



Productivity & Investment within the United Kingdom

CodeClan - Final Project



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Agenda

- Introduction to the project
- Analysis and findings
- Next steps and lessons learned
- Conclusions

Project Scope

How can we improve productivity within Scotland and the UK overall?

Does government spending on factors such as mental health, education, and research and development affect productivity in the UK?

Is there a relationship between government investment and productivity?

Can productivity be predicted based on investment?

Working Towards a Solution

Home Front

- How has UK investment affected productivity?
- What is relationship between; education, mental health and R&D investment and productivity?

Away Front

- Is there evidence there a link between government spending and productivity?
- Why are we falling behind some countries in regards to productivity?

Basic Definitions

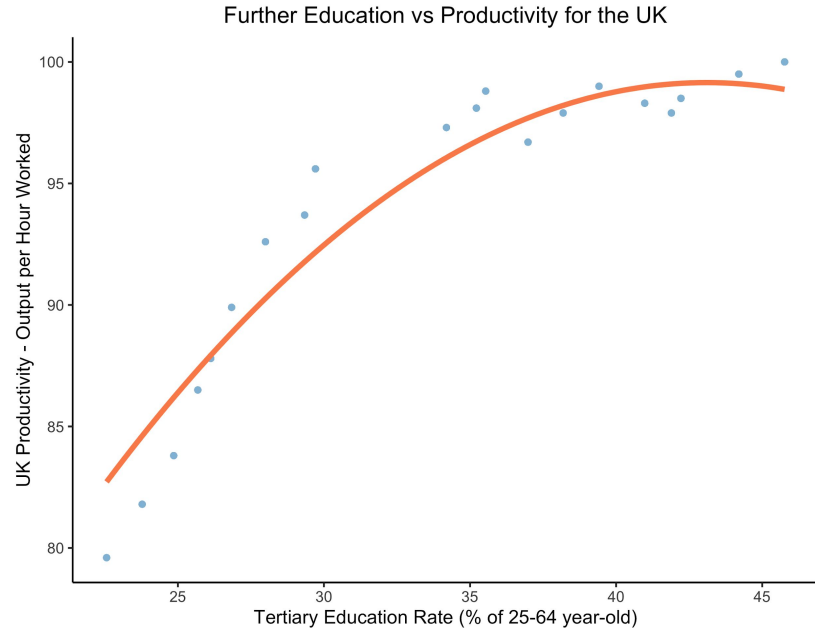
*“**Productivity** is commonly defined as a ratio between the output volume and the volume of inputs. In other words, it measures how efficiently production inputs, such as labour and capital, are being used in an economy to produce a given level of output.” - OECD*

*“**Output per hour** is calculated as gross value added (GVA) divided by the number of hours worked.”
-Office for National Statistics*

*“**Gross Value Added** is the value generated by any unit engaged in the production of goods and services.”
-Office for National Statistics*

Education

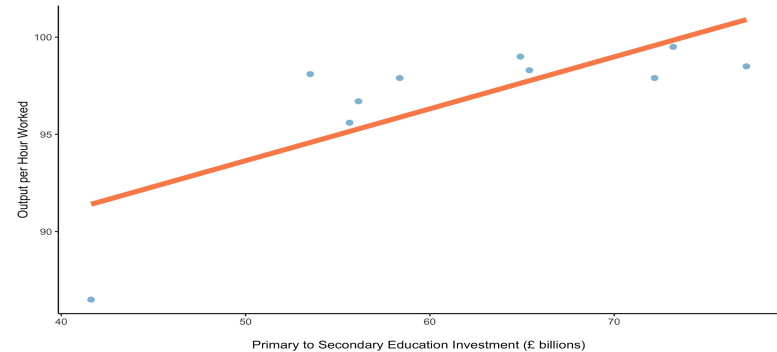
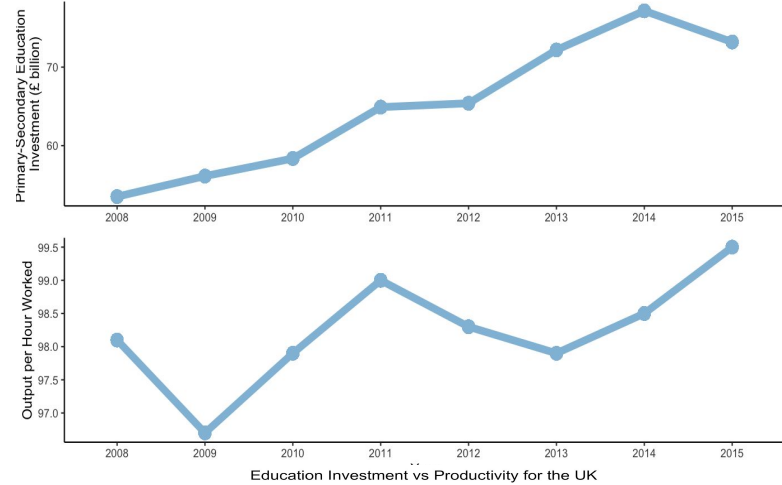
- Percentage of adults who have completed tertiary education (any form of education post school) and productivity are positively correlated
- Intuitively makes sense, the more skilled your workforce: the more likely your output will be greater
- However it looks like we are reaching a limit on the benefits to productivity with regards to further education



