Testing the Robustness of the Specification Proposed by Arvind Subramanian

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1) Background and Motivation

India changed its data sources and methodology for estimating the real gross domestic product since 2011-2012. Arvind Subramaniam has argued in his paper "India's GDP Mis-estimation: Likelihood, Magnitudes, Mechanisms, and Implications" that this change has lead to significant overestimation of the GDP. He claims that the GDP has been overestimated by upto 1.5-3.5 percent with 95 percent confidence level.

Though the paper claims India as an outlier for the post 2011 period, we feel that a further investigation is necessary to accept the claims made. To back our argument, an anomaly can be observed in Table 1 of the paper,

	Only MIC	
	With Electricity	Without Electricity
2002-11		
India	0.018	0.019
t-stat	*4.51*	*4.06*
R-sq.	0.43	0.35
2012-16		
India	0.029	0.037
t-stat	*6.40*	*11.44*
R sq.	0.68	0.62
# Observations	40	40

In the column for MIC with electricity, the t-stat values for pre-2011 period and post-2011 periods are comparable. Due to this we feel that the claims made by the paper may not entirely be accurate and hence may not clearly present the complete picture.

Proper citations are reqd. for models/ quotes picked as is.

2) Analysis Query

The regression equation models used in the paper relevant to us are:

$$GDP\ Growth_i = \beta_0 + \beta_1 Credit\ Growth_i + \beta_2 Electricity\ Growth_i + \beta_3 Export\ Growth_i + \beta_4 Import\ Growth_i + \beta_5 India + \varepsilon_i \quad \text{----------(1)}$$

$$GDP\ Growth_{it} = \beta_0 + \beta_1 Credit\ Growth_{it} + \beta_2 Electricity\ Growth_{it} + \beta_3 Export\ Growth_{it} + \beta_4 Import\ Growth_{it} + \beta_5 India * T + \beta_6 India + \beta_7 T + \beta_8 Credit\ Growth_{it} * T + \beta_9 Electricity\ Growth_{it} * T + \beta_{10} Export\ Growth_{it} * T + \beta_{11} Import\ Growth_{it} * T + \varepsilon_{it} \quad \text{--------- (1)'}$$

We will analyse the rebuttal point-wise hereon:

★ *"**However, given the fact that his paper lacks rigor in terms of specific data sources and description; alternative hypothesis**; rationale of equation specifications, use of dummies, and robustness-check diagnostics of estimated equations; **and choice of countries in the sample and a specific list**; it would not stand the scrutiny of academic or policy research standards."*

We agree with the EAC about the author not being descriptive enough about the data he used in his study. He has not explicitly mentioned the list of countries he has used, which makes it difficult to reproduce and verify his experiment. Although the paper mentions the sources and even classifies the countries, the number of observations still do not match and hence the removing few countries(based on factors such as population) are still unclear. Moreover, we also feel that to reaffirm his claim of robustness, we should run the same analysis with a different set of countries following the same economic trends.

Is this feasible?

We would also like to point out that the author didn't provide summary statistics for the data used. Providing it would've helped us in cross checking the data that we procured. It makes it difficult to replicate the experiment.

★ *"**However, given the fact that his paper lacks rigor in terms of** specific data sources and description; alternative hypothesis; **rationale of equation specifications**, use of dummies, and robustness-check diagnostics of estimated equations; and choice of countries in the sample and a specific list; it would not stand the scrutiny of academic or policy research standards."*

The paper justifies the rationale behind using variables like import, credits, exports and electricity as the reliable factors of estimation of GDP across most countries. Despite this the author kept in mind India's aggressive policy-induced electricity distribution which may mean that it becomes a less reliable indicator as the production rate might be much higher to the level of actual consumption. To accommodate for this, the paper implements all the regressions by

removing the feature variable $Electricity\ Growth_i$ and then fitting the regression model again. This means the rationale behind equation specification is present but not extensively. So to test the actual impact of electricity we should test its convex or concave relationship with gdp.

$$GDP_i = \beta_0 + \beta_1 Credit_i + \beta_2 Electricity_i + \beta_3 Electricity_i^2 + \beta_4 Export_i + \beta_5 Import_i + \beta_6 India + \varepsilon_i$$

★ *"**However, given the fact that his paper lacks rigor in terms of** specific data sources and description; alternative hypothesis; rationale of equation specifications, **use of dummies**, and robustness-check diagnostics of estimated equations; and choice of countries in the sample and a specific list; it would not stand the scrutiny of academic or policy research standards."*

The use of dummies has been extensively done in the paper with analysis of the regression with the following dummy variable combinations -

- India *(Equation (1))*
- Post - 2011 *(Equation (1'))*
- India * Post 2011 *(Equation (1'))*
- Dummy variable for each country and each year individually in equation 2 of panel estimation *(Equation (2'))*

We believe this extensively tests for all major scenarios and that the suggestion that the experiments have insufficient rigour in use of dummies is slightly harsh. We conclude it as unnecessary for further analysis.

★ *"**However, given the fact that his paper lacks rigor in terms of** specific data sources and description; alternative hypothesis; rationale of equation specifications, use of dummies, and **robustness-check diagnostics of estimated equations**; and choice of countries in the sample and a specific list; it would not stand the scrutiny of academic or policy research standards."*

We can test the robustness of the model in the following ways:

- Instead of using the growth rates, we can use the absolute numbers of the variables used in the model.
- Instead of only using the level-level model, we can also use the level-log, log-level, and log-log model to discover more insights to the relationship among the variables used in the model.
- Instead of just including the countries used by the author, we can use the countries falling under the same constraints as used by the author like discarding countries with population below a million.

Is India comparable (in any period) to countries of pop^n < 1 million

- We can try adding more explanatory variables to the model like steel, and check if the model is explained better or if the new models still depict a similar relationship as claimed by the author.

$$GDP_i = \beta_0 + \beta_1 Credit_i + \beta_2 Electricity_i + \beta_3 Export_i + \beta_4 Import_i + \beta_5 Steel_i + \beta_6 India + \varepsilon_i \quad \ldots.(2)$$

3) Variables and their Descriptions

Table	Variable	Source	Notation
Table 1,2,3	GDP (Constant LCU)	WDI	*GDP/GDP Growth*
Table 1,2,3	Import of Goods and Services at (Constant 2010 USD)	WDI	*Import/Import Growth*
Table 1,2,3	Export of Goods and Services at (Constant 2010 USD)	WDI	*Export/Export Growth*
Table 1,2,3	Domestic Credit to Private Sector (Constant LCU)	WDI	*Credit/Credit Growth*
Table 1,2,3	Electric Power Consumption (kWh per capita)	WDI	*Electricity/Electricity Growth*
Table 2	Steel Making Capacity in (Million Metric Tons)	OECD	*Steel*

4) Summary Statistics

ABSOLUTE MIC (Pre vs. Post 2011)

	N		Mean		SD		Min		Max		NA's	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Credit	38	38	7.4e+13	1.8e+14	3.1e+14	7.6e+14	5.0e+07	5.2e+07	1.4e+15	3.3e+15	3	3
Electric	30	30	739.5	904.0	724.9	801.3	88.7	72.2	3.2e+03	3.5e+03	11	11
Exports	38	33	2.4e+10	4.6e+10	4.8e+10	9.7e+10	2.0e+07	3.6e+08	2.5e+11	5.1e+11	3	8
GDP	40	41	1.8e+14	3.0e+14	9.1e+14	1.4e+15	1.4e+08	1.7e+08	5.6e+15	9.0e+15	1	0
Imports	38	33	2.6e+10	4.9e+10	5.2e+10	1.0e+11	3.2e+07	3.8e+08	2.9e+11	5.6e+11	3	8
Steel	29	29	4.78	7.4	13.6	22.1	0.0	0.0	60.8	113.9	12	12

[SS] { Electricity - consider checking for outliers.

