Datathon: Impacts of Brexit on healthcare industry: calculated through time series and machine learning.

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1 Topic Question

From June 23, 2016, when UK holding its referendum to leave the EU, till now, UK has changed in a lot of ways in social-economic area. The National Health System(NHS) in the UK has evolved to become one of the largest healthcare systems in the world, which is largely affected by UK EU membership referendum. In this report, we concentrate on the health care sector and tries to solve the following related questions:

What are the impacts of UK EU membership referendum on health care industry? How should UK deal with this?

2 Executive Summary

Through our analysis of data set related to healthcare industry, we find the following interesting discoveries:

Firstly, there's a discrepancy in the trend of the number of research scientists v.s. technicians after the UK EU membership referendum, even the number of job listing increased in similar trend in both areas. Here research scientists consist of biological scientists, biochemists, and physical scientists, social and humanities scientists etc. and the technicians consist of psychologists, pharmacists, ophthalmic opticians, dental practitioners, nurses, midwives etc. The data and plots are shown below in the technical exposition section.

Secondly, to understand the above described phenomenon, we used immigrant data and found the strong positive correlation between number of immigrants outside EU and the number of research scientists in medical field over the years.

3 Technical Exposition

To begin our analysis, it's important to note that we only care about data related to healthcare field. Out of all the data given, we are mostly interested in employment, job listing(demand), UK bill, and historical London Stock Exchange data.

3.1 Data Cleaning

We first found all health care industry jobs according to social occupation code legend. Then, we filtered data related to health care industry in job listing.csv and employment.csv. Since the vote for Brexit happened in late 2016, we grouped by unit code and time to find the number of job created from 2016 until now. This gave us the data used for job related analysis for the pose Brexit referendum period.

3.2 Data Exploration

To see the potential impacts of UK's EU membership referendum on the healthcare industry, we analyze the number of employment, job listing etc. both before and after the UK EU membership referendum. As in Figure 1, the left-hand-side plot shows how the number of employment of healthcare related research scientists(biological scientists, biochemists, and physical scientists, social and humanities scientists etc.) changes from year 2011 to 2018. We see that before the UK EU membership referendum in 2016, there's an increasing trend in the total number of research scientists, but after 2016, it's decreasing. On the other hand, from the second plot we see that the number of technicians is increasing throughout year 2016 till now. Compared with these two plots, we see the discrepancy between the trend of research scientists number and the technicians number in healthcare field.
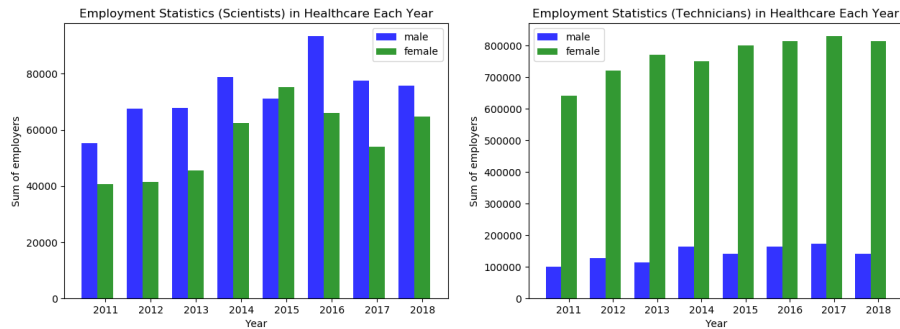

Figure 1: Technician v.s. scientist in healthcare sector over the years.

What is the total job opening trend then? Figure 2 shows the trend in the number of job listing(job demand) created, checked and deleted in healthcare

area. Since they 3 are basically of the same trend, we could just concentrate on the job created data. Notice that these 3 Although oscillating drastically after UK EU membership referendum, it is still comparably higher than the job demand before 2016. So we can see there's still high job demand in total, then why the number of research scientists decreases?
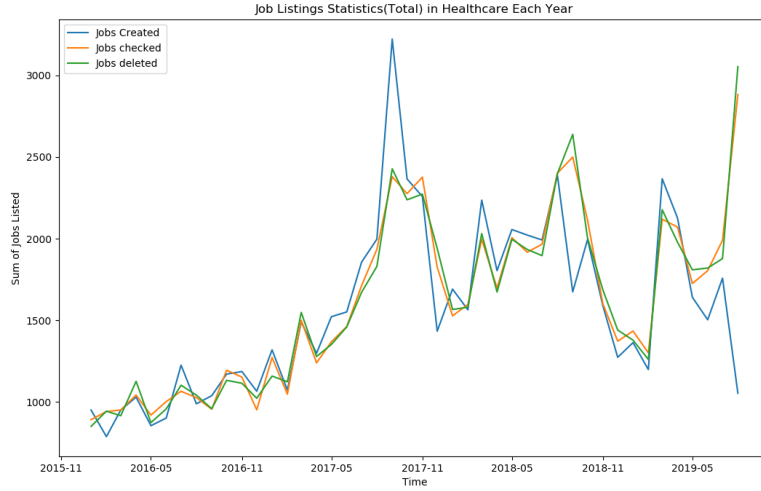

Figure 2: Number of job created, checked and deleted in healthcare field over the years.

