

# Problem Set 1

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Quantitative Macroeconomics

September 27, 2020

## The Labour Market and Covid-19

According to the BBC, “the US economy shrank at a 32.9% annual rate between April and June as the country grappled with lock-downs and spending cutbacks during the pandemic. It was the deepest decline since the government began keeping records in 1947 and three times more severe than the prior record of 10% set in 1958.”<sup>1</sup>. The impact of the stay-at-home policies introduced in response to Covid-19 will be discussed in the following report.

The principle data source is the Current Population Survey (CPS). The data is provided monthly, allowing a fine grain look into the dynamics of key labour market indicators. Throughout this discussion I refer to *the effect of Covid-19*. While to fully demonstrate causality a deeper event study should be conducted which accounts for other events which occurred between March and August 2020. However, due to the size of the policy interventions from the US and UK governments I imply causality.

### Employment Rate

In figure 1. the US employment rate is presented, alongside the predicted values. From January 18’ until March 20’ the employment rate remains relatively stable around 96%. The employment rate is calculated as,

$$\frac{\#of\ employed}{\#of\ employed + \#of\ unemployed}$$

according to those who reported themselves as part of the labour force. As is clear from the graph, the introduction of lock-down measures by the US government in March 2020 resulted in a severe shock to the employment rate.

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<sup>1</sup><https://www.bbc.com/news/business-53574953>



Figure 1: Employment Rate

There was a reduction of around ten percentage points following the policy introduction, as can be seen in figure 2. This is a significant reduction and a much larger shock than was suffered when the financial crisis hit in 08'. There is debate as to whether this represents a supply or demand shock. It is true that demand will fall as a result of the lock-down policy, but only in response to the stay-at-home orders. The demand for consumer products is arguably still high and can be justified by Amazon's spike in revenue<sup>2</sup>. Business which are flexible to the change in economic landscape have seen increases in demand which in my opinion demonstrates we are facing more a supply shock than demand.

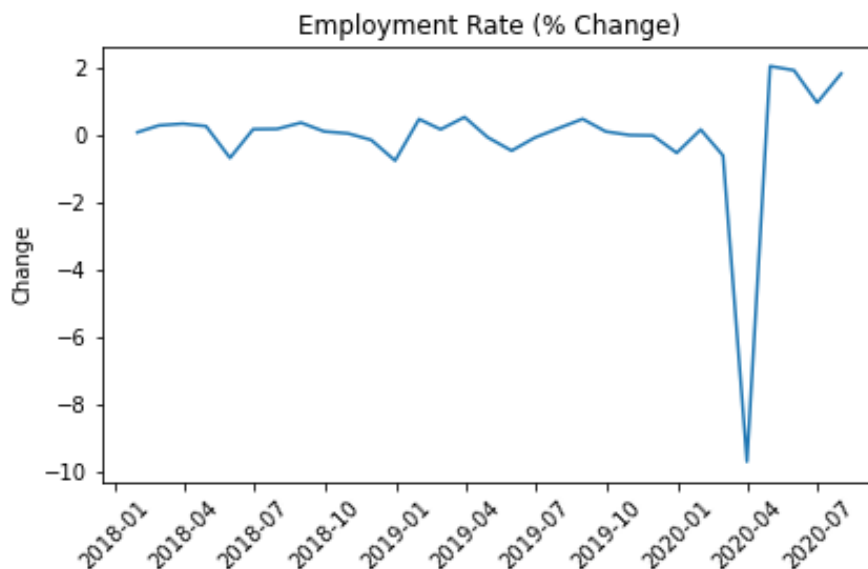


Figure 2: Employment Rate Percentage Change

The worlds population as a whole have been impacted by Covid-19. However the impacts of

<sup>2</sup><https://www.ft.com/content/7a42b1d8-9ca7-4827-aaae-729fdb7637f5>

the shock are not equally distributed across all agents due to inherent heterogeneity in the labour market. While education is a well established determinant of labour market power, due to the lock-down the number of people working from home jumped dramatically. Therefore we are also able to analyse the impact across different industries according to their ability to telework.

Respondents are grouped by education level. The predicted values are plotted as a reference point. Higher education levels are correlated with stronger labour market power and this is supported by the results in figure 3. As the level of education increases the negative shock from Covid-19 is less severe.

People with a high school diploma or less suffered a far more serious shock, though they have shown signs of recovering. None of the four categories have returned yet to pre-Covid-19 levels. This means that those with lower education levels will suffer more economic hardship as a result.