ABSOLUTE BASELINE (Pre vs. Post 2011)

	N		Mean		SD		Min		Max		NA's	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Credit	84	83	4.6e+13	9.7e+13	2.3e+14	5.2e+14	5.0e+07	5.2e+07	1.4e+15	3.3e+15	5	6
Electric	77	77	4.9e+03	5.0e+03	5.2e+03	4.9e+03	88.7	72.2	2.4e+04	2.3e+04	12	12
Exports	84	77	1.5e+11	2.1e+11	3.0e+11	3.7e+11	2.0e+07	3.6e+08	1.6e+12	2.1e+12	5	12
GDP	87	88	9.5e+13	1.5e+14	6.2e+14	1.0e+15	1.4e+08	1.7e+08	5.6e+15	9.0e+15	2	1
Imports	84	77	1.5e+11	2.0e+11	3.2e+11	4.0e+12	3.2e+07	3.8e+08	2.1e+12	2.7e+12	5	12
Steel	77	77	15.5	23.5	63.6	123.5	0.0	0.0	533.6	1.0e+03	12	12

[SS] { electricity → [88.7 - 24000, 72.2 - 23000] consider checking for outliers.

GROWTH MIC (Pre vs. Post 2011)

	N		Mean		SD		Min		Max		NA's	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Credit	38	38	13.14	7.68	9.60	7.46	-2.76	-10.34	33.51	29.99	3	3
Electric	30	30	4.80	3.95	4.12	6.37	-1.66	-17.05	16.65	18.30	11	11
Exports	34	33	10.84	4.23	6.91	5.10	1.29	-5.82	31.53	16.73	7	8
GDP	40	41	5.34	4.55	2.29	2.04	0.37	-1.19	11.40	8.56	1	0
Imports	34	33	11.41	4.83	8.55	4.99	1.91	-7.62	49.54	14.68	7	8
Steel	22	24	14.26	2.28	28.44	4.73	0.00	-1.10	127.78	18.27	19	17

[SS] [(2) for baseline countries: mean g> in credit is 60%. (huge) (Pre). (4157.9) → could be an outlier.

GROWTH BASELINE (Pre vs. Post 2011)

	N		Mean		SD		Min		Max		NA's	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Credit	84	83	58.30	4.77	452.77	6.94	-13.03	-10.34	4157.90	30.00	5	6
Electric	77	77	2.67	1.63	3.56	4.72	-1.66	-17.05	16.65	18.30	12	12
Exports	78	77	7.93	3.80	5.84	3.70	-0.28	-5.83	31.52	16.73	11	12
GDP	87	88	4.24	3.33	2.68	2.22	0.06	-1.62	14.42	8.56	2	1
Imports	78	77	8.77	3.98	6.90	3.53	0.62	-7.62	49.54	14.68	11	12
Steel	63	64	9.43	1.78	30.98	9.57	-14.29	-5.71	200.00	71.43	26	25

5) Results

	Baseline (Growth)		Baseline (Absolute)		MIC (Growth)		MIC (Absolute)	
	With Electricity	Without Electricity	With Electricity	Without Electricity	With Electricity	Without Electricity	With Electricity	Without Electricity
2001-2011								
India	0.90	1.00	8.4e+12	2.2e+13	1.55	1.65	-9.0e+14	-4.9e+14
t-stat	0.56	0.60	0.02	0.06	1.41	1.35	-0.59	-0.40
R sq.	0.59	0.56	0.71	0.72	0.70	0.62	0.82	0.83
# Observations	72	77	74	81	28	33	29	36
2012-2019								
India	2.93*	3.18*	3.5e+13	4.8e+13	2.49*	2.63*	-4.2e+15	-3.5e+15
t-stat	2.07	2.17	0.06	0.09	1.85	1.99	-1.11	-1.10
R sq.	0.54	0.48	0.77	0.77	0.58	0.57	0.76	0.77
# Observations	70	74	70	74	27	31	27	31
Diff-in-Diff								
India*Time	2.03	2.17	2.7e+13	2.6e+13	0.95	0.97	-3.3e+15	-3.0e+15
t-stat	0.94	0.97	0.04	0.04	0.54	0.54	-0.87	-0.97
R sq.	0.58	0.54	0.75	0.76	0.64	0.61	0.77	0.79
# Observations	142	151	144	155	55	64	56	67
# Countries	89	89	89	89	41	41	41	41

significance?

Table 1. Analysing India and India*Time dummy in baseline and MIC data for growth and absolute values

	Baseline (Growth)		Baseline (Absolute)		MIC (Growth)		MIC (Absolute)	
	With Electricity^2	With Steel	With Electricity^2	With Steel	With Electricity^2	With Steel	With Electricity^2	With Steel
Diff-in-Diff								
India*Time	2.07	2.26	2.0e+13	7.7e+14	-0.98	0.91	-3.1e+15	-3.8e+15
t-stat	0.95	1.02	0.03	0.99	0.55	0.53	-0.80	-0.76
R sq.	0.57	0.56	0.74	0.75	0.62	0.64	0.76	0.75
# Observations	142	111	144	136	55	39	144	136
# Countries	89	89	89	89	41	41	41	41

Table 2. Testing India dummy in baseline and MIC data with variables Electricity^2 and Steel

	(1) Baseline Absolute Log-Level	(2) Baseline Absolute Level-Log	(3) Baseline Absolute Log-Log
Credit	6.3e-15*** [1.0e-15]	1.1e+14** [4.2e+13]	0.95*** [0.02]
Exports	3.3e-12 [3.3e-12]	1.8e+13 [3.4e+14]	0.56** [0.20]
Imports	-4.8e-13 [3.0e-12]	-5.9e+13 [3.3e+14]	-0.68*** [0.19]
Electric	-7.5e-05 [5.1e-05]	-3.6e+13 [9.4e+13]	-0.36*** [0.05]
India	4.04* [2.22]	-5.2e+14 [8.6e+14]	0.10 [0.50]
India:T	-0.11 [3.15]	-3.1e+14 [1.2e+15]	0.02 [0.72]
Observations	89	89	89
R-sq.	0.40	0.18	0.97
Signif. Codes:	'***' 0.001	'**' 0.01	'*' 0.05 ' ' 1

Table 3. Testing baseline robustness for different models (with Electricity)

6) Discussions and Concluding Remarks

**Refer to the appendix for the exact results*

The models log-log, level-level, log-level, level-log were individually regressed across the datasets of MIC taken from the WDI and baseline countries (MIC and HIC both). The list of countries in the MIC and baseline dataset is mentioned in appendix group 6. All these models were run on both the growth and the absolute values of the data for checking the robustness. We also ran the regressions on various model specifications basis our hypothesis. There were various models which we did not find useful due to their lack of model explanation also validated by the low level of R^2.*

We didn't run the regression for model (1) in the paper. As it can be seen in the regression model in **Appendix Group 1**,model (1) gives us the same interpretation as the difference-in-difference specification (1'). The coefficient for credit in model (1') is the same as that in model (1) for the pre-2011 data, and the coefficient credit*T in model (1') equals the difference between the values of coefficient for credit in model (1) for post- and pre-2011 data.

For our analysis, we have taken the t-statistic to be in the 90% confidence interval to reject the null.

In **Table 1** we have replicated equations as done in the paper for the baseline countries and MIC. To test the robustness of the equations we also replicated the same model on absolute numbers along with the growth rates. All values of t-stat of the India*Time variable indicate that we can't reject the null thereby indicating that India's trend of its GDP differently affected in the post-2011 period.

But, w/ the first specification, India is an outlier post 2011. [SS]

→ was not

In **Table 2** we only report the results of the DIff-in-DIff equations. We introduce another explanatory variable steel which is known to be a good indicator of the economic growth in the country. Our R^2 metric shows very less increment which indicates that steel does not explain the model better explicitly. There is also low significance of the steel coefficient*. Also the low t-stat values of India*Time indicate that India was not affected differently in the post-2011 period.

(?)

After adding electricity, India does not turn out to be an outlier. [SS]
↳(may want to revisit the electricity variable)

In **Table 3,** we compare the results of the log-log, log-level, and the level-log model for the baseline model with absolute values. We have done the comparison for the absolute values as the growth rates can't be used for the log model due to the values being outside the domain of the function. We observed the R^2 value for the log-log model was 0.97, compared to the level-log model which had the value 0.18. The specification that the author used had an R^2 value of 0.71. This implies that the model specification is not robust to log transformations, which basically suppresses the higher moments of the data to a narrow range. Ideally, we should observe similar trends in different specifications. Moreover, the log-log specification on absolute values gave us the model with the highest R^2 value, and equivalently the lowest residual error on the data.

It should also be noted that for the log-log model the 4 explanatory variables in model (1) are significant with high confidence, and explain the relationship well because of the high R^2 value. This means that the explanatory variables should not be considered to have a linear relationship with GDP.

