitated rapid growth in domestic industry[4]. Under military-dictator-turned-president Park Chung-Hee, South Korea's government placed great emphasis on nurturing the growth of the then-infantile *chaebol*[5]. Alongside threatening jailtime for investment in non-government-sponsored entities (the Law of Ill-Gotten Gains), the government provided perks and protections that aided development. These perks included investment in human capital. More scientists and engineers were needed as the automobile industry expanded. Thus, governmental spending on education increased.

Chile attempted the creation of a similar automobile industry but failed for several reasons. Within the scope of this paper, one key reason is the lack of state-sponsored expenditure in education. Figure 1 below details the disparity between Chile and South Korea's governmental investment in education:

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[3] Minho Kuk, "The Governmental Role in the Making of Chaebol in the Industrial Development of South Korea," *Asian Perspective* 12, no. 1 (1988).
[4] Minho Kuk.
[5] Ashley Anderson, "Political Economy of Development: The 'East Asian' Miracle."

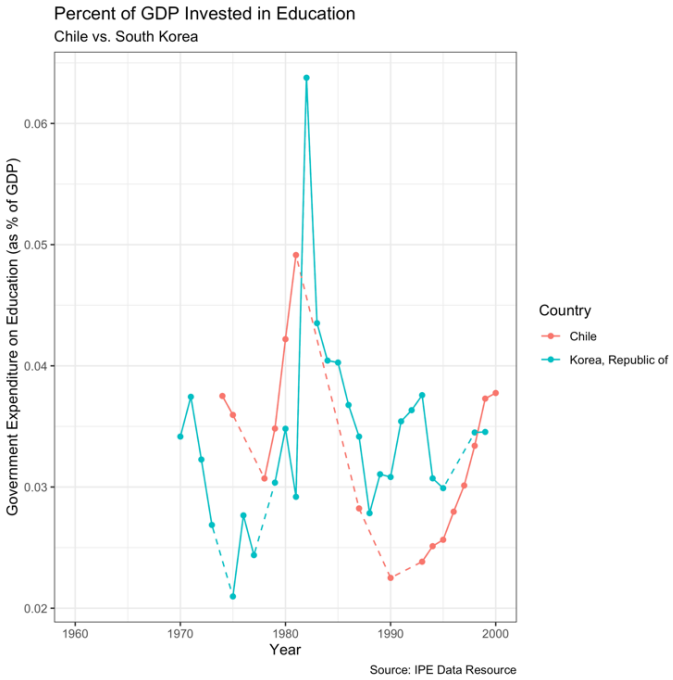

Figure 1: GDP Invested in Education in Chile and South Korea

We can also examine log GDP per capita within the same timeframe:

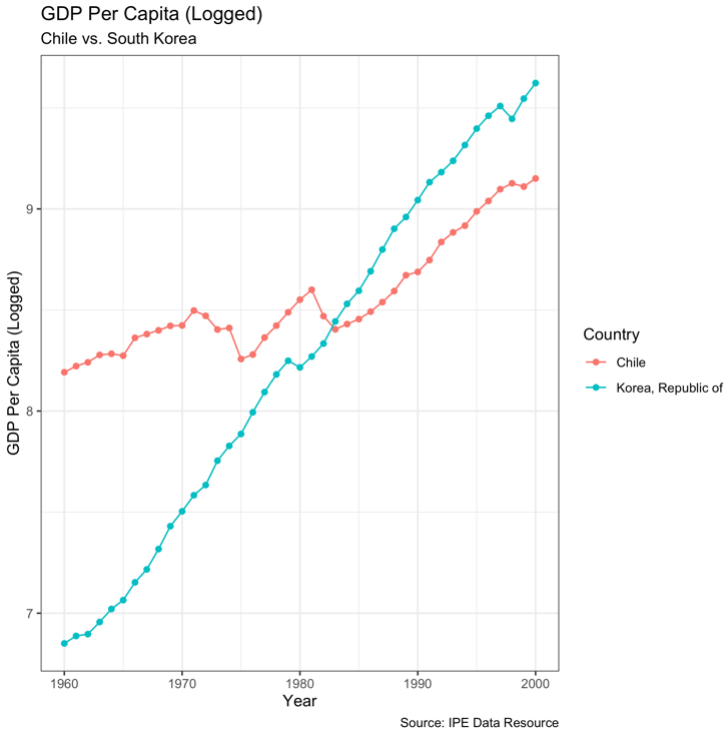

Figure 2: GDP Per Capita (Logged) In Chile and South Korea

Of note in Fig. 2 is the intersection and subsequent passing of South Korea's GDP over Chile's circa 1980. This overtaking coincides with a drastic increase in South Korea's spending in education around the same period. Thus, I claim that educational investment is a key indicator for GDP. More broadly, I claim that domestic factors are more telling indicators of economic development. I will now explore this claim more generally with a larger set of countries.

Quantifying Educational Impact: Data, Methods, and Results

Country-year data was pulled from the World Economics and Politics Dataverse[6]. Seven countries were chosen, all of which we have compared to one-another at some point in lecture: Chile, South Korea, Hong Kong, Mexico, Singapore, Zimbabwe, and Ghana. Initially, data was pulled for years in range 1900-2021, but most countries did not have data pre-1950. Thus, observations for all years before 1950 were dropped.

