Relationship between Provincial Governance Index and other data in attracting FDI in Vietnam across provinces

I – Introduction

I.I Description

Foreign direct investment (FDI) has played a vital role in Viet Nam's economic growth strategy during the reform period. Foreign investors bring much needed capital, technology, access to international markets and improved management practices to Viet Nam.

Local authorities, well aware of the benefits of foreign investment to the local economy, compete with each other to attract investors to their provinces and districts.

This paper explores the relationship between Provincial Governance Index (PCI) and other data in attracting FDI in Vietnam across provinces.

I.II Problem

If weare investor, we expect to see the provinces where there is hight PCI and other data like income, industrial zone, labour for better investment.

If weare Politician, we will known whereis the disadvantaged provinces should be proactive in helping themselves by building up their human capital, improving the quality of provincial governance, creating a good investment environment.

I.III Data Description

We report that province-specific per-capita income, secondary education enrolment, labor costs, openness to trade, and domestic investment affect FDI directly within the province itself and have indirect effects on FDI in neighboring provinces.

+ Map of provinces in Viet Nam, I download as Json file in OpenDevelopment [1] website.

+ General Statistics Office Of Viet Nam [2]

I export all data i need for this project:

- Percentage of trained employed workers at 15 years of age and above by province

- Foreign direct investment projects licensed in 2018 by province

- Index of Industrial production by province

- Monthly average income per capita in 2016 at current prices by income quintile and by province

+ PCI from The Provincial Competitiveness Index [3] website.

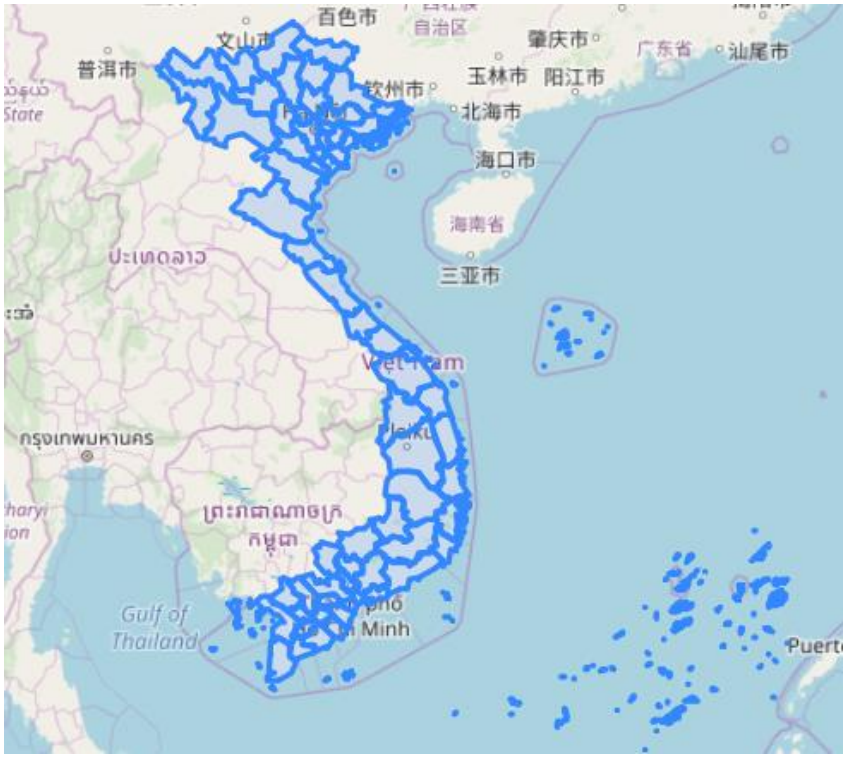
II. Methodology

II.1 Create Map of Viet Nam province

Load Geojson from website [1], we have data of 63 province and coordinates


```
{'type': 'FeatureCollection',
 'crs': {'type': 'name',
  'properties': {'name': 'urn:ogc:def:crs:OGC:1.3:CRS84'}},
 'features': [{'type': 'Feature',
   'properties': {'gid': 1, 'code': 'AD01', 'ten_tinh': 'An Giang'},
   'geometry': {'type': 'MultiPolygon',
    'coordinates': [[[[105.11524187400002, 10.955660896000017],
       [105.11462924600005, 10.946923054000111],
       [105.1038041100001, 10.932225292000018],
       [105.09732006500006, 10.92267923600012],
       [105.10156493000001, 10.920812300000103],
       [105.107523583, 10.919060767000042],
       [105.12843635500008, 10.923566429000074],
       [105.12933904900007, 10.923760866000086],
       [105.14527860200006, 10.924344837000087],
       [105.15753557100008, 10.923044120000023],
       [105.17210817900003, 10.915172694000129],
       [105.18066661600002, 10.913087368000072],
       [105.18712386600005, 10.913173943000041],
```