Education

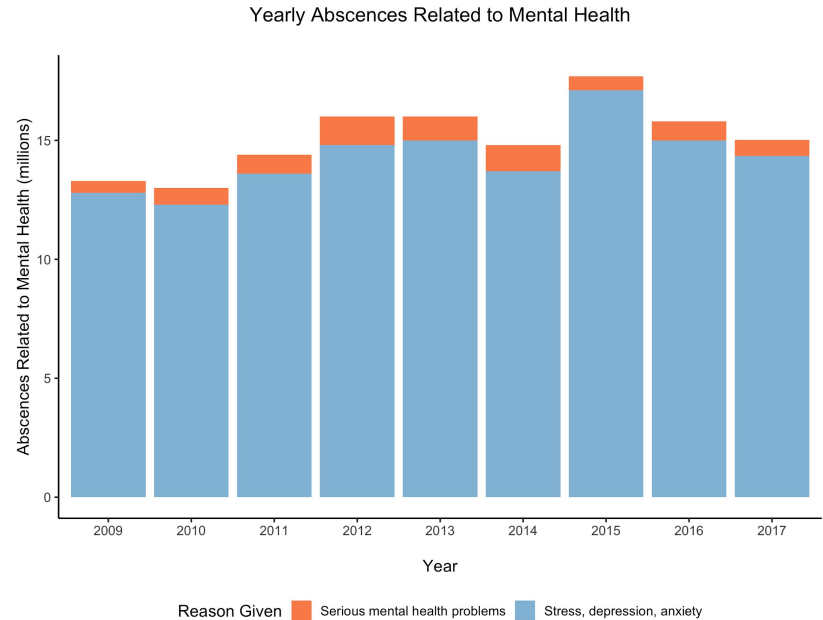
- Weak relationship between primary and secondary school investment and productivity
- Again makes sense, the better the schools: the more skilled the workforce and therefore a more likely rise in productivity

