The effect of corruption on economic growth in developing countries

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Research Question

How does corruption affect economic growth in developing countries?

- How to obtain a consistent and continuous measurement of corruption?

- How to estimate the impact of corruption on economic growth in developing countries?

- What is the best statistical learning model for prediction on economic growth?

Limitation of current corruption index

1. Different methodologies in each existing index.

2. Failing to include some important factors.

3. Current indices are not continuous.

## Reconstruction of corruption: SVM

- **Theoretical framework: SVM [1]**

  - Mainly measures Corruption via **Corruption Control** as $c_{i,t}$ for certain country i at period t :

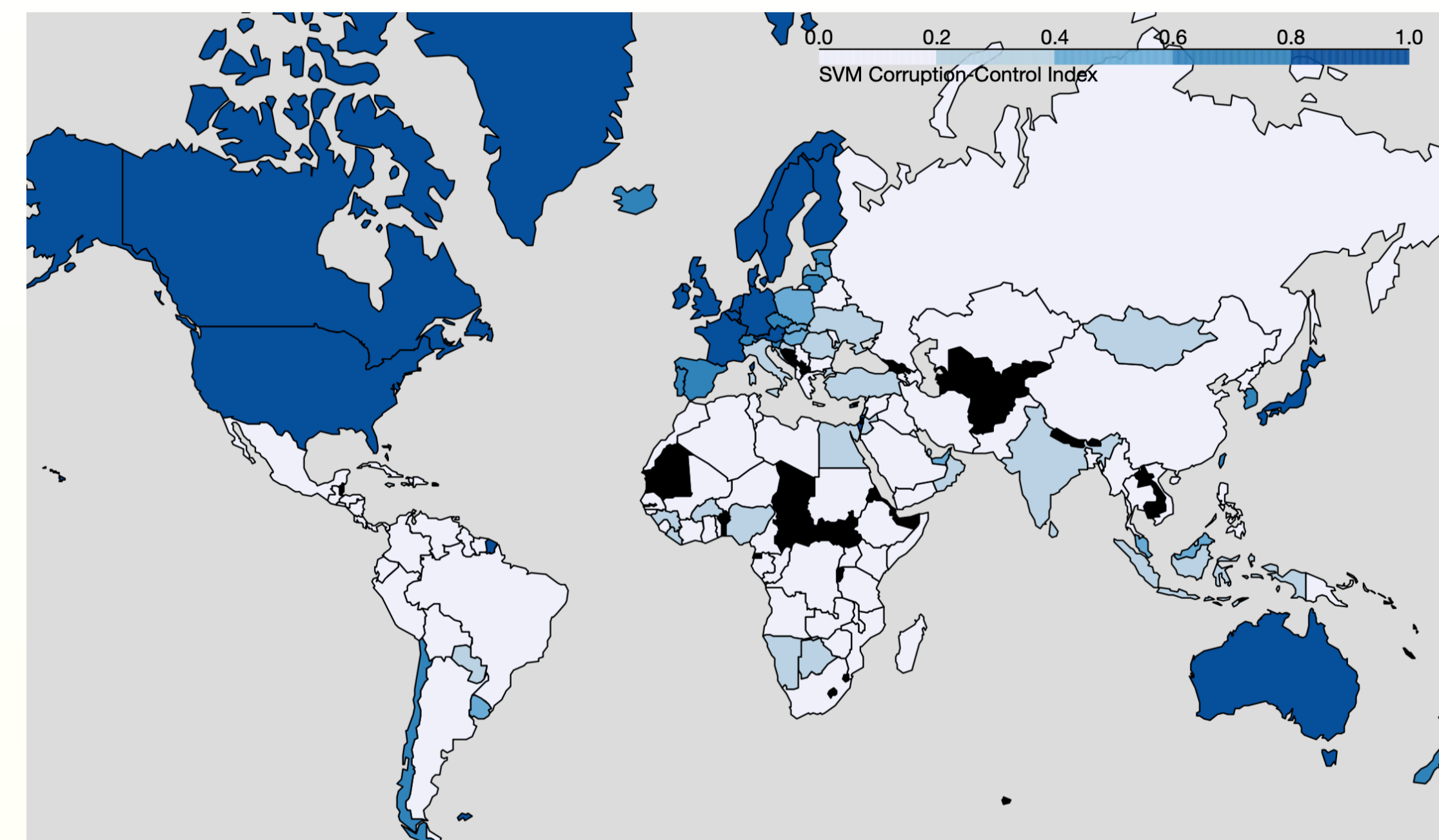- $c_{i,t} = F\left(x_{i,t}^1, \cdots, x_{i,t}^m\right) \quad \forall (i, t)$

