Problem Set 3

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1 Description

Foreign direct investment (FDI) is an important channel for the diffusion of knowledge. According to Romer (1993), there are gaps in innovation across countries, and foreign investment decreases the gap by bringing ideas and knowledge. For this homework, I utilize different graphs to analyze the relative innovation level among European countries and the correlation between FDI and innovation in European countries. Griliches (1990) explains that using patents to proxy for innovation provides a superior advantage in terms of the accessibility of the patent data and detailed information of the industry, sector, and technology, so I use the number of EPO patent applications per million people as the proxy variable for innovation. The dataset contains 22 European countries from 1995 to 2014. There are 440 observations. I collected data for the EPO patent, population from OECD, and FDI stock from the United Nations Conference on Trade and Development (UNCTAD).

Figure 1 is a choropleth map of European countries. It shows the average number of patents from 1995 to 2014 in each European country, which reflects the average innovation level of each European country over the 20 years. The color of a country reflects its innovation level which is measured in the number of patents per million people. The figure suggests that the countries that are in dark red color are the most innovative countries, and the countries that are in dark blue color are the least innovative countries. Some countries are in grey because they are not in the dataset. It seems that overall, in Europe, Sweden, Finland, Denmark, Germany, and Netherlands are the most innovative countries, and the Eastern European countries such as Poland and Czech are the least innovative countries.

Figure 2 shows the patent per million people data's distribution in terms of minimum, the first quartile, mean, median, third quartile, and maximum. The mean and median are around 300. The maximum is around 380 and the minimum is around 160.

Figure 3 helps us to examine the correlation between overall European real FDI stock per capita and innovation visually. It shows the changes in the mean of each country's patent per million people and the mean of each country's real FDI stock per capita over time. The Figure indicates that real FDI per capita and patent per million people follow a similar trend and have similar fluctuations. In most periods, the correlation between real FDI per capita and patent per million are positive. However, between

2007 and 2012, real FDI per capita and patent per million have a negative correlation; this negative correlation might be caused by the 2008 global recession.

Theoretically, agglomeration economies should have a positive effect on firm-level product innovation. Since larger countries usually have a larger labor force and market, larger countries should attract more FDI. Therefore, I use Figure 4 to analyze the correlation between the mean of each countries' total real FDI stock and patent per million people. The Figure shows that the correlation between real FDI stock and innovation is extremely similar to the correlation between real FDI stock per capita and innovation.

2 Figures

Figure 1: Average Number of Patents per Million People (1995-2014)

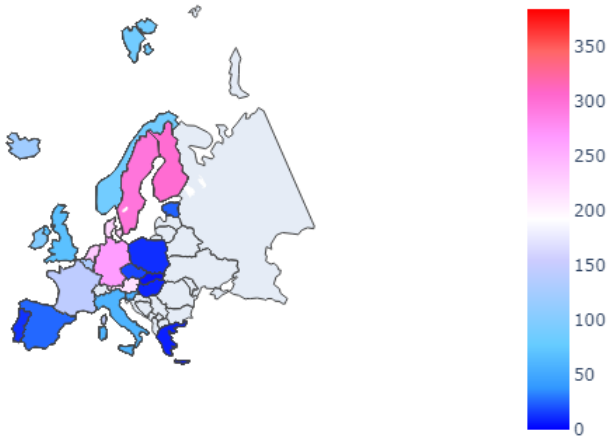


Figure 2: Distribution of Patents per Million People (1995-2014)

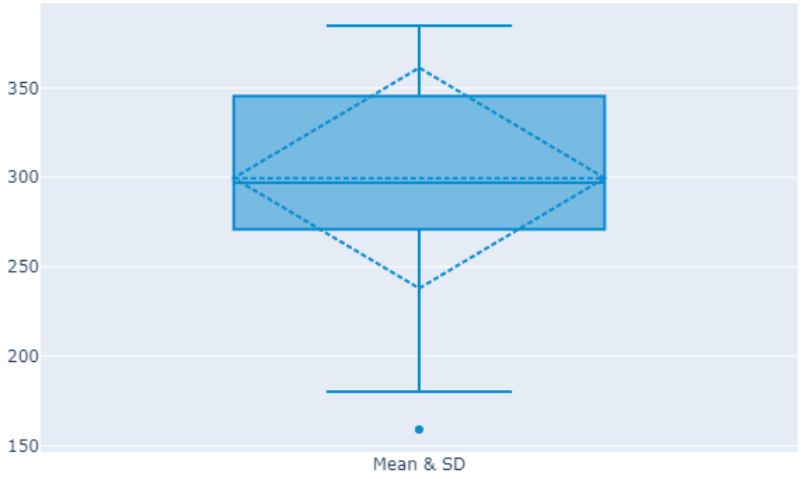


Figure 3: Patent and Real FDI Stock per Capita (1995-2014)