Education Investment and Productivity for the UK over Time



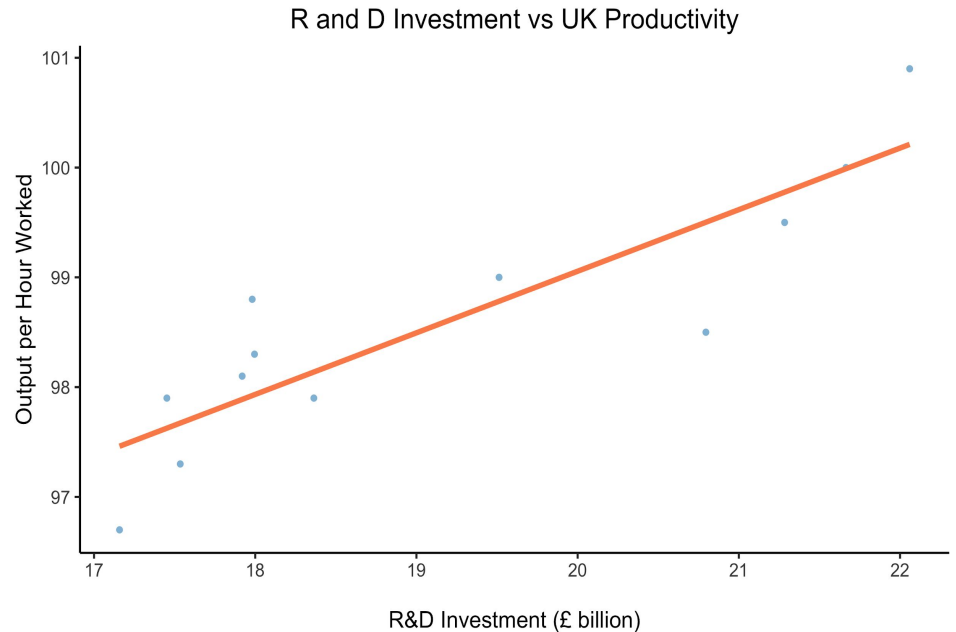
Mental Health

- No evidence from the data provided that mental health has improved in recent years
- Absences due to Stress, depression and anxiety have risen, however this may be due to better awareness
- Data on the investment specifically into mental health services would be required across several years to help support a conclusion
- Absences would intuitively reflect a drop in productivity



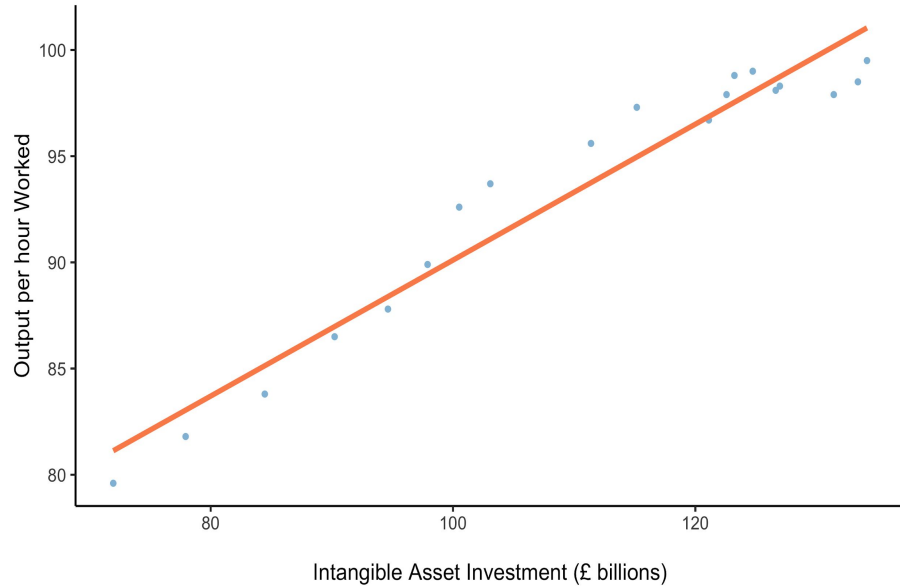
Research and Development

- There is a strong correlation between research and development investment and productivity
- Investing in R&D funds high skilled jobs such as technicians and scientists which can contribute to our workings in the country