Then we create map of Viet Nam with province border



II.2 Load data FDI in Viet Nam by Province

	Province	Total
0	Ha Noi	33134.7
1	Vinh Phuc	4527.1
2	Bac Ninh	17289.0
3	Quang Ninh	6231.3
4	Hai Duong	7758.3

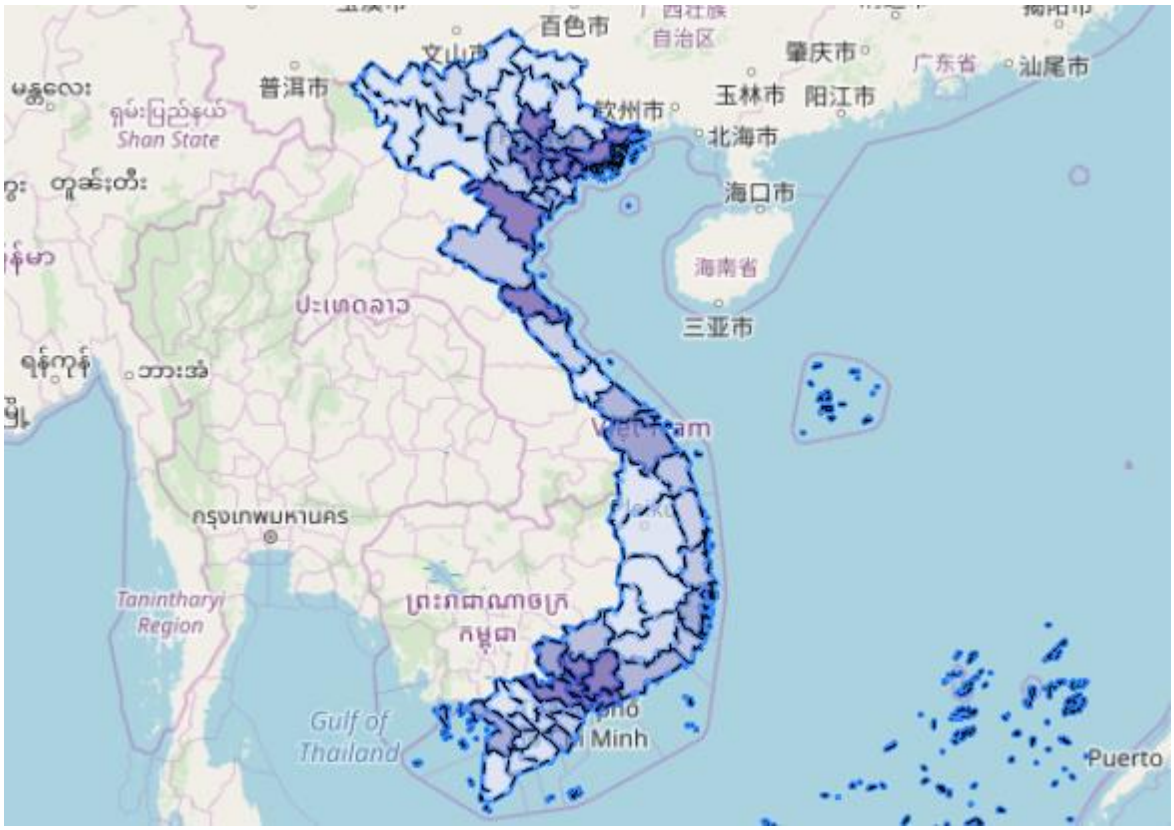
```
Province     object
Total       float64
dtype: object
```