- **Algorithms**

1. Select m conditions for function.

2. Get a sample set by coding country-year pairs as having good(1) or bad(0) Corruption Control.

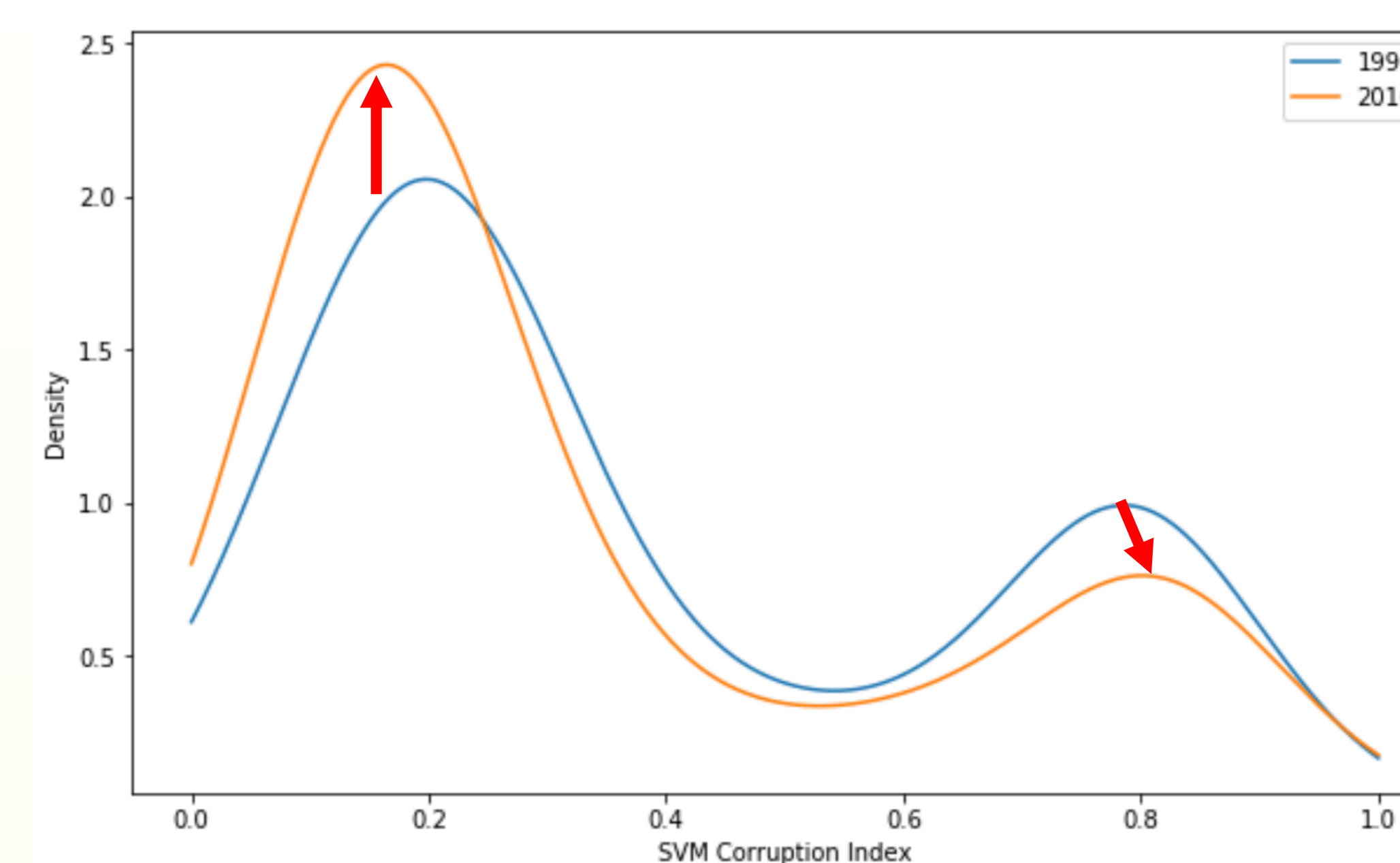3. Fit the SVM model and apply the approximated function to all country-year pairs.