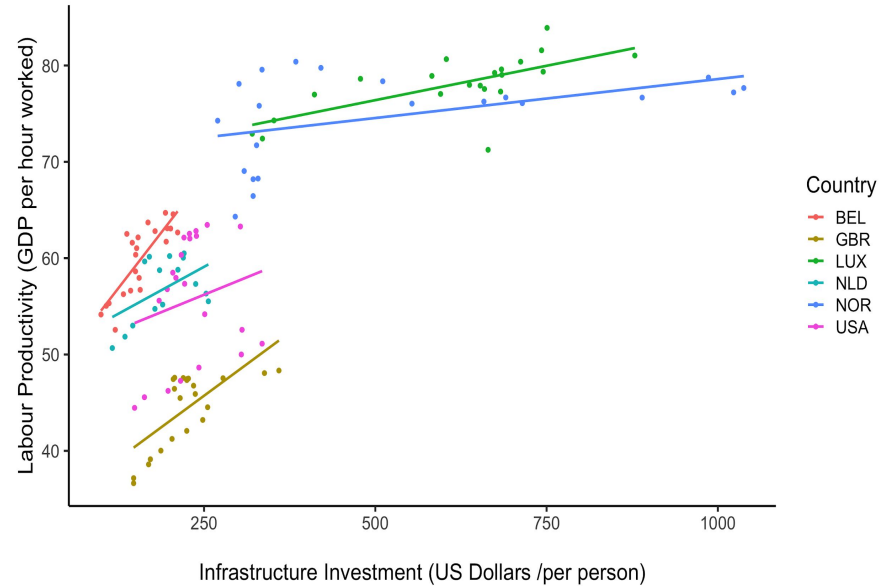


Other Investment Factors

Intangible Asset Investment vs UK Productivity



Infrastructure Investment per Population vs Labour Productivity



Predicting Future Productivity

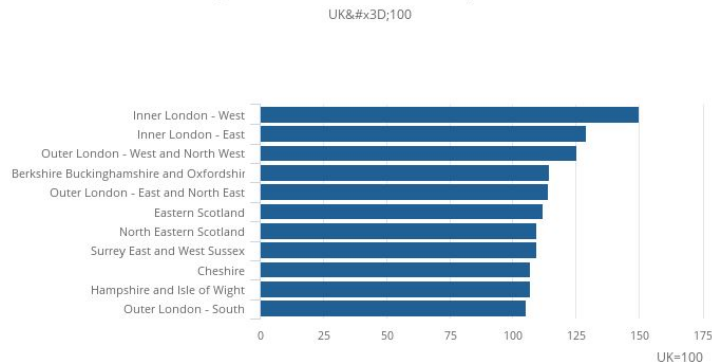
- A great model for predicting the productivity of a nation hasn't been achieved to date
- The best model achieved for predicting labour productivity was a multi-linear regression model which could predict with a RMSE of ~ 7.5
- The range of labour productivity was between 25 and 85 GDP per hour worked
- More could be done with more coherent and available data



Next Steps

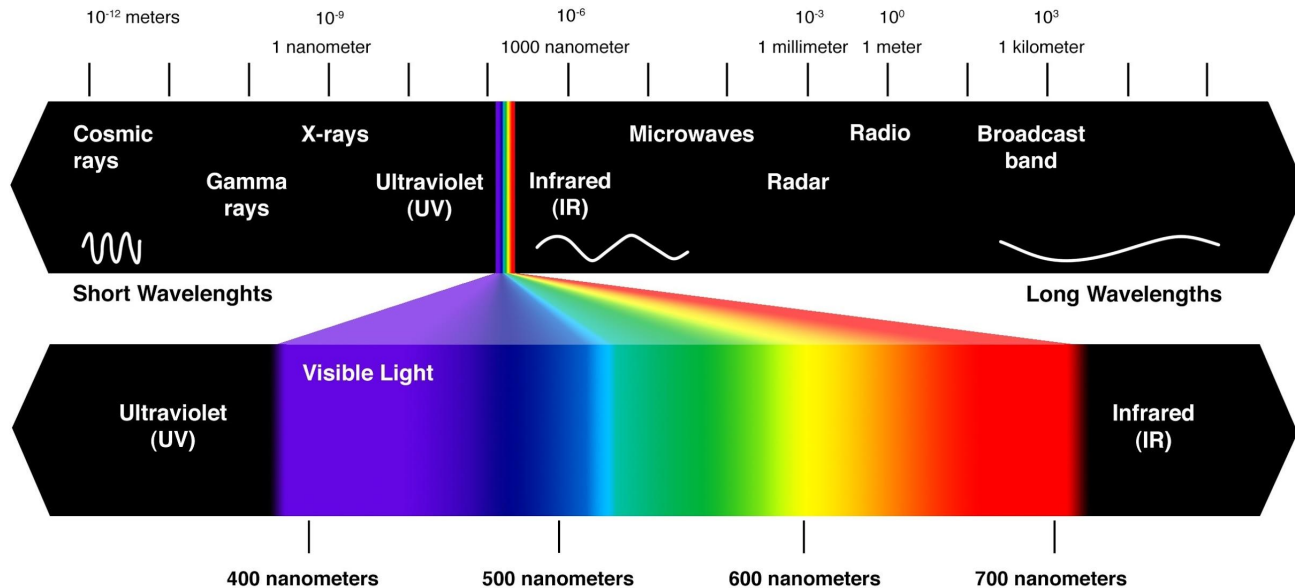
- Explore regional data for the UK, specifically Scotland
- Explore additional factors in greater granularity (financial data, commuting data, ease of doing business data, etc.)
- Compare more data from different countries and identify shortcomings in our growth strategies
- Investigate the effect mental health has on productivity in more detail
- More feature engineering and model refinement

Gross value added per hour worked – highest ranking UK NUTS2 subregions, unsmoothed, current prices, 2017



Source: Office for National Statistics

Learning from Experience



Conclusions

- Productivity in the UK is a complex, multi-variable equation with many different elements at play however a basic understanding of how productivity can be improved has been outlined
- Based on the data sources to date, an understanding of investment in mental health services and productivity hasn't been realised
- Productivity has not been successfully modelled to a satisfactory level in this project although it is believed to be achievable



Thank you for listening

Any Questions?