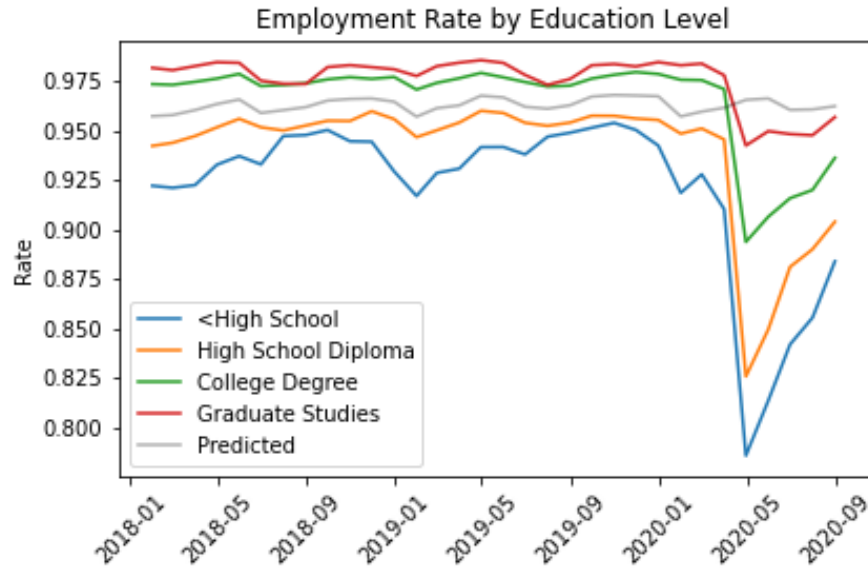


Figure 3: Employment Rate by Education

The ability to telework is capture by the American Time Use Survey (ATUS) where respondents indicate whether they are able to telework or not.

$$TeleworkAbility = \begin{cases} 1, & \text{Yes} \\ 0, & \text{Yes} \end{cases}$$

From these responses, each industry was given a telework score by summing the number of respondents in the industry category who reported they were able to telework and producing a cumulative percentage distribution. Industries who fell in the bottom 50<sup>th</sup> percentile were designated as unable to telework, and those above able to telework. People tended very heavily to report that they were unable to telework.

	Count	Percentage
Able to telework	3065	65%
Unable to telework	1650	35%

Table 1: Missing entries have been removed

It must be noted that this survey was last collected in 2018, the ability to telework is arguably endogenous to the problem since many workers had not done so before the Covid restrictions. Therefore they may respond differently, having now been forced to work from home.

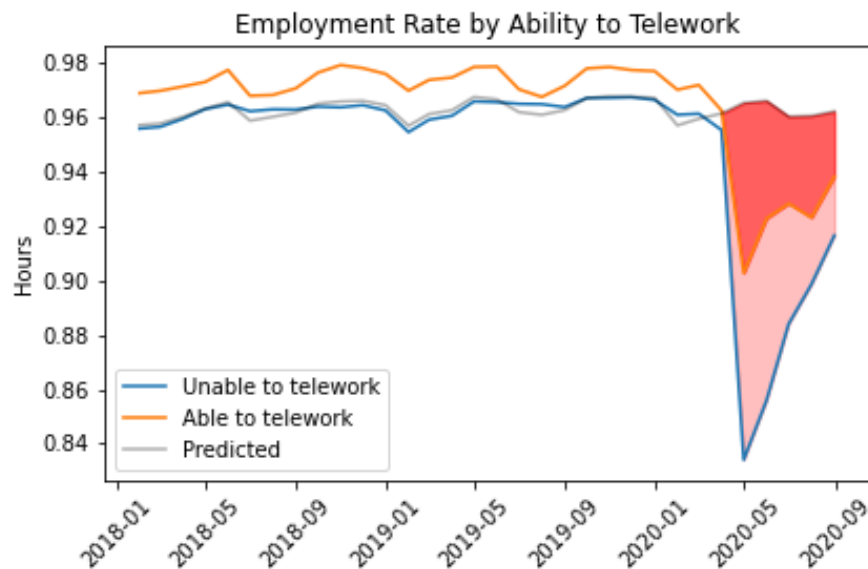


Figure 4: Employment Rate by Ability to Telework

As can be seen from figure 4. Industries that were recorded as able to telework suffered a significantly less severe shock to the employment rate. This should have been predictable owing to the fact that those who are unable to work from home, under a nationwide lock-down and stay-at-home policy, are unable to work at all.

Industries which depend on working in close contact with people or raw materials are going to respond differently to those which are more focused on information or communications. Since the results are reported on an industry basis however, the overall affect on supply chains warrants investigation. If industries that are able to work from home are downstream from those that are unable, the impacts may tickle down into their field.

In addition, if certain industries are hit worse than others their recovery may take longer due to a multiplier effect arising from an industry wide slump. A network study to understand industry wide shocks, similar to that of financial contagion, would be interesting.