We also had a hypothesis to understand the effect of electricity on our model by introducing a higher order variable, Electricity^2 . Once again the model behaved consistently suggesting that neither the variable coefficient was significant* nor did it affect the model significantly. Hence basis our observations on model without Electricity, with Electricity and with Electricity^2, we can say that India is not affected differently in the post-2011 period thereby dismissing any unusual shocks due to policy introduction. Also running the regression on the growth values in fact suggest the Electricity variable to be an important explanatory variable due to significant t-values*.

It is also worth noting that the Electric consumption value according to the paper has not been exposed to any major shock in the post-2011 period. Though the paper uses a different source for this data it should not be very different from the World Bank's data (**Figure 1**).

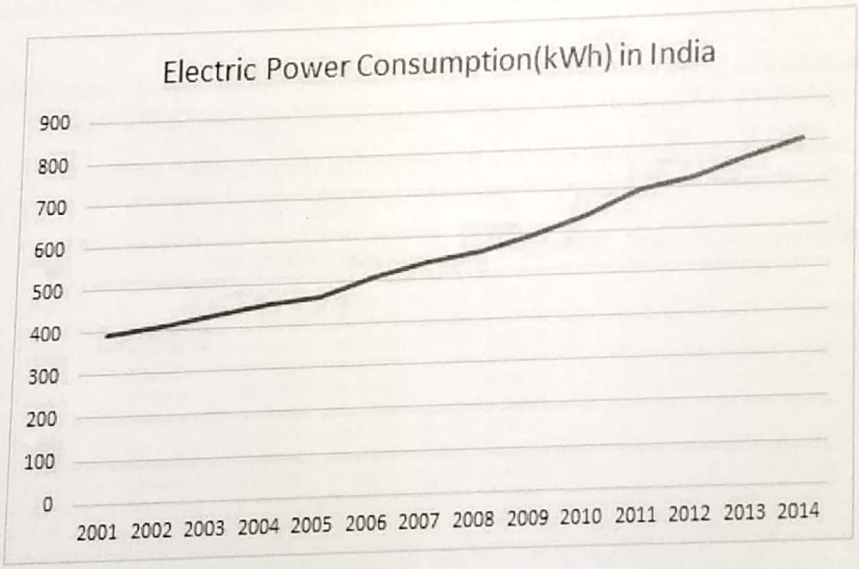

FIgure 1

To summarise,

- **Table 1** indicates that India is not differently affected in the post-2011 period.
- Using the log-log model with absolute values for variables fits the data best,and gives all the explanatory variables high significance. This shows that the explanatory variables have a nonlinear relationship with GDP.
- Electricity data is very consistent across the years according to the World Bank Data and has not been exposed to any major shock (**Figure 1**).
- Steel did not have any significant effect on the regression equation.

7) References

1. A. Subramanian, "India's GDP Mis-estimation: Likelihood, Magnitudes, Mechanisms and Implications", 2019 https://www.hks.harvard.edu/centers/cid/publications/faculty-working-papers/india-gdp-overestimate

2. Organisation for Economic Co-operation and Development, "Gross domestic product (GDP) - OECD Statistics - OECD.org", 2019, https://stats.oecd.org/index.aspx?queryid=60702

3. The World Bank, "World Development Indicators (WDI) | Data Catalog", 2019, https://datacatalog.worldbank.org/dataset/world-development-indicators

4. "World Population Review", 2019, http://worldpopulationreview.com/

8) Appendix

APPENDIX GROUP 1: Regressions to compare model specification 1 and 1'

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + India, data = pre)

Residuals:
     Min       1Q   Median       3Q      Max
-3.04610 -0.64298  0.00229  0.53482  2.09695

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.63718    0.42788   6.163 1.18e-06 ***
Credit       0.09005    0.02744   3.282  0.00276 **
Exports      0.11824    0.03989   2.964  0.00614 **
Imports      0.02365    0.03386   0.698  0.49069
India        1.65647    1.22386   1.353  0.18673
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.189 on 28 degrees of freedom
  (9 observations deleted due to missingness)
Multiple R-squared:  0.6699,    Adjusted R-squared:  0.6227
F-statistic:  14.2 on 4 and 28 DF,  p-value: 1.894e-06
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + India, data = post)

Residuals:
     Min       1Q   Median       3Q      Max
-1.80869 -0.83769 -0.05733  0.66446  2.82855

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.56841    0.36978   6.946 2.25e-07 ***
Credit       0.15953    0.03914   4.076 0.000383 ***
Exports      0.03790    0.07114   0.533 0.598742
Imports      0.09913    0.07700   1.287 0.209295
India        2.62961    1.32166   1.990 0.057247 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.299 on 26 degrees of freedom
  (11 observations deleted due to missingness)
Multiple R-squared:  0.6253,    Adjusted R-squared:  0.5677
F-statistic: 10.85 on 4 and 26 DF,  p-value: 2.618e-05
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + India + T + T *
    Credit + T * Exports + T * Imports + T * India, data = data)

Residuals:
     Min       1Q   Median       3Q      Max
-3.04610 -0.77353 -0.01657  0.65462  2.82855

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.63718    0.44732   5.895 2.51e-07 ***
Credit       0.09005    0.02868   3.139  0.00274 **
Exports      0.11824    0.04171   2.835  0.00644 **
Imports      0.02365    0.03540   0.668  0.50696
India        1.65647    1.27949   1.295  0.20095
T           -0.06877    0.57040  -0.121  0.90449
Credit:T     0.06948    0.04718   1.473  0.14662
Exports:T   -0.08034    0.07985  -1.006  0.31881
Imports:T    0.07548    0.08176   0.923  0.36001
India:T      0.97313    1.79924   0.541  0.59083
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.243 on 54 degrees of freedom
  (20 observations deleted due to missingness)
Multiple R-squared:  0.6704,    Adjusted R-squared:  0.6155
F-statistic: 12.21 on 9 and 54 DF,  p-value: 2.943e-10
```

APPENDIX GROUP 2: Regressions for robustness on the MIC dataset (values in growth%)

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + India + T + T *
    Credit + T * Exports + T * Imports + T * India, data = data)

Residuals:
     Min       1Q   Median       3Q      Max
-3.04610 -0.77353 -0.01657  0.65462  2.82855

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.63718    0.44732   5.895 2.51e-07 ***
Credit       0.09005    0.02868   3.139  0.00274 **
Exports      0.11824    0.04171   2.835  0.00644 **
Imports      0.02365    0.03540   0.668  0.50696
India        1.65647    1.27949   1.295  0.20095
T           -0.06877    0.57040  -0.121  0.90449
Credit:T     0.06948    0.04718   1.473  0.14662
Exports:T   -0.08034    0.07985  -1.006  0.31881
Imports:T    0.07548    0.08176   0.923  0.36001
India:T      0.97313    1.79924   0.541  0.59083
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.243 on 54 degrees of freedom
  (20 observations deleted due to missingness)
Multiple R-squared:  0.6704,    Adjusted R-squared:  0.6155
F-statistic: 12.21 on 9 and 54 DF,  p-value: 2.943e-10
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + India +
    T + T * Credit + T * Exports + T * Imports + T * Electric +
    T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-2.6722 -0.5845  0.0000  0.5513  2.4066

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.30559    0.48545   4.749 2.29e-05 ***
Credit       0.04764    0.03371   1.413  0.16475
Exports      0.11532    0.04159   2.773  0.00818 **
Imports      0.03796    0.03690   1.029  0.30925
Electric     0.13686    0.06479   2.112  0.04049 *
India        1.55105    1.23521   1.256  0.21601
T            0.36199    0.60788   0.595  0.55464
Credit:T     0.08900    0.05256   1.693  0.09760 .
Exports:T   -0.10200    0.07932  -1.286  0.20531
Imports:T    0.07358    0.08080   0.911  0.36752
Electric:T  -0.08562    0.07730  -1.108  0.27416
India:T      0.94522    1.73570   0.545  0.58886
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.194 on 43 degrees of freedom
  (29 observations deleted due to missingness)
Multiple R-squared:  0.716,     Adjusted R-squared:  0.6433
F-statistic: 9.855 on 11 and 43 DF,  p-value: 1.376e-08
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + Electric2 +
    India + T + T * Credit + T * Exports + T * Imports + T *
    Electric + T * Electric2 + T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-2.6027 -0.5372  0.0000  0.5337  2.4710

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.174248   0.652823   3.331  0.00184 **
Credit       0.049841   0.035165   1.417  0.16394
Exports      0.118347   0.043598   2.714  0.00967 **
Imports      0.036079   0.038185   0.945  0.35027
Electric     0.184760   0.168353   1.097  0.27885
Electric2   -0.003541   0.011443  -0.309  0.75857
India        1.478746   1.283466   1.152  0.25593
T            0.517215   0.756144   0.684  0.49781
Credit:T     0.093131   0.057829   1.610  0.11497
Exports:T   -0.103315   0.081808  -1.263  0.21376
Imports:T    0.068666   0.085593   0.802  0.42704
Electric:T  -0.132118   0.173834  -0.760  0.45159
Electric2:T  0.002577   0.011851   0.217  0.82893
India:T      0.989159   1.790992   0.552  0.58374
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.22 on 41 degrees of freedom
  (29 observations deleted due to missingness)
Multiple R-squared:  0.7173,    Adjusted R-squared:  0.6277
F-statistic: 8.003 on 13 and 41 DF,  p-value: 1.273e-07
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + Steel +
    India + T + T * Credit + T * Exports + T * Imports + T *
    Electric + T * Steel + T * India, data = data)

Residuals:
     Min       1Q   Median       3Q      Max
-2.09888 -0.40395 -0.07194  0.45833  2.30985

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  3.03913    0.62262   4.881 5.07e-05 ***
Credit       0.02316    0.04741   0.489   0.6294
Exports      0.13156    0.05704   2.307   0.0296 *
Imports      0.02981    0.04147   0.719   0.4789
Electric     0.12215    0.09291   1.315   0.2005
Steel       -0.01398    0.01027  -1.362   0.1854
India        1.24290    1.21921   1.019   0.3178
T           -0.51073    0.72769  -0.702   0.4893
Credit:T     0.18391    0.07700   2.388   0.0248 *
Exports:T   -0.10663    0.09987  -1.068   0.2959
Imports:T    0.01296    0.08483   0.153   0.8798
Electric:T  -0.08495    0.10463  -0.812   0.4245
Steel:T      0.07235    0.05974   1.211   0.2372
India:T      0.91200    1.70436   0.535   0.5973
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.144 on 25 degrees of freedom
  (45 observations deleted due to missingness)
Multiple R-squared:  0.765,     Adjusted R-squared:  0.6428
F-statistic: 6.261 on 13 and 25 DF,  p-value: 4.657e-05
```

