Green policies have positive impacts beyond the environmental side, boosting up economic growth.

Green Policies and Economic Growth

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Introduction

The first concept of sustainable development received its first major international recognition in 1972 at the UN Conference on the Human Environment held in Stockholm.[1] In 2000, the Millennium Development Goals (MDGs), which started a global effort to tackle the indignity of poverty, were created. 12 years later, in 2012, the Sustainable Development Goals (SDGs) were born at the United Nations Conference on Sustainable Development in Rio de Janeiro. The object was to produce a set of universal goals that meet the urgent environmental, political, and economic challenges facing our world.[2] With increasing importance and interest in the climate crisis and sustainability, the Paris Agreement was adopted by 196 Parties at the UN Climate Change Conference on 12 December 2015. The Paris Agreement is a legally binding international treaty on climate change.[3]

However, there are some controversies about the implementations that these have no advantage or even negative impacts on economic growth. Previous US President Donald Trump's rejection of the 2015 Paris Agreement on climate change mitigation arguing it undermines the US economy is a representative example of this.

Methods

To explore the dynamics between green policies and economic growth, I used the World Development Indicators Database from the World Bank. The dataset shows data from over 200 countries. The dataset before 2000 was filtered since it would be ambiguous to relate the outcome to the effect of green policies for the years before 2000.

This research is based on the economic theory that four factors, capital goods, labor force, and technology, are the determinants of economic growth. For the sustainable development variable, CO_2 emissions from solid fuel consumption (kt) was coded as CO2emission.fuel, CPIA business regulatory environment rating (1 low to 6 high) was coded as CPIA.busi.regl.envrn, CPIA policy and institutions for environmental sustainability rating (1 low to 6 high) was coded as CPIA.policy.envrn.sust, and Fossil fuel energy consumption (% of total) was coded as Fossil.fuel.cons. For the capital goods variable, Foreign direct investment net inflows were coded as FDI.inflow. For the labor force variable, unemployment (% of total labor force) was coded as Unemployment. For the technology variable, the number of researchers in R&D (per million people) was coded as Researchers.RD. Lastly, for the human capital variable, the government expenditure per tertiary student (% of GDP per capita) was coded as Gov.exp.per.stu.tertiary.

I separated the analysis into four parts. They are the analysis between green policies and each factor of economic growth; capital goods (equation 1), labor force (equation 2), technology (equation 3), and human capital (equation 4). For better fit, some models have a quadratic or logarithmic term depending on the shape of the original plots indicating the rough relationships between variables.

$$FDI.inflow = \beta_0 + \beta_1(CO2emission.fuel)$$

$$Unemployment = \beta_0 + \beta_1(CO2emission.fuel) + \beta_2(CPIA.busi.regl.envrn) + \beta_3(CPIA.busi.regl.envrn^2) + \beta_4(Fossil.fuel.cons)$$

$$Researchers.RD = \beta_0 + \beta_1(CPIA.policy.envrn.sust) + \beta_2(CPIA.policy.envrn.sust^2) + \beta_3(Fossil.fuel.cons)$$

$$Gov.exp.per.stu.tertiary = \beta_0 + \beta_1 log(Fossil.fuel.cons)$$

Results

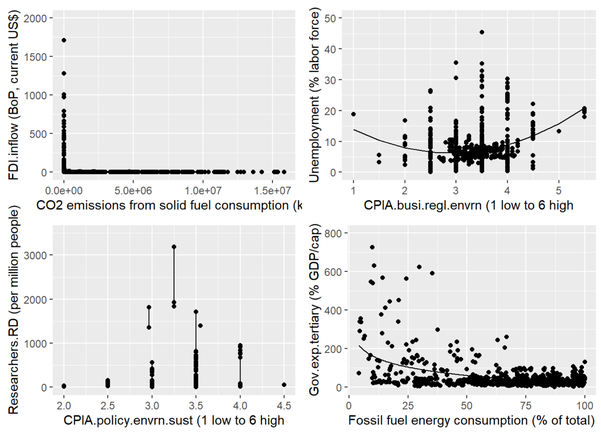

Figure 1: Green Policies & Determinants of Economic Growth

To assess the level of sustainable development from various angles, we can add other variables for sustainable development which we coded in the 'method' section. Among the four variables for sustainable development level, variables that have big p-values are excluded in each regression model. Also, 'CPIA.busi.regl.envrn' variable and 'CPIA.policy.envrn.sust' variable could be interpreted as a social interest in sustainability while 'CO2emission.fuel' variable and 'Fossil.fuel.cons' variable could be interpreted as the actual practice regarding sustainability.