We want to see the reason behind this trend. Why does the number of research scientists decrease but the technician jobs increases? We investigated the immigration data and the market capital data to find something interesting as the following.

As shown in Figure 3, the number of immigrants to UK from EU increases after 2016 and that from outside UK decreases after 2016. We see that immigration application from EU increases after the referendum and immigration application from outside of EU decreases. We think the reason behind this is that: after the real Brexit, it's harder for people in EU to immigrant to UK. Since UK is still one of the strongest country in EU, people in EU want to grab the last chance te immigrate, causing a boost in the number of application. On the other hand, due to Brexit, people from outside EU find it less attractive to move to UK. As a result, we see a decrease in the immigration application from outside EU.

Thirdly, we found that not enough focus is being given on the healthcare by the government which might be detrimental in the long run.

Above conclusion also reflects in the performance of the UK based companies vs Others. We found that healthcare companies with UK as country of incorpo-
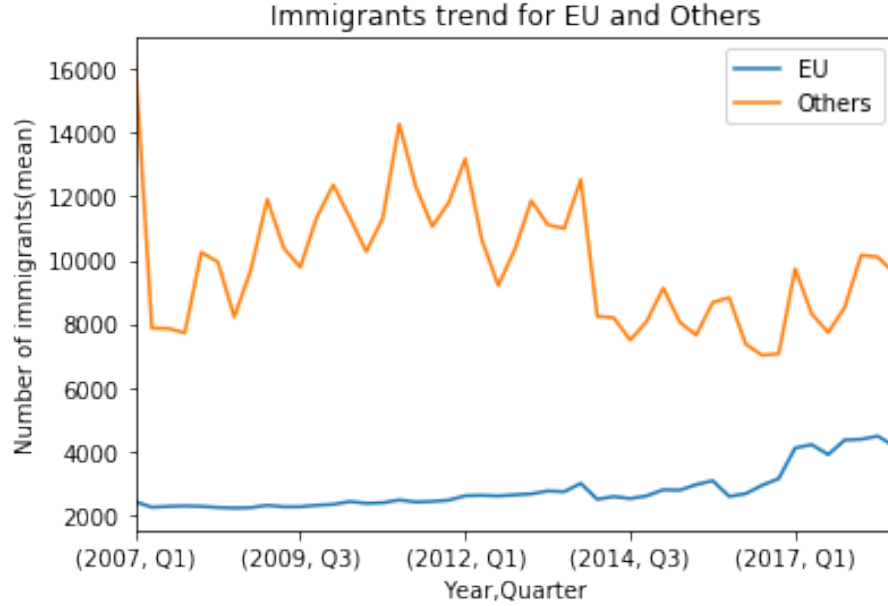
Figure 3: Immigration application from EU and from outside EU.

ration are performing better than those based outside of UK.This clearly shows the lack of policies to promote free markets and this gap might increase further if the 'No Deal Brexit' goes through.

While doing our analysis, we found an interesting trend on the immigrant flow. There has been a sudden spike in the immigrants from EU while the immigrant flow is almost the same for those outside EU. This shows that as 'No Deal Brexit' date approaches, immigrants from EU are in a hurry to enter UK, fearing that 'No Deal Brexit' might go through and they won't get a second chance.

Lastly, to make the number of research scientists in healthcare sector more sustainable, we suggest the government create better immigration policy in research area. This might help UK to be successful in the healthcare industry after the UK EU membership referendum.