APPENDIX GROUP 3: Regressions for robustness on the baseline (MIC and HIC) dataset (values in growth%)

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + India + T + T *
    Credit + T * Exports + T * Imports + T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-4.0539 -0.9329 -0.1047  0.8052  7.2020

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.4618393  0.3152103   4.638 7.96e-06 ***
Credit      -0.0002366  0.0003794  -0.624    0.534
Exports      0.1797034  0.0416000   4.320 2.93e-05 ***
Imports      0.1463478  0.0348911   4.194 4.81e-05 ***
India        1.0086007  1.5941803   0.633    0.528
T            0.1928599  0.4269464   0.452    0.652
Credit:T     0.1572547  0.0293817   5.352 3.44e-07 ***
Exports:T   -0.0540013  0.0850573  -0.635    0.527
Imports:T   -0.0580881  0.0882255  -0.658    0.511
India:T      2.1749245  2.2416679   0.970    0.334
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.563 on 141 degrees of freedom
  (29 observations deleted due to missingness)
Multiple R-squared:  0.5691,    Adjusted R-squared:  0.5416
F-statistic: 20.69 on 9 and 141 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + India +
    T + T * Credit + T * Exports + T * Imports + T * Electric +
    T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-3.3685 -0.8088 -0.1212  0.6690  8.0933

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.3164029  0.3091651   4.258 3.9e-05 ***
Credit      -0.0001917  0.0003639  -0.527 0.599314
Exports      0.1466708  0.0420145   3.491 0.000658 ***
Imports      0.1366253  0.0340429   4.013 0.000101 ***
Electric     0.1577743  0.0569324   2.771 0.006404 **
India        0.9014284  1.5325507   0.588 0.557426
T            0.3925953  0.4244160   0.925 0.356667
Credit:T     0.1080754  0.0334105   3.235 0.001544 **
Exports:T   -0.0604907  0.0846348  -0.715 0.476060
Imports:T   -0.0224954  0.0856788  -0.263 0.793309
Electric:T  -0.0353062  0.0739448  -0.477 0.633831
India:T      2.0327921  2.1549112   0.943 0.347262
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.498 on 130 degrees of freedom
  (38 observations deleted due to missingness)
Multiple R-squared:  0.6121,    Adjusted R-squared:  0.5792
F-statistic: 18.65 on 11 and 130 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + India + T + T *
    Credit + T * Exports + T * Imports + T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-4.0539 -0.9329 -0.1047  0.8052  7.2020

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.4618393  0.3152103   4.638 7.96e-06 ***
Credit      -0.0002366  0.0003794  -0.624    0.534
Exports      0.1797034  0.0416000   4.320 2.93e-05 ***
Imports      0.1463478  0.0348911   4.194 4.81e-05 ***
India        1.0086007  1.5941803   0.633    0.528
T            0.1928599  0.4269464   0.452    0.652
Credit:T     0.1572547  0.0293817   5.352 3.44e-07 ***
Exports:T   -0.0540013  0.0850573  -0.635    0.527
Imports:T   -0.0580881  0.0882255  -0.658    0.511
India:T      2.1749245  2.2416679   0.970    0.334
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.563 on 141 degrees of freedom
  (29 observations deleted due to missingness)
Multiple R-squared:  0.5691,    Adjusted R-squared:  0.5416
F-statistic: 20.69 on 9 and 141 DF,  p-value: < 2.2e-16


Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + Electric2 +
    India + T + T * Credit + T * Exports + T * Imports + T *
    Electric + T * Electric2 + T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-3.3666 -0.8310 -0.1266  0.6827  8.0861