Table 1: Estimates for capital goods as regressed on one green variable (Data: World Bank)

term	estimate	std.error	statistic	p.value
(Intercept)	9.2697434	0.9409225	9.851761	0.0000000
CO2emission.fuel	-0.0000009	0.0000005	-1.863064	0.0625295

For FDI.inflow, CO2emission.fuel was the most significant independent variable showing a negative correlation. Yet, there was no clear correlation between capital goods and green policies for the following two reasons. First, the p-value of CO2emission.fuel is around 0.06 which is over 0.05. Second, the estimate of CO2emission.fuel is too small that it is negligible considering the CO2emission.fuel variable is scaled on kiloton and FDI.inflow is scaled on USD. For example, the estimate indicates that one kiloton increase in CO2emission.fuel decreases FDI.inflow by 0.0000009 USD.

Table 2: Estimates for labor force as regressed on three green variables (Data: World Bank)

term	estimate	std.error	statistic	p.value
(Intercept)	25.2704760	5.9117131	4.274645	2.37e-05
CO2emission.fuel	-0.0000004	0.0000001	-4.599861	5.60e-06
CPIA.busi.regl.envrn	-13.7597155	3.2727992	-4.204265	3.20e-05
I(CPIA.busi.regl.envrn^2)	2.2007577	0.4494212	4.896872	1.40e-06
Fossil.fuel.cons	0.0501147	0.0102036	4.911464	1.30e-06

The CO2emission.fuel variable is a negligible factor as it has a too small estimate considering the units of itself and the dependent variable. On the other hand, the unemployment rate increases by 5% as Fossil.fuel.cons increases by 1%. For CPIA.busi.regl.envrn, at first, the unemployment rate decreases as CPIA.busi.regl.envrn increases. After some point, however, the two have positive relationships.

Table 3: Estimates for technology as regressed on two green variables (Data: World Bank)

term	estimate	std.error	statistic	p.value
(Intercept)	2960.842806	988.6803255	2.994742	0.0038287
CPIA.policy.envrn.sust	-2133.984067	635.9986631	-3.355328	0.0013000
I(CPIA.policy.envrn.sust^2)	369.280603	101.4520674	3.639952	0.0005270
Fossil.fuel.cons	4.936708	0.6471657	7.628198	0.0000000

Researchers.RD increases by around 5 as Fossil.fuel.cons increases by one unit. For CPIA.policy.envrn.sust, meanwhile, Researchers.RD decreases significantly at first but it starts to increase after some point.

Table 4: Estimates for human captial as regressed on one green variable (Data: World Bank)

term	estimate	std.error	statistic	p.value
(Intercept)	307.33456	15.17664	20.25051	0
log(Fossil.fuel.cons)	-63.01664	3.63974	-17.31350	0

Gov.exp.per.stu.tertiary decreases by around 63 units as log(Fossil.fuel.cons) increases by one unit. This means a 1% increase in Fossil.fuel.cons results in a 0.63% decrease in Gov.exp.per.stu.tertiary.

Discussion

In conclusion, it is identified that green policies positively affect economic growth by boosting up labor force, technology, and human capital even though the impact on capital goods was not clear. Especially, it is notable that the quadratic terms in the second and the third models imply that the business regulatory environment shouldn't be too strong to decrease unemployment while the policies for environmental sustainability should be strong to increase the number of researchers in R&D.

However, some concerns need to be supplemented in the follow-up research. For now, it is difficult to guarantee that the independent variables selected for green policies, capital goods, labor force, technology, and human capital are fully representing each of them. We could settle down to analyzing what causes the specific relationships between the variables on a solid foundation once we are sure of the selection of the variables.

References

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