Problem Set 1 - Quantitative Macroeconomics

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Question 1) Labor Market and Covid

Compute (and plot) the time series of the monthly employment rate in the U.S. As source of data go to IPUMS and download the latest available CPS monthly data. Detrend and deseasonalize to show the effect of COVID19 in your estimates for year 2020. Discuss your results.
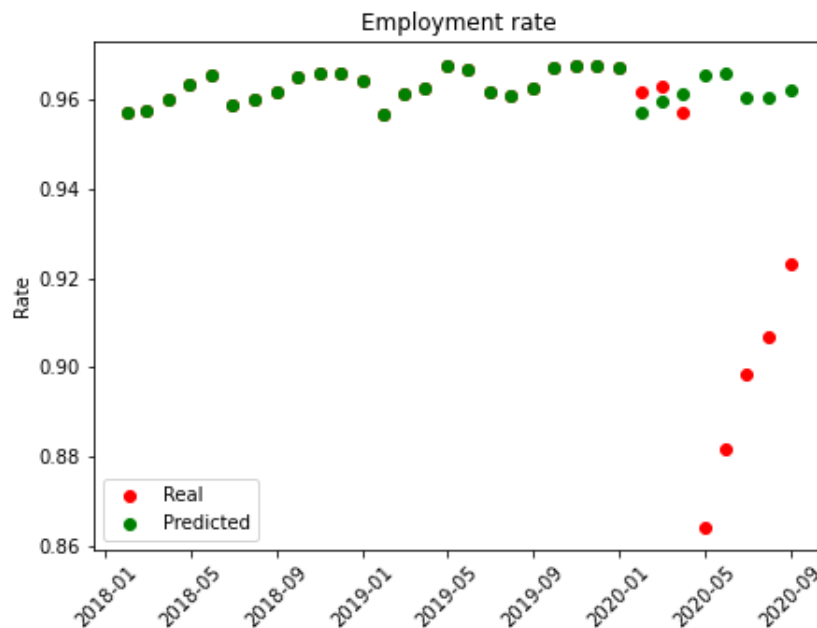

Figure 1: Employment rate

In figure 1, we can see that there has been a large decline of the employment rate in April 2020 (compare to what we could expect deseasonalizing), followed by slowly recovery. In the latest month available, August, the employment rate was (approximately) four percentage points below the deseasonalized estimation. Thus, we could expect a recovery to pre-covid levels if no other shocks are observed (another wave, for example). It is worth noticing the high level of the the employment rate pre-covid, approaching the 97% employment rate.

- **Redo by education group as <HS, HS, College and > College.**

  In figure 2, we can see that the Covid pandemic have affected more the workers with a lower education level. However, it is worth noticing that their recovery have been faster in the previous months so that the trend seems to indicate that we may be in the process to recover similar pre-covid employment rates. Still, the employment rate for all the education levels is lower than the pre-covid ones.
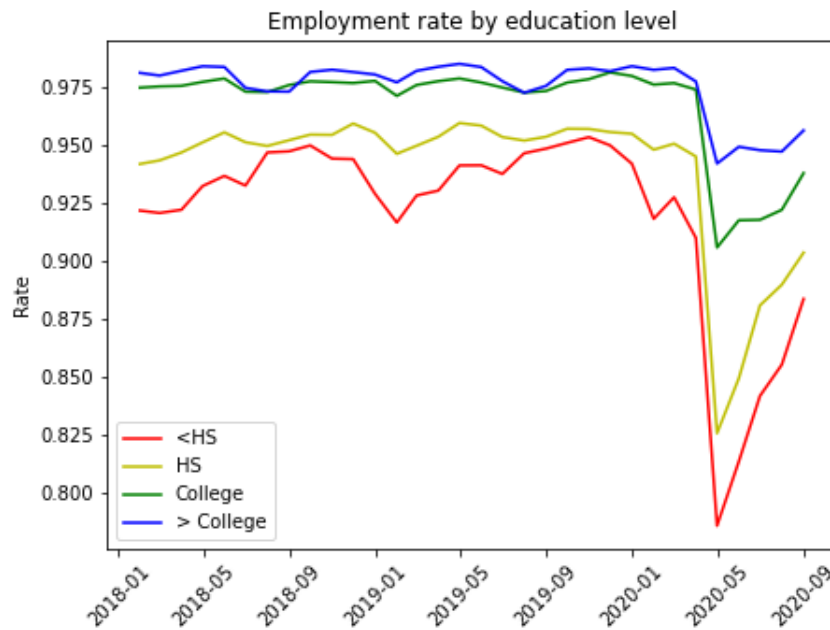