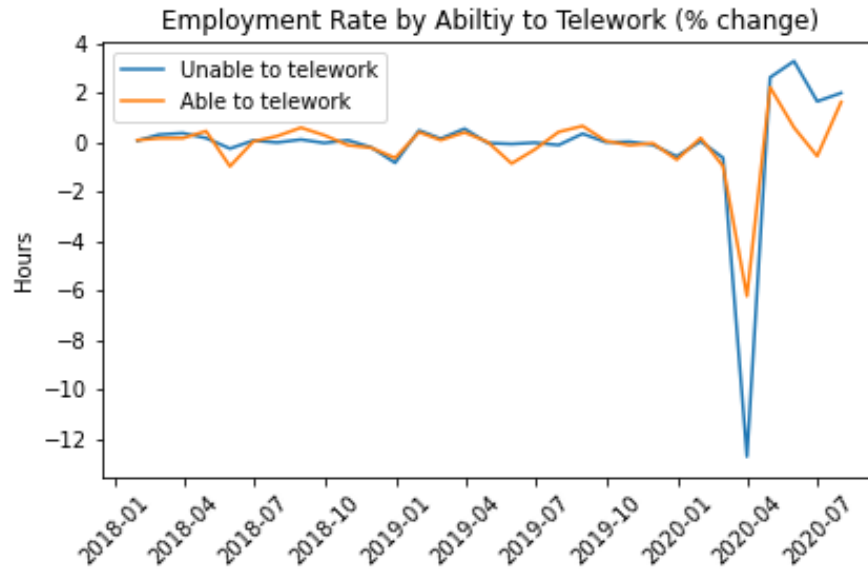


Figure 5: Employment Rate by Telework Percentage Change

Figure 6. again represents the idiosyncratic nature of the Covid-19 shock. In addition to education and telework ability, heterogeneous impacts may have been felt at an individual level. The CPS provides information on an occupation level and on the employment type of each agent. Studying how the impact of Covid-19 affects people with different labour statuses is interesting as part of a wider discussion on labour rights and protection.

Firstly, people who are employed and paid a contracted salary, which includes both the private and public sector positions, have a lower employment rate. Furthermore, following Covid-19, the drop in the employment rate was larger for contracted workers. This may be due to the fact that due to their contracts if they are kept on during the lock-down they will need to be paid. Self-employed workers may not have “lost” their job, however what is not seen here is whether they worked significantly less hours. The flexibility of self-employment contracts and occupations where self employment is common may have benefited individuals.

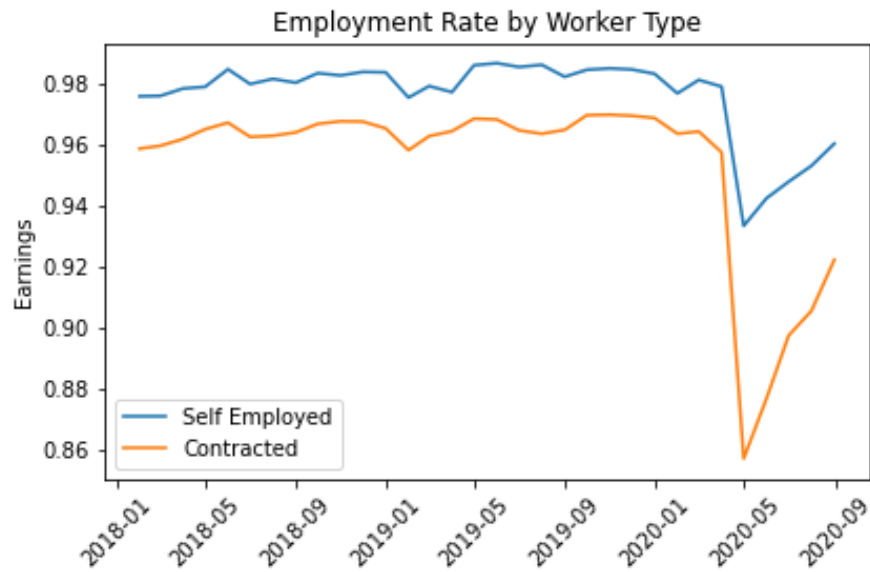


Figure 6: Employment Rate

## Average Weekly Hours

Many positions and occupations were suddenly told to work from home following the introduction of the lock-down. This justifies studying how average weekly hours changed in response, as part of a wider investigation into whether people maintain or diverge in their productivity rate when working from home. Average weekly hours are presented alongside the predicted levels and show a similar negative shock in March 20' following the Covid-19 policy measures.