- **Statistical justification:**

F1. Comparison of MSE
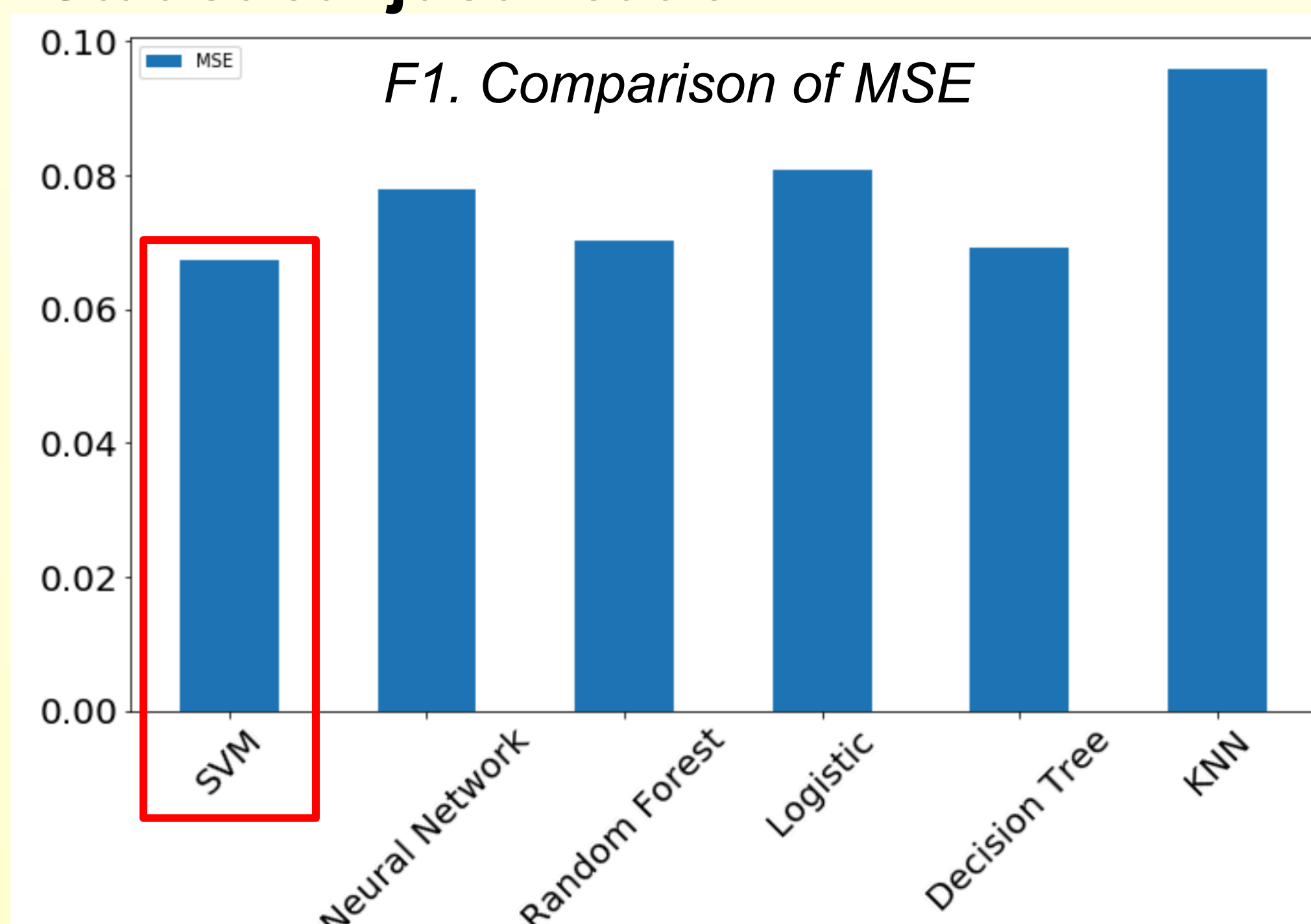
Estimated SVM Corruption index: Visualization