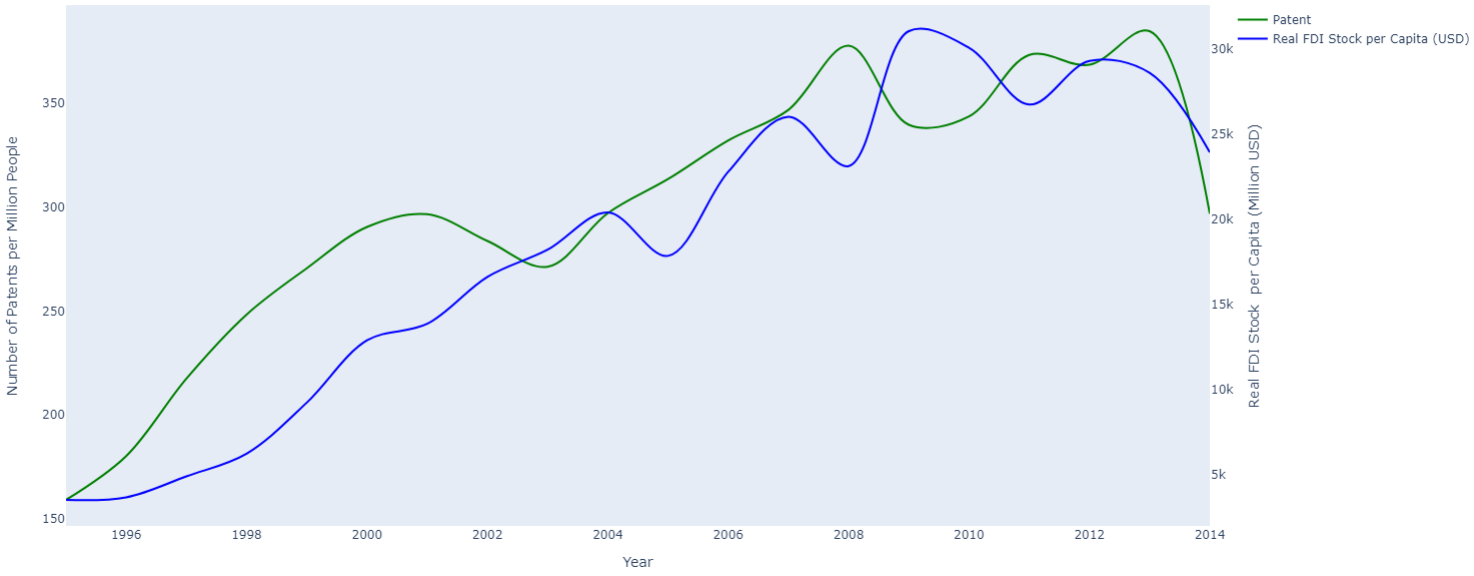
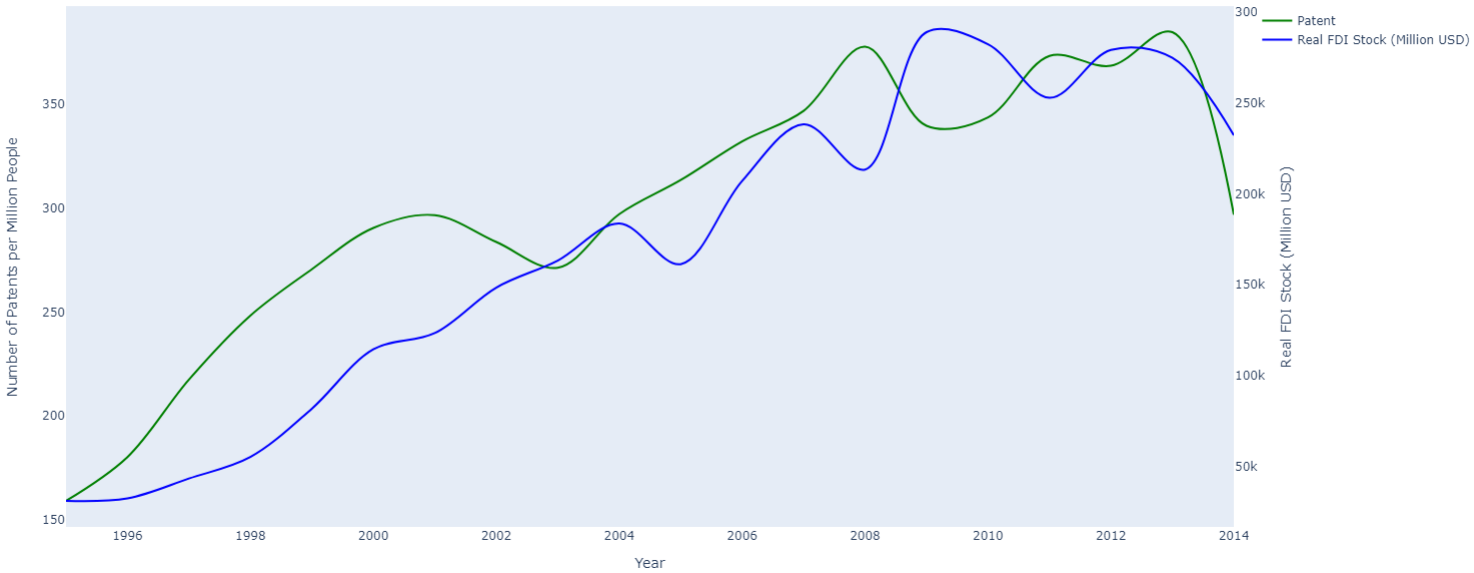


Figure 4: Patent and Real FDI Stock (1995-2014)



References

Griliches, Zvi. 1990. "Patent Statistics as Economic Indicators: A Survey." *Journal of Economic Literature*, 28(4): 1661–1707.

Romer, Paul. 1993. "Idea gaps and object gaps in economic development." *Journal of monetary economics*, 32(3): 543–573.