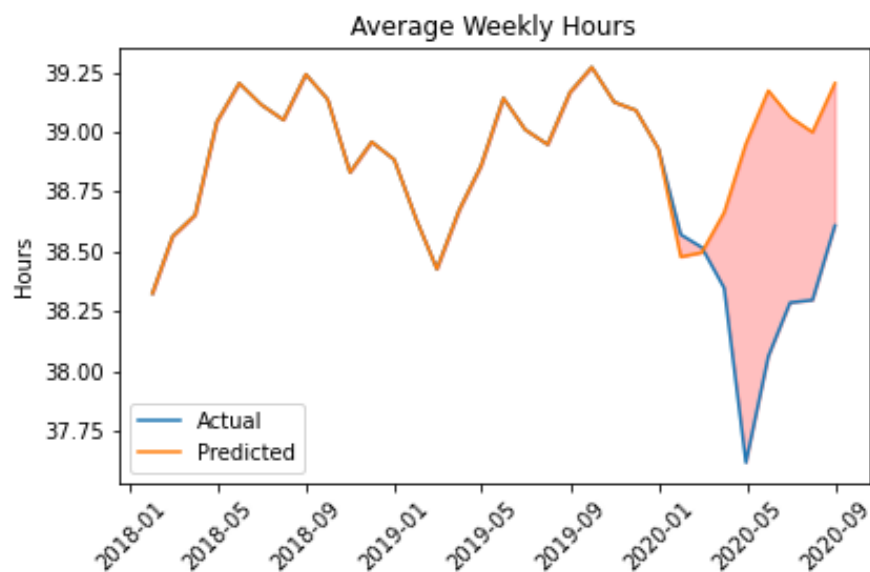


Figure 7: Average Weekly Hours

Again, average hours were broken down into both education groups, the ability to telework and employment type.

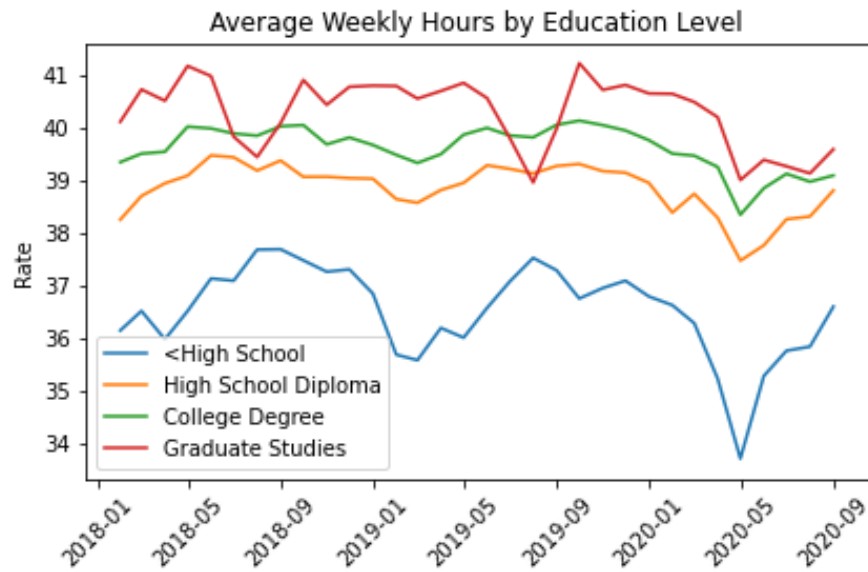


Figure 8: Average Weekly Hours by Education

From figure 8. it appears that people with a higher education level work longer hours. This is an interesting result and should be included in discussion of the effect of education on labour market power. To access management and senior positions often higher education qualifications are required, these jobs regularly entail longer working hours. For all education levels average hours appear to have reverted back to pre-Covid 19 levels.

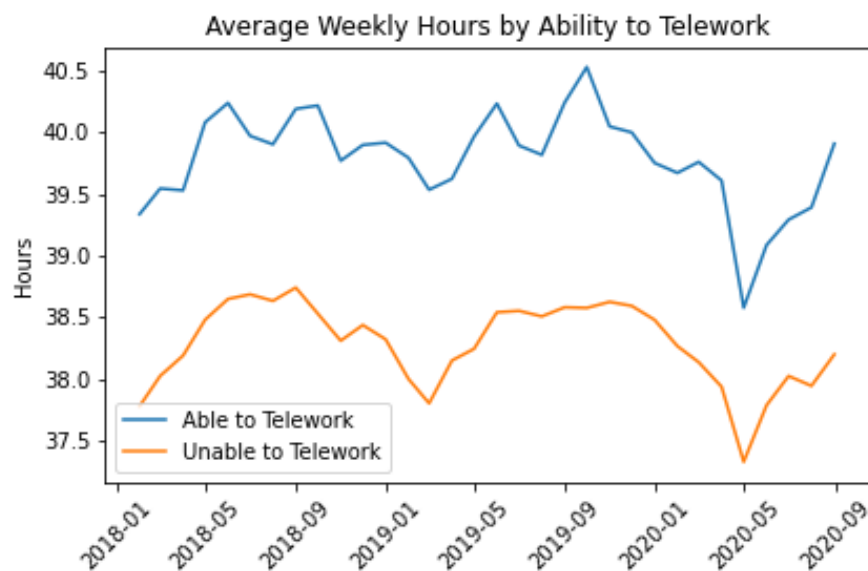


Figure 9: Average Weekly Hours by Telework

When looking at the ability to telework on average hours in figure 9. those who are unable to telework worked fewer hours pre-Covid. Following the introduction of the lock-down measures, the average hours of both groups appear to have followed a similar course. This data is conditional on the person being employed, this was chosen to remove the impact of people becoming unem-

ployed and focus on the changes to working patterns following Covid-19. The ability to telework doesn't appear to be a strong determinant in the impact of Covid-19 on average hours.