Summary statistics for the final dataset are presented below:

sumtable {vtable} Summary Statistics

Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
year	492	1984.665	20.346	1950	1967	2002	2021
log_gdp_per_capita	447	8.494	1.201	6.542	7.206	9.368	10.972
fdi_inward_millions	336	9661.067	20382.779	-267.221	109.14	9504.625	174352.888
educ_pct_GDP_gov_exp	189	0.042	0.037	0.015	0.028	0.045	0.443
educ_pct_govt_exp	110	19.575	4.571	7.642	17.069	22.016	37.521
pct_tertiary_ages_20_24	91	12.007	15.664	0.4	2.686	14.681	84.983
math_avg_PIS	30	487.586	54.11	399.722	429.299	534.848	556.022
reading_avg_PIS	30	487.586	54.11	399.722	429.299	534.848	556.022
science_avg_PIS	30	487.586	54.11	399.722	429.299	534.848	556.022
pupil_teacher_ratio_in_secondary_education	216	0.218	0.061	0.115	0.175	0.245	0.391
total_test	30	1462.758	162.33	1199.166	1287.896	1604.544	1668.066

Table 1: Summary Statistics

[6] "Graham, Benjamin .A.T., Raymond Hicks, Helen Milner, and Lori D. Bougher. 2018. World Economics and Politics Dataverse," n.d.

Though I utilize most indicators in my regression, for the sake of concision I will highlight three here: *fdi_inward_millions* is a measure of inward FDI flows for a given country in a given year. This indicator is meant to represent the international factors discussed at the beginning of this paper. Secondly, *year* is simply the "year" portion of the dataset, meant as a control of sorts. Though we did not discuss modernization theory in this paper, I wanted to consider the passage of time as a possible mechanism for development. All other indicators represent stateside educational attainment and investment, with *total_test* equating to the summation of average OCED Programme for International Student Assessment (PISA) scores across math, science, and reading.

The table below presents ordinary least-squares regression results for six bivariate models:

Table 2: Regression Results

	Dependent variable:					
	log_gdp_per_capita					
	Year (Time)	Foreign Direct Investment	% 20-24 in Tertiary	Pupil-Teacher Ratio	Test Scores	Gov't Spending (% GDP) on Education
	(1)	(2)	(3)	(4)	(5)	(6)
year	0.028***					
	(0.003)					
fdi_inward_millions		0.00003***				
		(0.00000)				
pct_tertiary_ages_20_24			0.045***			
			(0.006)			
pupil_teacher_ratio_in_secondary_education				-5.030***		
				(1.278)		
total_test					0.003***	
					(0.0003)	
educ_pct_GDP_gov_exp						-9.006***
						(2.261)
Constant	-46.954***	8.394***	7.810***	9.751***	5.275***	9.175***
	(5.469)	(0.064)	(0.128)	(0.289)	(0.501)	(0.126)
Observations	447	336	83	216	30	189
R^2	0.188	0.275	0.394	0.068	0.750	0.078
Adjusted R^2	0.186	0.273	0.387	0.063	0.741	0.073
Residual Std. Error	1.084 (df = 445)	1.056 (df = 334)	0.910 (df = 81)	1.145 (df = 214)	0.298 (df = 28)	1.133 (df = 187)
F Statistic	102.790*** (df = 1; 445)	126.579*** (df = 1; 334)	52.705*** (df = 1; 81)	15.498*** (df = 1; 214)	84.185*** (df = 1; 28)	15.864*** (df = 1; 187)
Note:						*p<0.1; **p<0.05; ***p<0.01

Table 2: Regression Results

Discussion

Comparing R^2 values as measures of model fit, PISA scores are the best-fitting predictor of log GDP per capita with this particular dataset. We can also consider the percentage of 20–24-year-olds in tertiary school as the next-best fitting indicator. Both models have correlation coefficients that are statistically significant at the 0.01 level.

The model utilizing foreign direct investment as a regressor fits only ~28% of the data, indicating that log GDP per capita is not well-modeled by FDI (at least for this set of countries). Likewise, an increase of 0.00003 units in log GDP for every million dollars in FDI calls into question the magnitude of the impact that foreign investment has on development.

Arguably the most interesting result is government spending. A one-unit increase in government spending (as a percent of GDP) leads to a negative and statistically significant decrease of log GDP per capita by roughly 9 units. This opens the possibility for a counterargument, wherein government spending in education actually harms GDP. I argue against this claim by noting a difference in scale for the two variables. Our GDP measurement is logged and relative to population, whereas government spending is measured as a percentage of real GDP. This may have caused this model to have unexpected behavior.

To end with an expected result, a one unit increase in pupil-teacher ratio leads to a negative and statically significant decrease in log GDP per capita by about 5 units. This result makes since, given that larger class sizes can be interpreted as a result of underfunded educational programs. More funding enables the hiring of more teachers, which leads to smaller class sizes, a better-educated workforce, and better preparedness for innovation and economic growth.

Conclusion

We began our discussion of development by looking at two international theories of development: relative backwardness and dependency theory. These theories do well to explain international factors surrounding development but fail to answer how countries should handle development inwardly. By comparing GDP and investment in education in Chile and South Korea, I provide a basis for the argument that educational investment is a key indicator for GDP. Regressing log GDP per capita on educational features such as student-teacher ratio and outcomes such as PISA test scores corroborates the importance of education in development. However, the key indicator of educational investment as a percentage of GDP behaves unexpectedly, likely due to a discrepancy in the two variables' scaling.

Given more time, I would attempt a similar analysis with a greater sample size of countries. In addition, I would look for indicators that better represent the theories of relative backwardness and dependency discussed in the beginning of the paper. FDI was chosen for simplicity, but a more in-depth study might utilize directed dyad-year data to compare sets of metropoles and their dependent satellites' economies over time. With more time I would also ensure correct scaling across variables to ensure that regression coefficients are as telling as possible.

Future work should continue to focus on the implications of better-funded educational systems on economic growth. Education is one of the many ways developing countries can provide a better quality-of-life for the next generation.

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