The data of GeoJson and data FDI is connect together with "Province" name, check all Province name is same or not. If not, correct them.

```
value same map to data:  True    63
Name: Province, dtype: int64
value same data to map:  True    63
Name: Province, dtype: int64
```

II.3 Create Choropleth map of FDI

All province same, now we create Choropleth map



II.4 Load Industrial data of Viet Nam Province

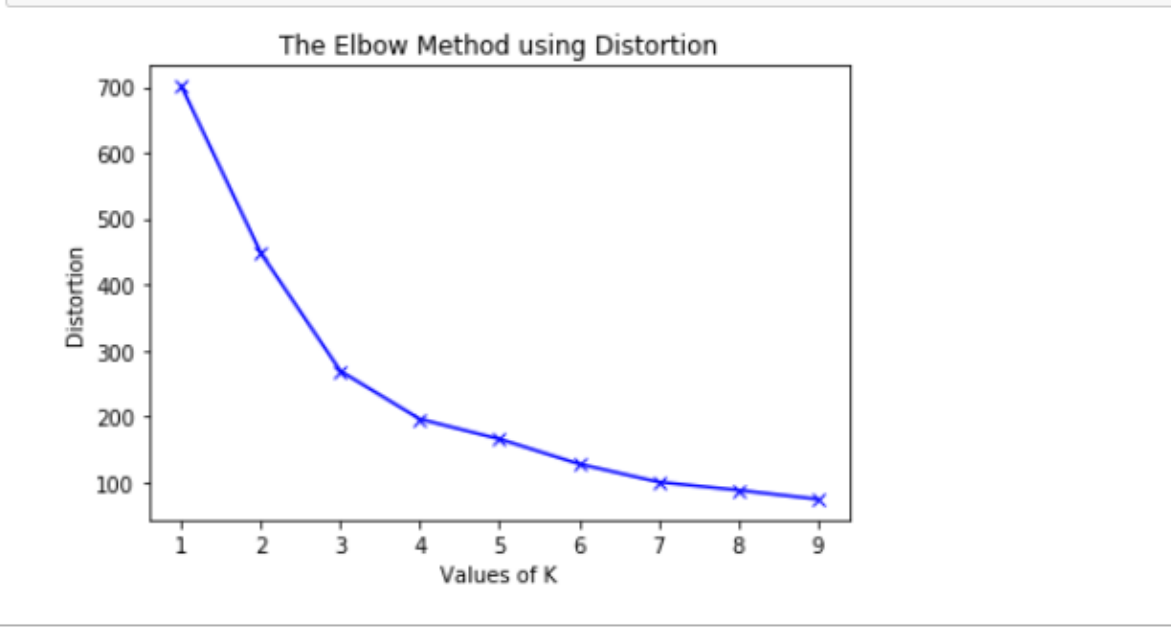
	Province	employed workers at 15 years	Index of Industrial production	Income	PCI
0	Ha Noi	42.1	107.0	4875.0	65.40
1	Vinh Phuc	21.5	107.5	2860.0	64.55
2	Bac Ninh	26.1	135.5	4308.0	64.50
3	Quang Ninh	33.0	103.1	3747.0	70.36
4	Hai Duong	20.2	109.6	3169.0	60.98

Add Latitude and Longtitude of each province

	latitude	Longtitude	Province	employed workers at 15 years	Index of Industrial production	Income	PCI
0	21.029450	105.854444	Ha Noi	42.1	107.0	4875.0	65.40
1	21.311356	105.603294	Vinh Phuc	21.5	107.5	2860.0	64.55
2	21.121205	106.088025	Bac Ninh	26.1	135.5	4308.0	64.50
3	10.043497	105.782998	Quang Ninh	33.0	103.1	3747.0	70.36
4	20.944368	106.378037	Hai Duong	20.2	109.6	3169.0	60.98

Now we classisfication of Province by K-means. K-Means algorithm is one of the most common cluster method of unsupervised learning.

I will run K-Means to cluster the boroughs into 7 clusters because when I analyze the K-Means with elbow method it ensured me the 6 degree for optimum k of the K-Means.