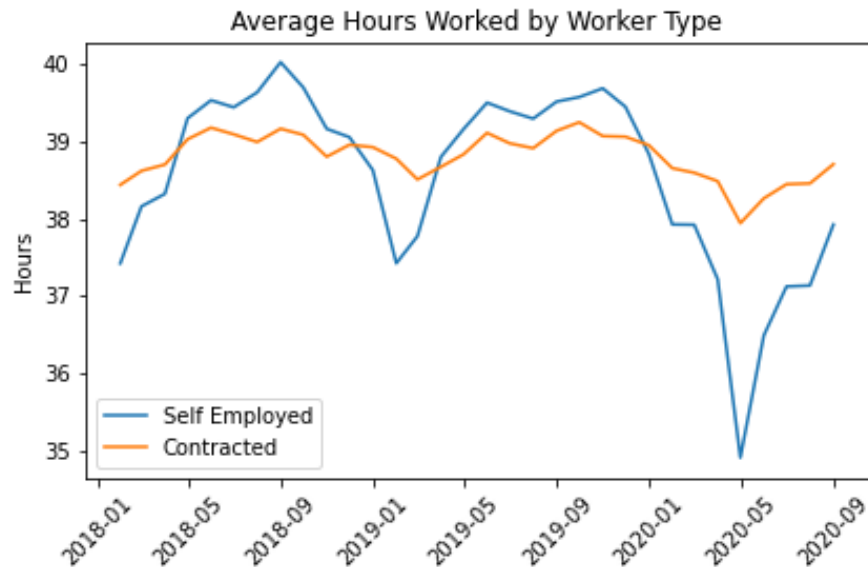


Figure 10: Average Weekly hours by Worker Type

In figure 10. there is clear distinction between workers who are self-employed and contracted. Firstly, those who are self employed report a larger variance in the average hours worked than contracted workers. Furthermore, the lock-down policies had a demonstrably worse effect on self-employed workers. This is in line with the previous hypothesis that while the employment rate for self-employed workers decreased less, they did stop working as much, as average hours reduced.

### 3

Aggregate hours were approximated by multiplying the number of people employed by the average hours worked. As can be seen in figure 11. aggregate hours saw a 12% decrease from March to May. To understand the driving force for this change, the percentage change of both employment and average hours is also presented. Both employment and average hours decreased in the period, however average hours saw a much less significant decrease and it was decreasing employment rates which determined aggregate hours movement.

This indicates that those people who kept working did see some decrease in their output however overall it was an employment shock. This means that policy makers in the US must tailor their recovery plan to deal with increased welfare claims and prioritise reviving industries with high employment rates.



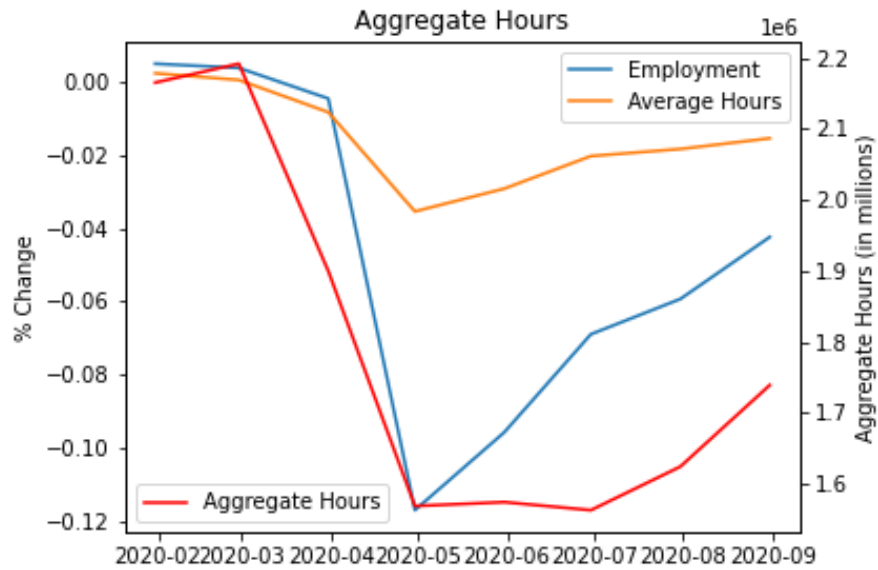


Figure 11: Employment Rate

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The analysis above is now extended to weekly earnings. The data provided by the CPS shows a high level of volatility in the pre-tax reported earnings.