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.3203784  0.3277316   4.029 9.55e-05 ***
Credit      -0.0001914  0.0003659  -0.523 0.601779
Exports      0.1464714  0.0425595   3.442 0.000782 ***
Imports      0.1367756  0.0344497   3.970 0.000119 ***
Electric     0.1537135  0.1206020   1.275 0.204777
Electric2    0.0003645  0.0095275   0.038 0.969545
India        0.9092803  1.5543576   0.585 0.559586
T            0.3478784  0.4422000   0.787 0.432912
Credit:T     0.0985327  0.0357109   2.759 0.006645 **
Exports:T   -0.0677626  0.0857739  -0.790 0.430981
Imports:T   -0.0088174  0.0879988  -0.100 0.920343
Electric:T  -0.0382031  0.1298977  -0.294 0.769157
Electric2:T  0.0023277  0.0101230   0.230 0.818506
India:T      2.0744059  2.1770436   0.953 0.342460
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.586 on 128 degrees of freedom
  (38 observations deleted due to missingness)
Multiple R-squared:  0.6139,    Adjusted R-squared:  0.5747
F-statistic: 15.66 on 13 and 128 DF,  p-value: < 2.2e-16
```

APPENDIX GROUP 4: Regressions for robustness on the MIC dataset (values in absolute numbers)

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + India + T + T *
    Credit + T * Exports + T * Imports + T * India, data = data)

Residuals:
      Min        1Q    Median        3Q       Max
-2.798e+15 -1.238e+13  7.073e+13  1.087e+14  2.755e+15

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.741e+13  1.407e+14  -0.337    0.737
Credit       2.136e+00  4.548e-01   4.696 1.72e-05 ***
Exports      3.724e+04  2.544e+04   1.464    0.149
Imports     -3.044e+04  2.669e+04  -1.140    0.259
India       -4.968e+14  1.936e+15  -0.257    0.798
T           -1.094e+14  2.095e+14  -0.522    0.604
Credit:T    -7.503e-01  5.259e-01  -1.427    0.159
Exports:T   -2.776e+04  2.639e+04  -1.052    0.297
Imports:T    2.846e+04  2.773e+04   1.026    0.309
India:T     -3.038e+15  3.123e+15  -0.973    0.335
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6.137e+14 on 57 degrees of freedom
  (17 observations deleted due to missingness)
Multiple R-squared:  0.8186,    Adjusted R-squared:  0.7899
F-statistic: 28.58 on 9 and 57 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + India + T + T *
    Credit + T * Exports + T * Imports + T * India, data = data)

Residuals:
      Min        1Q    Median        3Q       Max
-2.798e+15 -1.238e+13  7.073e+13  1.087e+14  2.755e+15

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.741e+13  1.407e+14  -0.337    0.737
Credit       2.136e+00  4.548e-01   4.696 1.72e-05 ***
Exports      3.724e+04  2.544e+04   1.464    0.149
Imports     -3.044e+04  2.669e+04  -1.140    0.259
India       -4.968e+14  1.936e+15  -0.257    0.798
T           -1.094e+14  2.095e+14  -0.522    0.604
Credit:T    -7.503e-01  5.259e-01  -1.427    0.159
Exports:T   -2.776e+04  2.639e+04  -1.052    0.297
Imports:T    2.846e+04  2.773e+04   1.026    0.309
India:T     -3.038e+15  3.123e+15  -0.973    0.335
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6.137e+14 on 57 degrees of freedom
  (17 observations deleted due to missingness)
Multiple R-squared:  0.8186,    Adjusted R-squared:  0.7899
F-statistic: 28.58 on 9 and 57 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + Electric2 +
    India + T + T * Credit + T * Exports + T * Imports + T *
    Electric + T * Electric2 + T * India, data = data)

Residuals:
      Min        1Q    Median        3Q       Max
-2.760e+15 -6.196e+13  4.859e+13  1.417e+14  2.717e+15

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.152e+14  2.972e+14  -0.724  0.47302
Credit       1.872e+00  5.803e-01   3.226  0.00243 **
Exports      4.689e+04  3.248e+04   1.444  0.15623
Imports     -3.700e+04  3.369e+04  -1.098  0.27830
Electric     4.353e+11  5.870e+11   0.742  0.46246
Electric2   -1.900e+08  2.073e+08  -0.916  0.36467
India       -1.026e+15  2.422e+15  -0.424  0.67391
T            1.057e+14  4.494e+14   0.235  0.81522
Credit:T    -5.187e-01  6.643e-01  -0.781  0.43931
Exports:T   -3.869e+04  3.362e+04  -1.151  0.25639
Imports:T    3.732e+04  3.495e+04   1.068  0.29178
Electric:T  -5.890e+11  7.966e+11  -0.739  0.46380
Electric2:T  2.136e+08  2.636e+08   0.810  0.42239
India:T     -3.102e+15  3.873e+15  -0.801  0.42768
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 7.023e+14 on 42 degrees of freedom
  (28 observations deleted due to missingness)
Multiple R-squared:  0.8233,    Adjusted R-squared:  0.7686
F-statistic: 15.05 on 13 and 42 DF,  p-value: 8.023e-12
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + Steel +
    India + T + T * Credit + T * Exports + T * Imports + T *
    Electric + T * Steel + T * India, data = data)

Residuals:
      Min        1Q    Median        3Q       Max
-2.683e+15 -4.755e+13  7.131e+13  1.646e+14  2.640e+15

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -1.669e+14  3.115e+14  -0.536  0.59559
Credit       1.920e+00  6.420e-01   2.990  0.00515 **
Exports      4.139e+04  3.684e+04   1.123  0.26911
Imports     -2.995e+04  3.985e+04  -0.752  0.45746
Electric     8.840e+10  3.232e+11   0.273  0.78614
Steel       -2.290e+13  3.104e+13  -0.738  0.46568
India       -2.201e+14  3.103e+15  -0.071  0.94387
T           -1.320e+14  4.554e+14  -0.290  0.77364
Credit:T    -7.151e-01  7.486e-01  -0.955  0.34621
Exports:T   -3.340e+04  3.807e+04  -0.877  0.38648
Imports:T    3.434e+04  4.153e+04   0.827  0.41407
Electric:T  -5.284e+10  4.265e+11  -0.124  0.90212
Steel:T      3.632e+12  4.179e+13   0.087  0.93125
India:T     -3.852e+15  5.052e+15  -0.763  0.45099
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 7.72e+14 on 34 degrees of freedom
  (36 observations deleted due to missingness)
Multiple R-squared:  0.8254,    Adjusted R-squared:  0.7586
F-statistic: 12.36 on 13 and 34 DF,  p-value: 2.535e-09
```

```
Call:
lm(formula = logGDP ~ Credit + Exports + Imports + India + T +
    T * Credit + T * Exports + T * Imports + T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-6.4442 -1.6913 -0.6703  2.0605  5.7140

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.573e+01  6.090e-01  42.247   <2e-16 ***
Credit       3.185e-15  1.969e-15   1.617    0.111
Exports     -4.608e-11  1.101e-10  -0.418    0.677
Imports      1.026e-10  1.156e-10   0.888    0.379
India       -1.234e+01  8.381e+00  -1.472    0.146
T            4.527e-01  9.071e-01   0.499    0.620
Credit:T    -2.950e-15  2.277e-15  -1.296    0.200
Exports:T    8.759e-11  1.143e-10   0.766    0.447
Imports:T   -9.699e-11  1.201e-10  -0.808    0.423
India:T     -5.876e+00  1.352e+01  -0.435    0.665
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.657 on 57 degrees of freedom
  (17 observations deleted due to missingness)
Multiple R-squared:  0.526,     Adjusted R-squared:  0.4512
F-statistic: 7.029 on 9 and 57 DF,  p-value: 9.344e-07
```

```
Call:
lm(formula = logGDP ~ Credit + Exports + Imports + Electric +
    India + T + T * Credit + T * Exports + T * Imports + T *
    Electric + T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-3.9682 -1.3985 -0.2376  1.3800  4.4055

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.738e+01  7.415e-01  36.926   <2e-16 ***
Credit       3.016e-15  1.769e-15   1.705   0.0953 .
Exports     -1.160e-11  9.832e-11  -0.118   0.9066
Imports      6.137e-11  1.052e-10   0.583   0.5626
Electric    -1.453e-03  6.315e-04  -2.300   0.0262 *
India       -9.929e+00  7.981e+00  -1.244   0.2201
T            9.443e-02  1.103e+00   0.086   0.9322
Credit:T    -2.499e-15  2.046e-15  -1.221   0.2286
Exports:T    3.671e-11  1.022e-10   0.359   0.7213
Imports:T   -4.541e-11  1.096e-10  -0.414   0.6805
Electric:T   4.524e-04  8.646e-04   0.523   0.6034
India:T     -6.355e+00  1.268e+01  -0.501   0.6187
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.317 on 44 degrees of freedom
  (28 observations deleted due to missingness)
Multiple R-squared:  0.6246,    Adjusted R-squared:  0.5307
F-statistic: 6.654 on 11 and 44 DF,  p-value: 2.099e-06
```

```
Call:
lm(formula = GDP ~ logCredit + logExports + logImports + India +
    T + T * logCredit + T * logExports + T * logImports + T *
    India, data = data)

Residuals:
      Min        1Q    Median        3Q       Max
-1.549e+15 -6.505e+14 -4.033e+13  3.491e+14  5.951e+15

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)   -4.506e+15  2.602e+15  -1.732   0.0887 .
logCredit      1.534e+14  7.226e+13   2.122   0.0382 *
logExports    -3.838e+14  6.739e+14  -0.570   0.5712
logImports     4.142e+14  6.716e+14   0.617   0.5399
India         -1.032e+15  1.242e+15  -0.832   0.4091
T             -4.186e+15  4.590e+15  -0.912   0.3656
logCredit:T    1.293e+14  1.105e+14   1.171   0.2466
logExports:T   2.264e+14  8.824e+14   0.257   0.7985
logImports:T  -1.929e+14  9.085e+14  -0.212   0.8326
India:T       -8.640e+14  1.795e+15  -0.481   0.6321
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.151e+15 on 57 degrees of freedom
  (17 observations deleted due to missingness)
Multiple R-squared:  0.3621,    Adjusted R-squared:  0.2614
F-statistic: 3.596 on 9 and 57 DF,  p-value: 0.001336
```

```
Call:
lm(formula = GDP ~ logCredit + logExports + logImports + logElectric +
    India + T + T * logCredit + T * logExports + T * logImports +
    T * logElectric + T * India, data = data)

Residuals:
      Min        1Q    Median        3Q       Max
-1.349e+15 -6.850e+14 -1.427e+14  4.159e+14  5.592e+15

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)   -7.363e+15  3.696e+15  -1.992   0.0526 .
logCredit      1.823e+14  8.333e+13   2.188   0.0340 *
logExports     2.119e+14  9.246e+14   0.229   0.8198
logImports    -1.303e+14  9.117e+14  -0.143   0.8870
logElectric    1.559e+14  2.640e+14   0.590   0.5580
India         -1.316e+15  1.363e+15  -0.965   0.3396
T             -7.299e+15  7.197e+15  -1.014   0.3161
logCredit:T    7.645e+13  1.292e+14   0.592   0.5570
logExports:T   1.104e+14  1.209e+15   0.091   0.9276
logImports:T   8.442e+13  1.285e+15   0.066   0.9479
logElectric:T  8.622e+13  4.117e+14   0.209   0.8351
India:T       -1.164e+15  2.036e+15  -0.572   0.5704
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.241e+15 on 44 degrees of freedom
  (28 observations deleted due to missingness)
Multiple R-squared:  0.4221,    Adjusted R-squared:  0.2776
F-statistic: 2.922 on 11 and 44 DF,  p-value: 0.005601
```

```
Call:
lm(formula = logGDP ~ logCredit + logExports + logImports + India +
    T + T * logCredit + T * logExports + T * logImports + T *
    India, data = data)

Residuals:
     Min       1Q   Median       3Q      Max
-1.2932 -0.4672  0.0000  0.4418  1.0542

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    5.29785    1.39498   3.798 0.000357 ***
logCredit      0.98098    0.03875  25.318  < 2e-16 ***
logExports     0.51979    0.36133   1.439 0.155748
logImports    -0.66241    0.36011  -1.839 0.071055 .
India         -0.03071    0.66573  -0.046 0.963366
T             -3.29724    2.46094  -1.340 0.185618
logCredit:T   -0.06076    0.05923  -1.026 0.309317
logExports:T  -0.10722    0.47313  -0.227 0.821525
logImports:T   0.30416    0.48713   0.624 0.534867
India:T       -0.18729    0.96230  -0.195 0.846379
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.617 on 57 degrees of freedom
  (17 observations deleted due to missingness)
Multiple R-squared:  0.9744,    Adjusted R-squared:  0.9704
F-statistic: 241.4 on 9 and 57 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = logGDP ~ logCredit + logExports + logImports + logElectric +
    India + T + T * logCredit + T * logExports + T * logImports +
    T * logElectric + T * India, data = data)

Residuals:
     Min       1Q   Median       3Q      Max
-0.94880 -0.38433  0.00734  0.32361  0.99065

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    8.09582    1.54759   5.231 4.48e-06 ***
logCredit      0.95164    0.03489  27.277  < 2e-16 ***
logExports     0.44066    0.38710   1.138  0.26113
logImports    -0.59092    0.38171  -1.548  0.12877
logElectric   -0.29951    0.11054  -2.709  0.00957 **
India          0.14227    0.57073   0.249  0.80431
T             -3.70322    3.01331  -1.229  0.22562
logCredit:T   -0.01987    0.05409  -0.367  0.71512
logExports:T  -0.37841    0.50596  -0.748  0.45849
logImports:T   0.57022    0.53798   1.060  0.29496
logElectric:T -0.08476    0.17235  -0.492  0.62531
India:T       -0.25941    0.85223  -0.304  0.76227
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5195 on 44 degrees of freedom
  (28 observations deleted due to missingness)
Multiple R-squared:  0.9811,    Adjusted R-squared:  0.9764
F-statistic:   208 on 11 and 44 DF,  p-value: < 2.2e-16
```