F2. SVM Corruption index around world, 2016
Higher index, better corruption control

F3. Kernel density estimate of SVM corruption control, 1996 and 2016

Impact of corruption on growth: Model specification

- **A Dynamic Panel Data (DPD) model** is implemented. Baseline model is written as

$$y_{i,t} = \beta y_{i,t-1} + \gamma c_{i,t} + \theta X_{i,t} + \mu_i + \xi_t + \epsilon_{i,t},$$

- $y_{i,t}$ denotes the log form of GDP per capita, $c_{i,t}$ denotes the corruption-control indicator, X denotes all other control variables, μ_i denotes country's fixed effect, and ξ_t denotes time's fixed effect .

- **Two-step "Difference" GMM** is applied for estimation. [2]

Data and Variables: Statistic summary

Variables	Obs	Mean	Std.Dev.
GDP Per Capita	2630	5448.30	8370.52
Corruption Control	1974	0.23	0.17
Regulatory Quality	2646	-0.39	0.77
Inflation%	2623	13.44	111.67
Gov Consumption%	2464	14.66	7.21
Trade Openness%	2553	82.55	50.86
Capital Investment%	2464	22.51	8.23
FDI inflow%	2605	4.38	7.46
Natural Resource%	2630	10.19	12.85

T1. Summary Statistics

Empirical results

| Dependent: lgdp_pcap	(1)	(2)	(3)	(4)
Lagged lgdp_pcap	0.97*** (0.0017)	0.97*** (0.0020)	0.97*** (0.0018)	0.96*** (0.0018)
Corruption Control (CC)	0.087*** (0.0067)	0.29*** (0.027)	0.25*** (0.031)	0.56*** (0.072)
CC^2		-0.24*** (0.037)	-0.25*** (0.039)	-0.75*** (0.10)
Regulatory Quality (RQ)			0.029*** (0.0021)	0.00057 (0.0035)
CC×RQ				0.139*** (0.015)

* p<0.1, ** p<0.05, *** p<0.01
T2. GMM estimation results

Corruption Control's overall effect on column 4 :
0.56-1.50×CC+0.139×Reg_Qual

Given a proper corruption control (0.56-1.50×CC > 0),
Better RQ enlarges CC's positive effect.