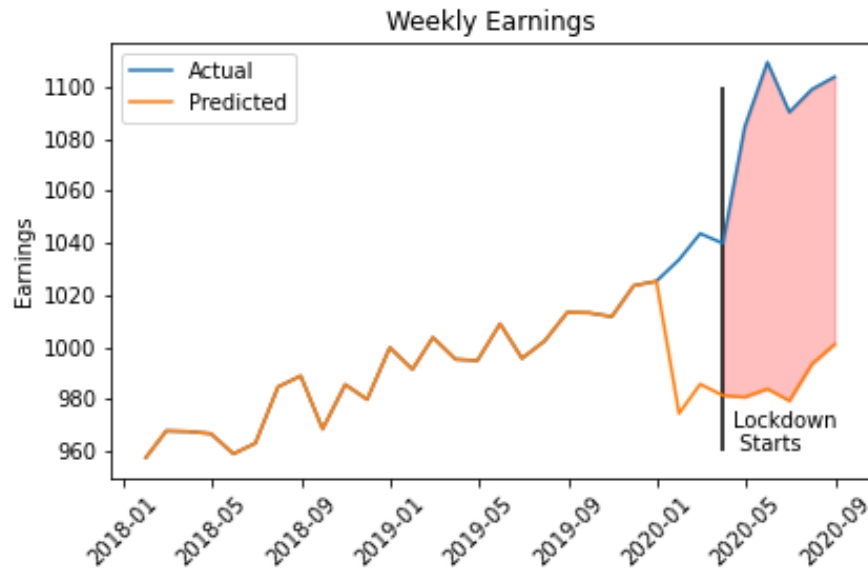


Figure 12: Employment Rate

There appears to be a significant upward trend over the period in wages, which is removed and the de-trended results are presented in table 13.

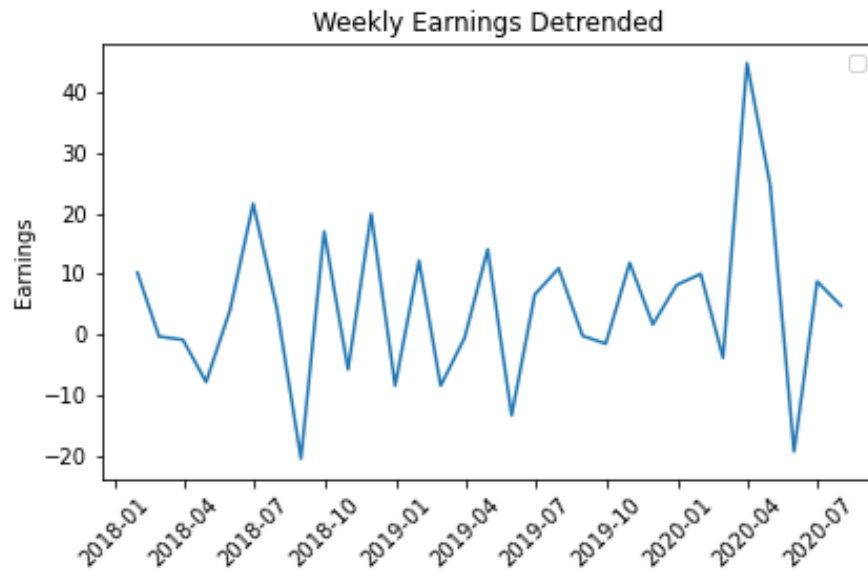


Figure 13: Employment Rate

The time series continues to demonstrate a high level of volatility, this may be due to the reporting methods in the survey or further underlying characteristics.

Not only have weekly earnings appeared to increase during the period in question but the increase is more pronounced post lock-down policy measures. The predicted values are provided to give a reference point and imply that the lock-down policies may have lead to an increase in reported weekly earnings. This result may be counter intuitive due to the general perspective is of economic downturn.

A few factors may be driving this result. Consider figure 14. which differentiates weekly earnings by education level where the dispersion in earnings appears to subside. The previous results indicate that people with a higher level of education suffered a lower decrease in employment and on average work more hours and suffered less of a negative shock as a result of Covid-19. The earnings findings presented above may therefore tell a story of highly paid, computer heavy positions being maintained and low paid, physical work being lost, thus skewing the mean values. This combined effect on earnings warrants future research.