APPENDIX GROUP 5: Regressions for robustness on the baseline (HIC and MIC) dataset (values in absolute numbers)

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + India + T + T *
    Credit + T * Exports + T * Imports + T * India, data = data)

Residuals:
       Min         1Q     Median         3Q        Max
-2.916e+15 -3.973e+12  2.923e+12  1.298e+13  3.110e+15

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 7.765e+12  5.667e+13   0.137  0.89121
Credit      2.382e+00  2.105e-01  11.314  < 2e-16 ***
Exports     -9.042e+01  6.643e+02  -0.136  0.89192
Imports     -2.862e+01  6.144e+02  -0.047  0.96291
India        2.170e+13  4.434e+14   0.049  0.96104
T           -9.196e+12  8.328e+13  -0.110  0.91222
Credit:T    -6.346e-01  2.300e-01  -2.759  0.00654 **
Exports:T    1.153e+02  9.649e+02   0.119  0.90505
Imports:T   -5.204e+01  8.892e+02  -0.059  0.95342
India:T      2.611e+13  6.287e+14   0.042  0.96693
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.399e+14 on 145 degrees of freedom
  (25 observations deleted due to missingness)
Multiple R-squared:  0.7697,    Adjusted R-squared:  0.7554
F-statistic: 53.86 on 9 and 145 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + India +
    T + T * Credit + T * Exports + T * Imports + T * Electric +
    T * India, data = data)

Residuals:
       Min         1Q     Median         3Q        Max
-2.915e+15 -6.781e+12  2.692e+12  2.669e+13  3.109e+15

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.954e+13  7.881e+13   0.248   0.8046
Credit      2.374e+00  2.226e-01  10.666   <2e-16 ***
Exports     -7.779e+01  7.003e+02  -0.111   0.9117
Imports     -2.899e+01  6.443e+02  -0.045   0.9642
Electric    -2.638e+09  1.079e+10  -0.244   0.8073
India        8.387e+12  4.679e+14   0.018   0.9857
T           -1.110e+13  1.155e+14  -0.096   0.9236
Credit:T    -6.303e-01  2.434e-01  -2.590   0.0107 *
Exports:T    1.250e+02  1.022e+03   0.122   0.9029
Imports:T   -6.310e+01  9.347e+02  -0.068   0.9463
Electric:T   2.862e+08  1.631e+10   0.018   0.9860
India:T      2.660e+13  6.645e+14   0.040   0.9681
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.608e+14 on 132 degrees of freedom
  (36 observations deleted due to missingness)
Multiple R-squared:  0.7695,    Adjusted R-squared:  0.7503
F-statistic: 40.07 on 11 and 132 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + Electric2 +
    India + T + T * Credit + T * Exports + T * Imports + T *
    Electric + T * Electric2 + T * India, data = data)

Residuals:
       Min         1Q     Median         3Q        Max
-2.912e+15 -2.239e+13  1.126e+13  3.804e+13  3.103e+15

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  4.295e+13  9.507e+13   0.452    0.652
Credit       2.365e+00  2.249e-01  10.516   <2e-16 ***
Exports     -5.019e+01  7.073e+02  -0.071    0.944
Imports     -2.999e+01  6.483e+02  -0.046    0.963
Electric    -1.527e+10  3.031e+10  -0.504    0.615
Electric2    6.838e+05  1.532e+06   0.446    0.656
India       -1.512e+13  4.737e+14  -0.032    0.975
T           -7.145e+12  1.417e+14  -0.050    0.960
Credit:T    -6.268e-01  2.460e-01  -2.547    0.012 *
Exports:T    1.892e+02  1.051e+03   0.180    0.857
Imports:T   -1.209e+02  9.498e+02  -0.127    0.899
Electric:T  -1.289e+09  4.584e+10  -0.028    0.978
Electric2:T  8.793e+04  2.323e+06   0.038    0.970
India:T      2.004e+13  6.741e+14   0.030    0.976
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.637e+14 on 130 degrees of freedom
  (36 observations deleted due to missingness)
Multiple R-squared:  0.7702,    Adjusted R-squared:  0.7472
F-statistic: 33.52 on 13 and 130 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = GDP ~ Credit + Exports + Imports + Electric + Steel +
    India + T + T * Credit + T * Exports + T * Imports + T *
    Electric + T * Steel + T * India, data = data)

Residuals:
       Min         1Q     Median         3Q        Max
-2.989e+15 -1.162e+13 -1.519e+12  2.227e+13  2.989e+15