More results: Prediction on growth

- Randomly splitting dataset to get 10 bootstraps

- Applying 8 prediction models
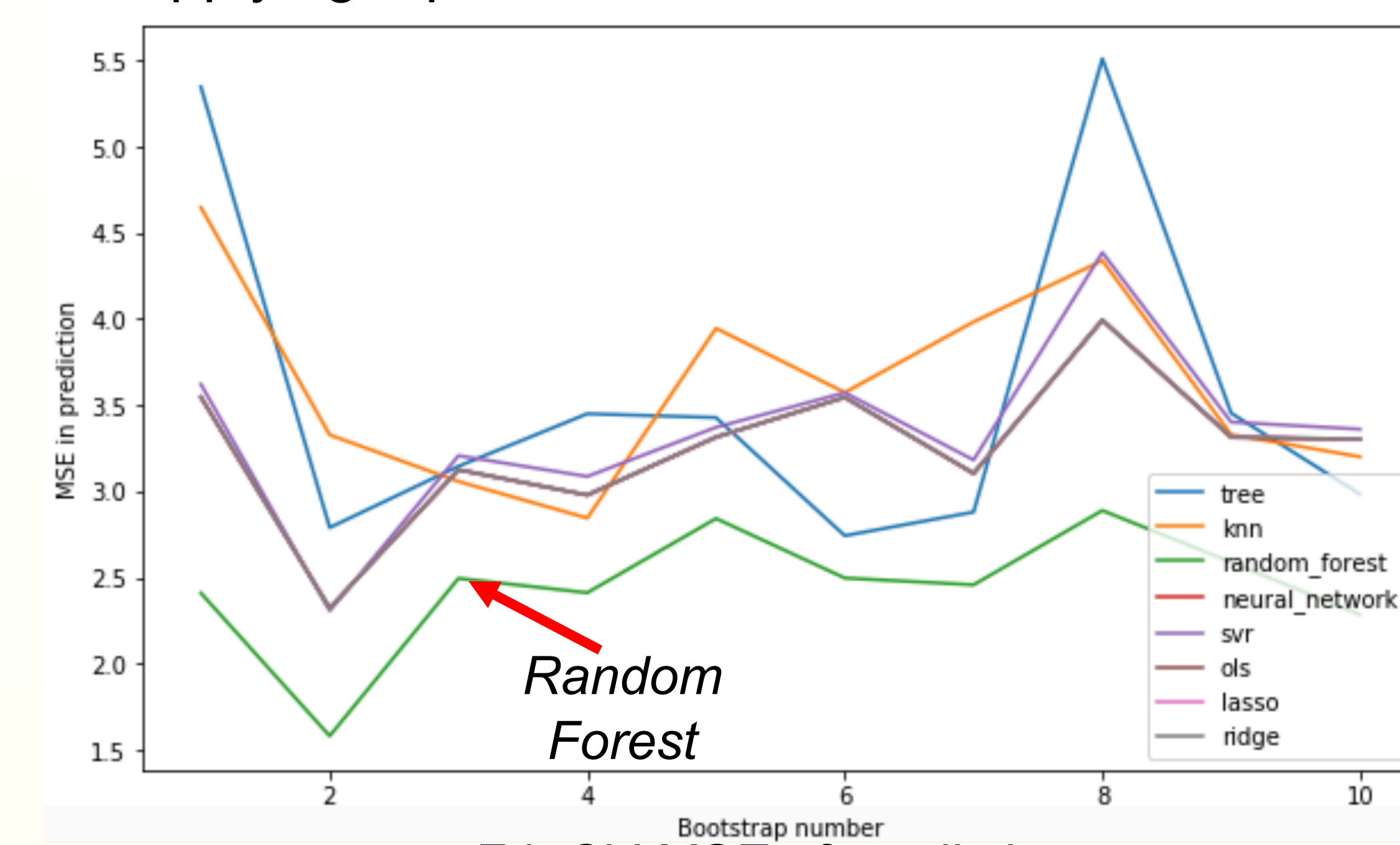
Random Forest
F4. CV-MSE of prediction

- Best prediction model: **Random Forest**

Conclusions

1. There is an optimal level of corruption control regarding growth in developing countries.

2. Better regulatory quality could enlarge the positive impact of corruption control on growth.

3. Best prediction model on economic growth is Random Forest.

Limitations & Future work

1. The diff-GMM, though much better than sys-GMM, still has IV proliferation which weakens the power of IV related test (Sargan test).

2. More approaches and algorithms could be explored to measure the corruption more accurately other than SVM in this work.

References

[1] Gründler, K., & Krieger, T. (2016). Democracy and growth: Evidence from a machine learning indicator. *European Journal of Political Economy*, 45, 85–107.

[2] Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58(2), 277–297.

Acknowledgements