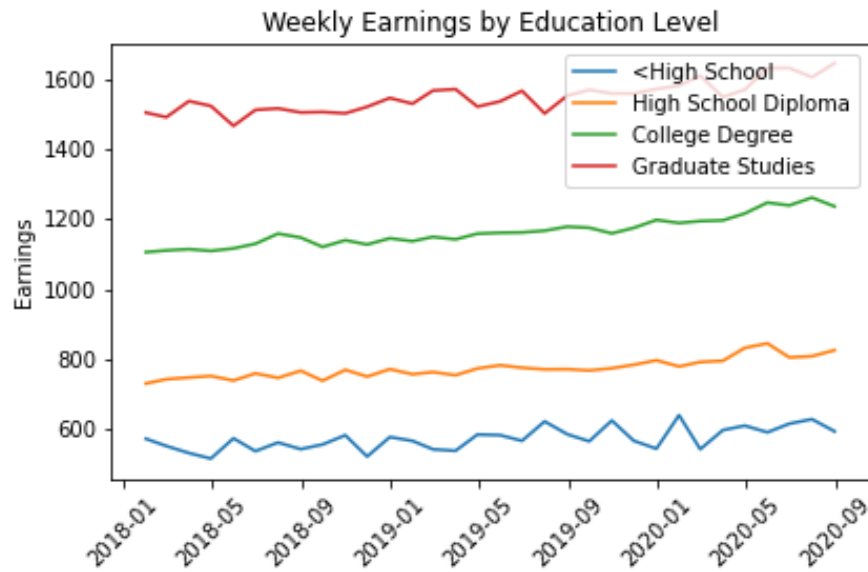


Figure 14: Employment Rate

The CPS doesn't record the data for self employed wages and they are set to missing. The results above are interesting enough that I have maintained the self-employed/contracted distinction in the report. To analyse the effect on wages for the self-employed I use comparative statistics on the other time series data reported. Firstly the average values for all variables for self employed workers are reported in the table below.

Variable	Mean
Hours Worked	38.63
Education Level	2.76
Telework Ability	0.35

Table 2: Mean values for self employed workers

The education level is essentially equal to the mean for all employees  $\approx 2.74$ . However they tend to be unable to telework. This will, according to the previous reported data, limit their ability to work and therefore weekly earnings for the self employed may have suffered the same drop as that of those unable to telework. As reported before, self employed workers saw a larger decrease in average hours worked. For any paid on an hourly basis, this would feed directly into lower wages as a result of the Covid-19 measures. Many self employed workers enjoy greater flexibility, often without one fixed workplace. The impact of movement restrictions therefore may limit their ability to work more than contracted workers.

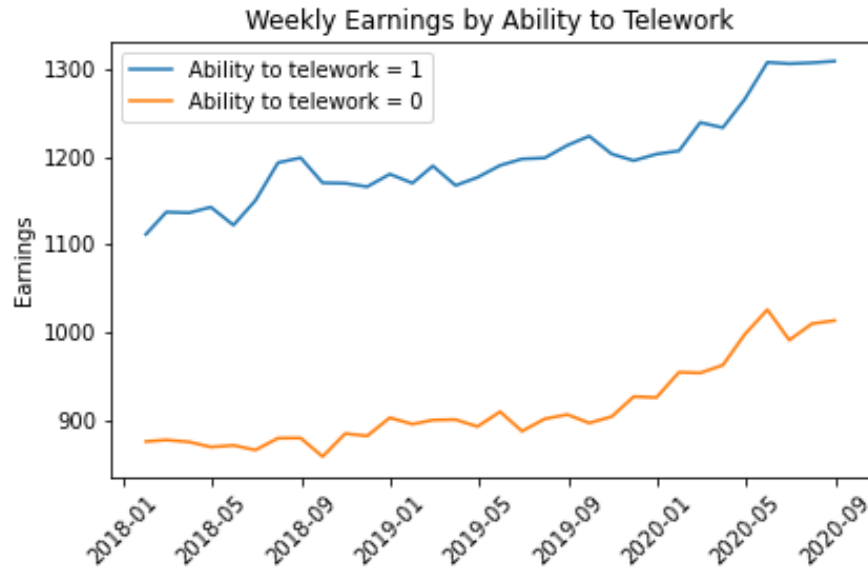


Figure 15: Weekly Earnings by Telework

Those who reported as able belonging to industries in which they can telework, as can be seen in figure 15. reported significantly higher earnings over the whole period. Both saw a continued increase post lock-down policy introduction, which is in line with the other weekly earnings findings. This provides further support for previous hypotheses on self-employed workers. As self-employed employees tend towards being unable to telework, this could indicate a tendency towards lower weekly earnings which could help fill the missing gaps in the data.

Overall the weekly earnings data has a large number of missing values, this in a data set as large as this one may not be an issue, however it is worth considering.

## 5

To conclude, data from the UK is analysed as a point of interest due to the stark difference in policy response to Covid-19. The UK data is collected and produced by the Labour Force Survey (LFS) and is reported monthly as with the CPS. In response to Covid-19 the UK government introduced the furlough policy whereby the government would pay 70% of an employees wages, with the employer paying between 10% and 30% extra, up to a maximum of £2500.