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.919e+13  8.494e+13   0.226   0.8216
Credit       2.375e+00  2.280e-01  10.417   <2e-16 ***
Exports      2.176e+02  8.835e+02   0.246   0.8059
Imports     -1.910e+02  7.176e+02  -0.266   0.7905
Electric    -4.795e+09  1.173e+10  -0.409   0.6833
Steel       -8.002e+11  1.384e+12  -0.578   0.5643
India        3.090e+13  4.805e+14   0.064   0.9488
T           -1.054e+13  1.248e+14  -0.084   0.9328
Credit:T    -5.917e-01  2.500e-01  -2.366   0.0195 *
Exports:T   -2.897e+02  1.170e+03  -0.248   0.8048
Imports:T    5.569e+02  1.024e+03   0.544   0.5875
Electric:T   1.797e+09  1.728e+10   0.104   0.9173
Steel:T     -7.762e+12  4.459e+12  -1.741   0.0842 .
India:T      7.781e+14  7.816e+14   0.996   0.3214
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.709e+14 on 122 degrees of freedom
  (44 observations deleted due to missingness)
Multiple R-squared:  0.7772,    Adjusted R-squared:  0.7535
F-statistic: 32.75 on 13 and 122 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = logGDP ~ Credit + Exports + Imports + India + T +
    T * Credit + T * Exports + T * Imports + T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-7.0051 -1.6803 -0.1621  1.1962  5.2829

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.631e+01  3.011e-01  87.372  < 2e-16 ***
Credit       6.671e-15  1.119e-15   5.964  1.8e-08 ***
Exports      3.644e-12  3.530e-12   1.032  0.30356
Imports     -8.089e-13  3.265e-12  -0.248  0.80470
India        4.610e+00  2.356e+00   1.956  0.05236 .
T            3.691e-01  4.425e-01   0.834  0.40560
Credit:T    -3.805e-15  1.222e-15  -3.113  0.00223 **
Exports:T   -1.281e-12  5.127e-12  -0.250  0.80307
Imports:T    4.387e-13  4.725e-12   0.093  0.92616
India:T     -7.847e-02  3.341e+00  -0.023  0.98129
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.337 on 145 degrees of freedom
  (25 observations deleted due to missingness)
Multiple R-squared:  0.4102,    Adjusted R-squared:  0.3736
F-statistic: 11.21 on 9 and 145 DF,  p-value: 3.477e-13
```

```
Call:
lm(formula = logGDP ~ Credit + Exports + Imports + Electric +
    India + T + T * Credit + T * Exports + T * Imports + T *
    Electric + T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-3.3021 -1.6598 -0.0778  1.2547  5.0814

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.691e+01  3.746e-01  71.824  < 2e-16 ***
Credit       6.322e-15  1.058e-15   5.974 2.03e-08 ***
Exports      3.325e-12  3.329e-12   0.999  0.31978
Imports     -4.878e-13  3.063e-12  -0.159  0.87372
Electric    -7.513e-05  5.131e-05  -1.464  0.14548
India        4.049e+00  2.225e+00   1.820  0.07103 .
T            3.381e-01  5.491e-01   0.616  0.53918
Credit:T    -3.608e-15  1.157e-15  -3.119  0.00223 **
Exports:T   -6.623e-13  4.860e-12  -0.136  0.89181
Imports:T    4.622e-14  4.444e-12   0.010  0.99172
Electric:T  -1.864e-05  7.753e-05  -0.240  0.81032
India:T     -1.150e-01  3.159e+00  -0.036  0.97102
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.191 on 132 degrees of freedom
  (36 observations deleted due to missingness)
Multiple R-squared:  0.453,     Adjusted R-squared:  0.4074
F-statistic: 9.937 on 11 and 132 DF,  p-value: 5.561e-13
```

```
Call:
lm(formula = GDP ~ logCredit + logExports + logImports + India +
    T + T * logCredit + T * logExports + T * logImports + T *
    India, data = data)

Residuals:
       Min         1Q     Median         3Q        Max
-1.241e+15 -2.619e+14 -5.758e+13  1.753e+14  7.101e+15

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -1.419e+15  1.126e+15  -1.261  0.20939
logCredit    1.129e+14  3.513e+13   3.214  0.00161 **
logExports  -1.224e+14  2.756e+14  -0.444  0.65747
logImports   6.217e+13  2.904e+14   0.214  0.83075
India       -4.381e+14  8.192e+14  -0.535  0.59358
T           -1.092e+15  1.832e+15  -0.596  0.55215
logCredit:T  1.022e+14  5.167e+13   1.978  0.04986 *
logExports:T 1.582e+14  4.178e+14   0.379  0.70541
logImports:T -2.229e+14 4.491e+14  -0.496  0.62045
India:T     -3.688e+14  1.162e+15  -0.317  0.75139
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 7.999e+14 on 145 degrees of freedom
  (25 observations deleted due to missingness)
Multiple R-squared:  0.2385,    Adjusted R-squared:  0.1913
F-statistic: 5.047 on 9 and 145 DF,  p-value: 6.317e-06
```

```
Call:
lm(formula = GDP ~ logCredit + logExports + logImports + logElectric +
    India + T + T * logCredit + T * logExports + T * logImports +
    T * logElectric + T * India, data = data)

Residuals:
       Min         1Q     Median         3Q        Max
-1.260e+15 -2.813e+14 -8.445e+13  2.101e+14  7.060e+15

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)   -1.754e+15  1.373e+15  -1.277  0.20395
logCredit      1.189e+14  4.281e+13   2.778  0.00626 **
logExports     1.800e+13  3.426e+14   0.053  0.95817
logImports    -5.987e+13  3.357e+14  -0.178  0.85873
logElectric   -3.629e+13  9.431e+13  -0.385  0.70103
India         -5.292e+14  8.668e+14  -0.610  0.54260
T             -8.166e+14  2.243e+15  -0.364  0.71637
logCredit:T    9.586e+13  6.200e+13   1.546  0.12448
logExports:T   1.071e+14  4.887e+14   0.219  0.82687
logImports:T  -1.799e+14  5.064e+14  -0.355  0.72299
logElectric:T  1.194e+13  1.394e+14   0.086  0.93190
India:T       -3.160e+14  1.234e+15  -0.256  0.79824
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 8.323e+14 on 132 degrees of freedom
  (36 observations deleted due to missingness)
Multiple R-squared:  0.2481,    Adjusted R-squared:  0.1855
F-statistic:  3.96 on 11 and 132 DF,  p-value: 5.538e-05
```

```
Call:
lm(formula = logGDP ~ logCredit + logExports + logImports + India +
    T + T * logCredit + T * logExports + T * logImports + T *
    India, data = data)

Residuals:
     Min       1Q   Median       3Q      Max
-1.63501 -0.39002 -0.08404  0.36429  1.45983

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   7.54512    0.88530   8.523 1.85e-14 ***
logCredit     1.03215    0.02763  37.353  < 2e-16 ***
logExports    0.04525    0.21674   0.209    0.835
logImports   -0.36078    0.22836  -1.580    0.116
India         0.63591    0.64427   0.987    0.325
T            -1.29085    1.44109  -0.896    0.372
logCredit:T  -0.03295    0.04064  -0.811    0.419
logExports:T -0.01521    0.32857  -0.046    0.963
logImports:T  0.10059    0.35323   0.285    0.776
India:T       0.04771    0.91381   0.052    0.958
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.6291 on 145 degrees of freedom
  (25 observations deleted due to missingness)
Multiple R-squared:  0.9573,    Adjusted R-squared:  0.9546
F-statistic:   361 on 9 and 145 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = logGDP ~ logCredit + logExports + logImports + logElectric +
    India + T + T * logCredit + T * logExports + T * logImports +
    T * logElectric + T * India, data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-1.4120 -0.3364  0.0000  0.2912  1.3698