3.3 Data Analysis

We concluded a linear regression model fitting process between the number of jobs created in each unit group and the mean market cap data in the Healthcare industry.According to the correlation plot, we found that the following sub categories have positive correlation with eh market value: Physiotherapist-sOccupational therapistsTherapy professionals n.e.c.NursesMedical and dental techniciansAmbulance staff (excluding paramedics)Care escorts. Therefore, we
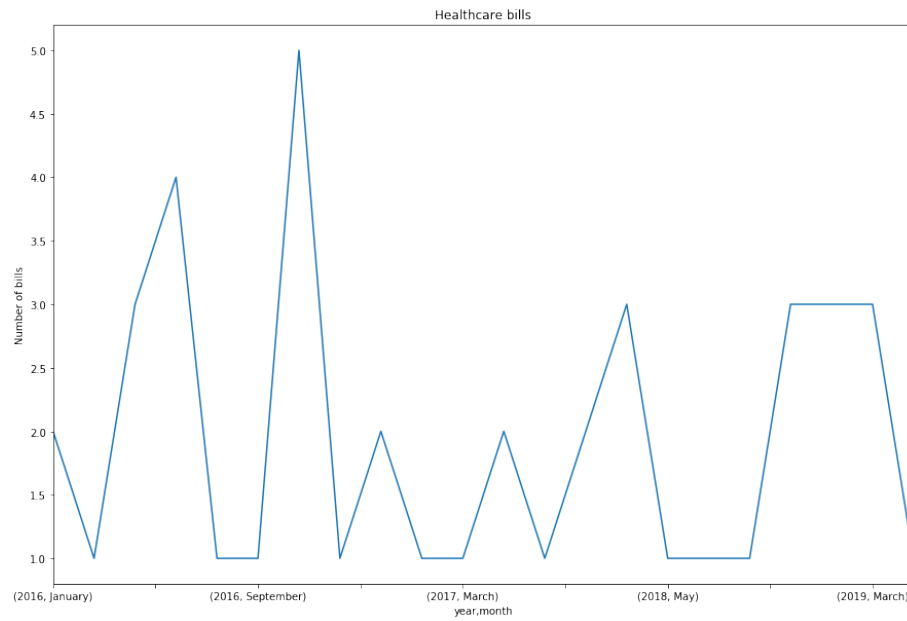
Figure 4: The number of healthcare bills over the years.

suggest that the Britain government should invest more money on those areas after Brexit. The following chart shows that there might be some correlations between the market growth for Healthcare industry and the increase of jobs opportunities in different unit group
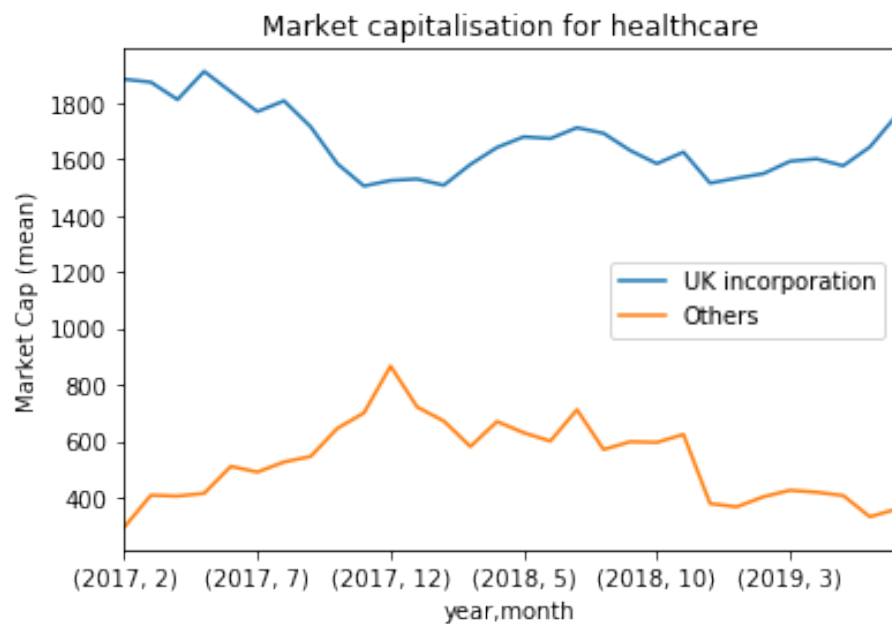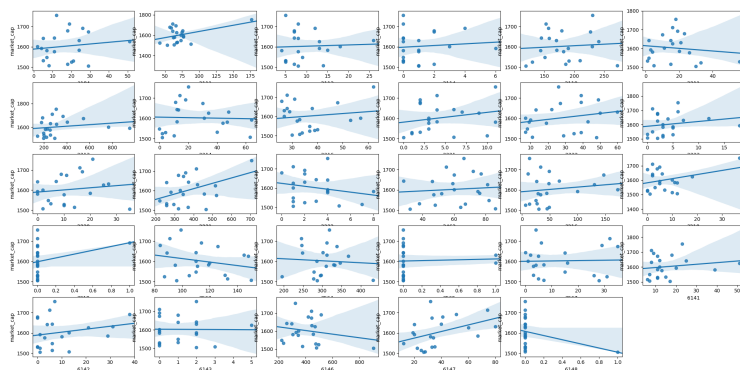
Figure 5: Market capital of EU v.s. others over the years.

Figure 6: The number of healthcare bills over the years.

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