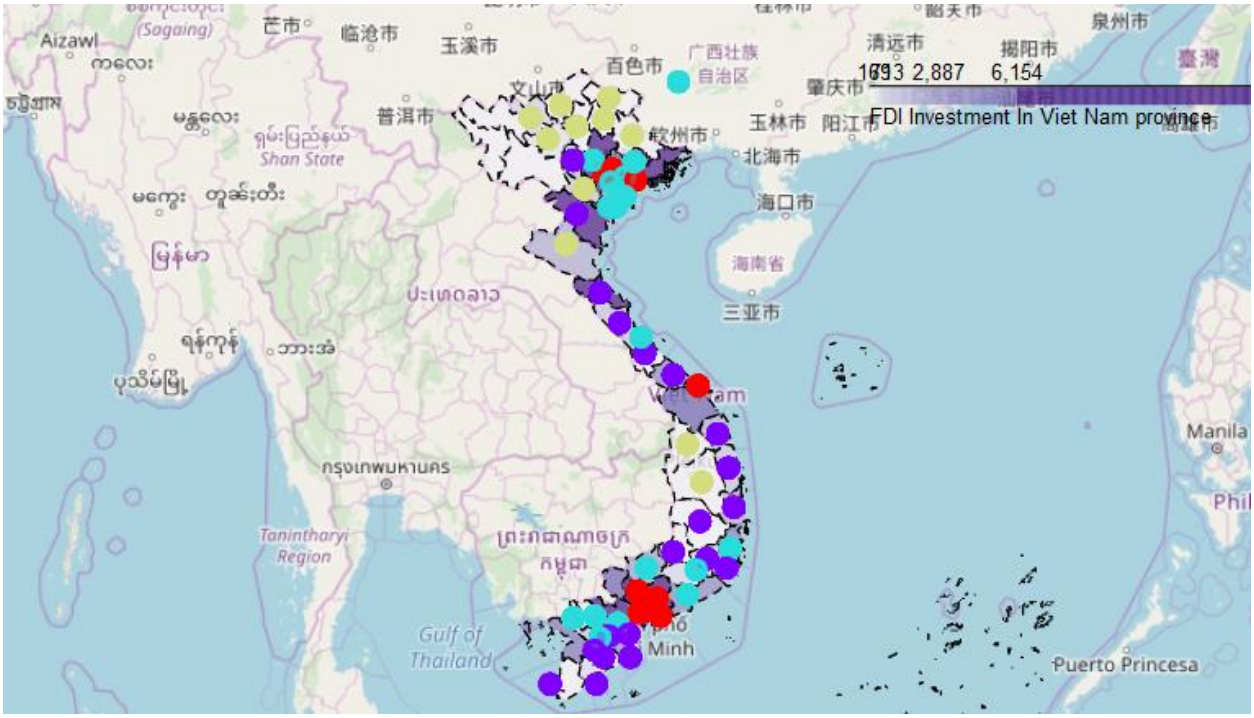


Add Cluster column in to data

	Cluster Labels	latitude	Longtitude	Province	employed workers at 15 years	Index of Industrial production	Income	PCI
0	0	21.029450	105.854444	Ha Noi	42.1	107.0	4875.0	65.40
1	2	21.311356	105.603294	Vinh Phuc	21.5	107.5	2860.0	64.55
2	0	21.121205	106.088025	Bac Ninh	26.1	135.5	4308.0	64.50
3	2	10.043497	105.782998	Quang Ninh	33.0	103.1	3747.0	70.36
4	2	20.944368	106.378037	Hai Duong	20.2	109.6	3169.0	60.98

Final section, I created choropleth map which also has the below informations for each borough:

- Province,
- Cluster name,



III. Discussion

The Latitude and Longtitude get from Nominatim not correct in some province. Viet Nam with 63 province, is such a complexity, very different approaches can be tried in clustering and classification studies. Moreover, there is another classification method can apply to analysis this case, but i chose the easy method so the result will not have high quality.

IV. Conclusion

As a result, Investor will see the provinces where there is hight PCI and other data like income, industrial zone, labour for better investment.

And Politician will known where is the disadvantaged provinces should be proactive in helping themselves by building up their human capital, improving the quality of provincial governance, creating a good investment environment.

V. References

[1] https://data.vietnam.opendevelopmentmekong.net/

[2] https://www.gso.gov.vn/

[3]https://www.researchgate.net/publication/228119928_Provincial_Governance_and_Foreign_Direct_Investment_in_Vietnam