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    7.71694    0.80465   9.590  < 2e-16 ***
logCredit      0.95426    0.02508  38.050  < 2e-16 ***
logExports     0.56559    0.20071   2.818 0.005578 **
logImports    -0.68570    0.19666  -3.487 0.000665 ***
logElectric   -0.36988    0.05525  -6.695 5.63e-10 ***
India          0.10169    0.50782   0.200 0.841595
T             -1.63752    1.31388  -1.246 0.214853
logCredit:T   -0.01293    0.03632  -0.356 0.722450
logExports:T  -0.30863    0.28631  -1.078 0.283012
logImports:T   0.38096    0.29665   1.284 0.201328
logElectric:T  0.01689    0.08166   0.207 0.836465
India:T        0.02274    0.72269   0.031 0.974945
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.4876 on 132 degrees of freedom
  (36 observations deleted due to missingness)
Multiple R-squared:  0.9729,    Adjusted R-squared:  0.9706
F-statistic: 430.8 on 11 and 132 DF,  p-value: < 2.2e-16
```

APPENDIX GROUP 6: List of countries used in the MIC and HIC dataset

MIC: Angola, Bangladesh, Bhutan, Bolivia, Cambodia, Cameroon, Djibouti, Egypt, El Salvador, Georgia, Ghana, Honduras, India, Indonesia, Ivory Coast, Kenya, Kiribati, Kyrgyzstan, Laos, Lesotho, Mauritania, Micronesia, Moldova, Mongolia, Morocco, Myanmar, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Sao Tome and Principe, Solomon Islands, Sri Lanka, Sudan, Tunisia, Ukraine, Uzbekistan, Vanuatu, Vietnam, Zambia

HIC: Argentina, Australia, Austria, Bahrain, Belgium, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Netherlands, New Zealand, Norway, Oman, Panama, Poland, Portugal, Puerto Rico, Qatar, Saudi Arabia, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States, Uruguay

Testing the Robustness of the Model Proposed by Arvind Subramanian

13

Aditya Singh (2016220)
Shivin Dass (2016091)
Naman Kedia (2016058)

Analysis:

The regression equation models used by Subramanian relevant to us are:

$$GDP\ Growth_i = \beta_0 + \beta_1 Credit\ Growth_i + \beta_2 Electricity\ Growth_i + \beta_3 Export\ Growth_i + \beta_4 Import\ Growth_i + \beta_5 India + \varepsilon_i \quad \text{----------(1)}$$

$$GDP\ Growth_{it} = \beta_0 + \beta_1 Credit\ Growth_{it} + \beta_2 Electricity\ Growth_{it} + \beta_3 Export\ Growth_{it} + \beta_4 Import\ Growth_{it} + \beta_5 India * T + \beta_6 India + \beta_7 T + \beta_8 Credit\ Growth_{it} * T + \beta_9 Electricity\ Growth_{it} * T + \beta_{10} Export\ Growth_{it} * T + \beta_{11} Import\ Growth_{it} * T + \varepsilon_{it} \quad \text{-------- (1)'}$$

$$Ln\ GDP_{it} = \beta_0 + \beta_1 Ln\ Credit_{it} + \beta_2 Ln\ Electricity_{it} + \beta_3 Ln\ Exports_{it} + \beta_4 Ln\ Imports_{it} + \beta_5 Ln\ Credit_{it} * Post + \beta_6 Ln\ Electricity_{it} * Post + \beta_7 Ln\ Exports_{it} * Post + \beta_8 Ln\ Imports_{it} * Post + \beta_9\ India * Post + \sum_{j=1}^{n-1} \delta_j\ \gamma_i * 2008 + \sum_{j=1}^{n-1} \theta_j\ \gamma_i * 2009 + \eta_t + \gamma_i + u_{it} \quad \text{--------(2)}$$

We will analyse the rebuttal point-wise hereon:

★ *"**However, given the fact that his paper lacks rigor in terms of specific data sources and description; alternative hypothesis** (rationale of equation specifications, use of dummies, and robustness-check diagnostics of estimated equations; **and choice of countries in the sample and a specific list**, it would not stand the scrutiny of academic or policy research standards."*

Is this true? See footnote 7 Table 1

We agree with the EAC about the author not being descriptive enough about the data he used in his study. He has not explicitly mentioned the list of countries he has used, which makes it difficult to reproduce and verify his experiment. Moreover, we also feel that to reaffirm his claim of robustness, we should run the same analysis with a different set of countries following the same economic trends.

★ *"**However, given the fact that his paper lacks rigor in terms of** specific data sources and description; alternative hypothesis; **rationale of equation specifications**, use of dummies, and robustness-check diagnostics of estimated equations; and choice of countries in the sample and a specific list; it would not stand the scrutiny of academic or policy research standards."*

The paper justifies the rationale behind using variables like Import, Credits, Exports and Electricity as the reliable factors of estimation of GDP across most countries. Despite this the author kept in mind India's aggressive policy-induced electricity distribution which may mean that it becomes a less reliable indicator as the production rate might be much higher to the level of actual consumption. To accommodate for this, the paper implements all the regressions by removing the feature variable *Electricity Growth*, and then fitting the regression model again. Given that the other variables were not exposed to such external variations they have not been changed. This means the rationale behind equation specification is present but not extensively. So to test the actual impact of electricity we should test its convex or concave relationship with gdp.

★ *"**However, given the fact that his paper lacks rigor in terms of** specific data sources and description; alternative hypothesis; rationale of equation specifications; **use of dummies**; and robustness-check diagnostics of estimated equations; and choice of countries in the sample and a specific list; it would not stand the scrutiny of academic or policy research standards."*

The use of dummies has been extensively done in the paper with analysis of the regression with the following dummy variable combinations -

- India *(Equation (1))*
- Post - 2011 *(Equation (1'))*
- India * Post 2011 *(Equation (1'))*
- Dummy variable for each country and each year individually in equation 2 of panel estimation *(Equation (2'))*

We believe this extensively tests for all major scenarios and that the suggestion that the experiments have insufficient rigour in use of dummies is harsh. We conclude it as unnecessary for further analysis. However the author could have explained the dummy variables more clearly in equation (2').

★ *"**However, given the fact that his paper lacks rigor in terms of** specific data sources and description; alternative hypothesis; rationale of equation specifications; use of dummies; and **robustness-check diagnostics of estimated equations**; and choice of countries in the sample and a specific list; it would not stand the scrutiny of academic or policy research standards."*

We can test the robustness of the model in the following ways:

- Instead of using the growth rates, we can use the absolute numbers of the variables used in the model.
- Instead of only using the level-level model, we can also use the level-log, log-level, and log-log model to discover more insights to the relationship among the variables used in the model.
- Instead of just including the countries used by the author, we can add more countries and test if the result still holds in that case.
- We can try adding more explanatory variables to the model, and test if the new models still depict a similar relationship as claimed by the author.

Why use cap in the middle of a sentence?

are you sure or taking the author's face-value

I think a similar argument has also been made for Credit lending in India!!

acronym : GDP

Why? Didn't explain.

Be careful. PS.

vague. Be specific please

PS consider stationarity tests

Do both

Apply level-level, log-level, level-log, log-log to growth vars

② → Do the same for absolute GDP values

Data:

Variable	Description	Source
GDP	Gross Domestic Product(current US$)	https://datacatalog.worldbank.org/dataset/world-development-indicators
Credit	Domestic credit to private sector(% of GDP) which can be converted to *current US$* by multiplying it with GDP(current US$)	https://datacatalog.worldbank.org/dataset/world-development-indicators
Export	Exports of goods and services(current US$)	https://datacatalog.worldbank.org/dataset/world-development-indicators and data for India can be exchanged with https://data.gov.in/resources/gross-domestic-product-economic-activity-current-prices-1950-51-2013-14-30052014 to check for robustness
Import	Imports of goods and services(current US$)	https://datacatalog.worldbank.org/dataset/world-development-indicators and data for India can be exchanged with https://data.gov.in/resources/gross-domestic-product-economic-activity-current-prices-1950-51-2013-14-30052014 to check for robustness
Electricity Consumption	Electric Power Consumption(kWh per capita)	https://datacatalog.worldbank.org/dataset/world-development-indicators
Steel	Nominal Crude Steel-making Capacity(million metric tons)	https://stats.oecd.org/index.aspx?queryid=60702#

Setup:

Statistical model:
We are using the log-log, log-level, level-level variations for equation 1 and 1'. Further, as explained in the analysis, we plan to add another explanatory variable 'steel production' to the model. We will also fit the model on a different set of countries, and observe how well the new model aligns with the previous results. We will hence test the robustness of the author's results.

Statistical Tests:
We intend to analyse the t-values and the R^2 values of the models that we implement. The t-values will represent how significant our explanatory variables are, and the R^2 values will represent how well our model explains the variation in the observed data.

Defence:

Though the paper claims India as an outlier for the post 2011 period, on carefully analysing Table 1 of the paper, the column for MIC countries with electricity does not align well with this claim.

	Only MIC	
	With Electricity	Without Electricity
2002-11		
India	0.018	0.019
t-stat	*4.51*	*4.06*
R-sq.	0.43	0.35
2012-16		
India	0.029	0.037
t-stat	*6.40*	*11.44*
R sq.	0.68	0.62
# Observations	40	40

The t-stat values for pre-2011 period and post-2011 periods are comparable. Due to this we feel that the claims made by the paper may not entirely be accurate and hence does not present the complete picture clearly. To test the rationale behind this we would like to conduct the various alternative tests as mentioned above and statistically support our conclusions based on those results.