The impact of the policy is clearly shown in figure 16.<sup>3</sup>, the time series has been split along gender in response to the high level of current media discussion on the heterogeneous impact of Covid-19 on men and women.<sup>4</sup>

<sup>3</sup>The absolute value is different to the US due to different measures of the employment rate. For the UK it is measured as

$$\frac{\#of\ employed}{\#people\ aged\ 16-64}$$

<sup>4</sup><https://www.mckinsey.com/featured-insights/future-of-work/covid-19-and-gender-equality-countering-the-regressive-effects>

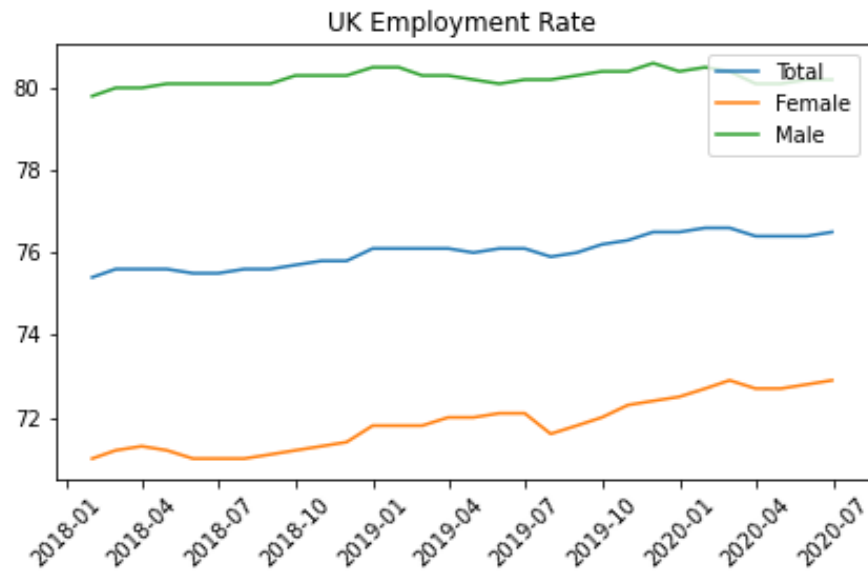


Figure 16: Employment Rate

The furlough system appears to have achieved its purpose of maintaining employment levels in the UK as the employment rate has not shown the same significant decrease as that seen in the US. This would appear to be a positive, however it must be framed in the context of public spending and debt levels. The furlough system is an extreme intervention from the state and the final outcome will not be seen for a while yet. One that if it does manage to save the UK economy from a serious and prolonged recession will provide a strong argument for Keynesian style fiscal intervention.

Finally in figure 17. the average hours worked is reported. Interestingly, while the employment rate has not decreased the average hours being worked has done so. This is capturing the furlough affect since people being paid via furlough were not working, therefore they will be contributing to the employment rate but decreasing the average hours worked.

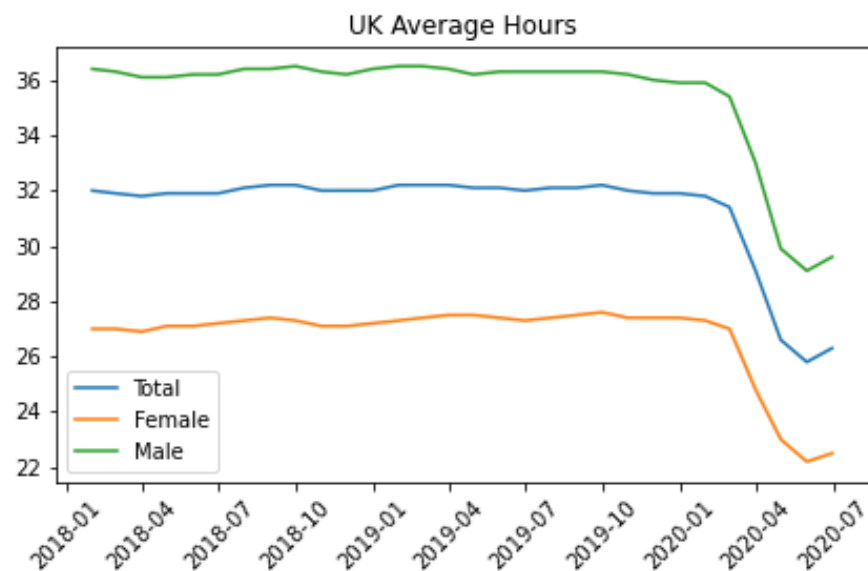


Figure 17: Employment Rate

From figure 17. we can see the gender gap in employment in the UK. While both genders suffered similar decreases in average hours of around 18-20%, if this translates into a similar decrease in pay then women will suffer a greater impact following the Covid-19 policy changes.

The difference between the US and the UK is clear. The US opted to let employment fall on the belief that the market will respond and clear employment post-Covid faster without distortionary policies from the state. The UK government went in the other direction and chose to intervene and prop up employment rates, whilst it is only a conjecture it may be safe to assume the UK would have seen similar decreases in employment to the US. Which policy proves to be the most effective is a source of interest for all on both sides of the pond.