Figure 2: Employment rate by education level

- **Redo by industry (for example, create two groups of industries according to their ability to telework).**
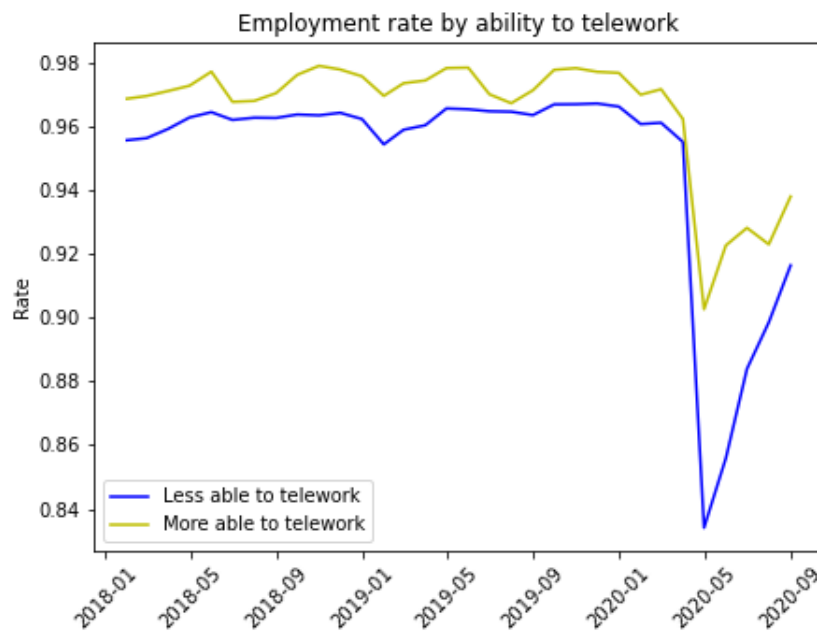

Figure 3: Employment rate by education level

In figure 3, we can see that, as it could be expected, the jobs classified as "More able

to telework" have resisted better the shock. But, we can see that those jobs classified as "Less able to telework" are recovering faster so that I will be interesting to check it how it evolves in the following months. This classification have been done using the variable "Ability to work at home" from the CPS data.

- **Redo by occupation. Hint: Find an interesting way to split occupations (2 or 3 groups) that you think is useful to learn the effects of COVID19.**

Figure 4: Employment rate by education level

In this section, I have classified the workers by "self-employed", "government" workers and "private sector" workers, using the "Class of worker" variable from CPS. In figure 4, we can see that that "private sector" workers have been the more affected but its recovery is being the fastest. Still, the three categories have an employment rate lower than the pre-covid ones. From my point of view, it is quite surprising that "government" workers have a lower employment rate than those classified as "self-employed" post-covid since usually public position are more protected. With the hours worked, we may obtain more information to know potential reasons why this happens.

Redo the previous item for average weekly hours. Discuss your results.

In figure 5, we can see that the average weekly hours by worker has decreased substantially from what it could be expected by deseasonalizing the trend. The recovery seems to be quite fast.
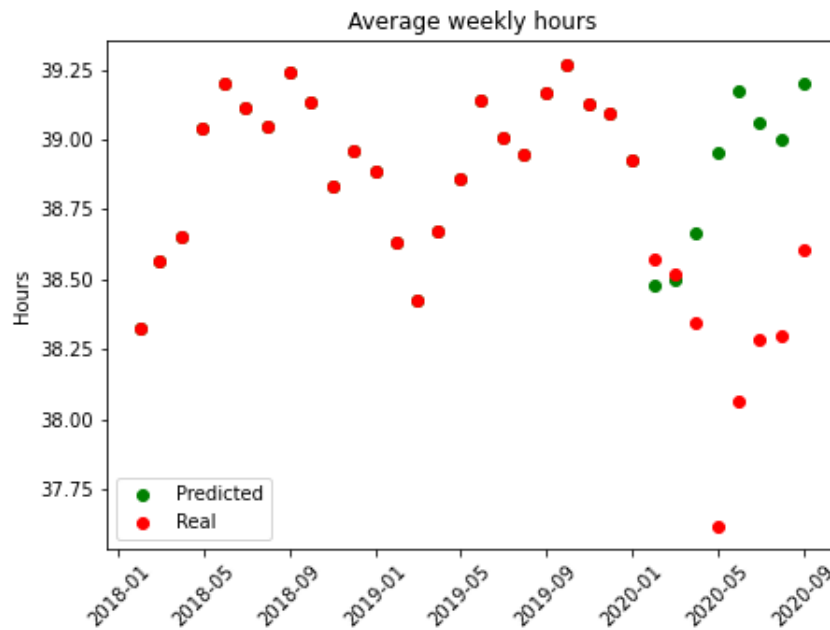
Figure 5: Average weekly hours

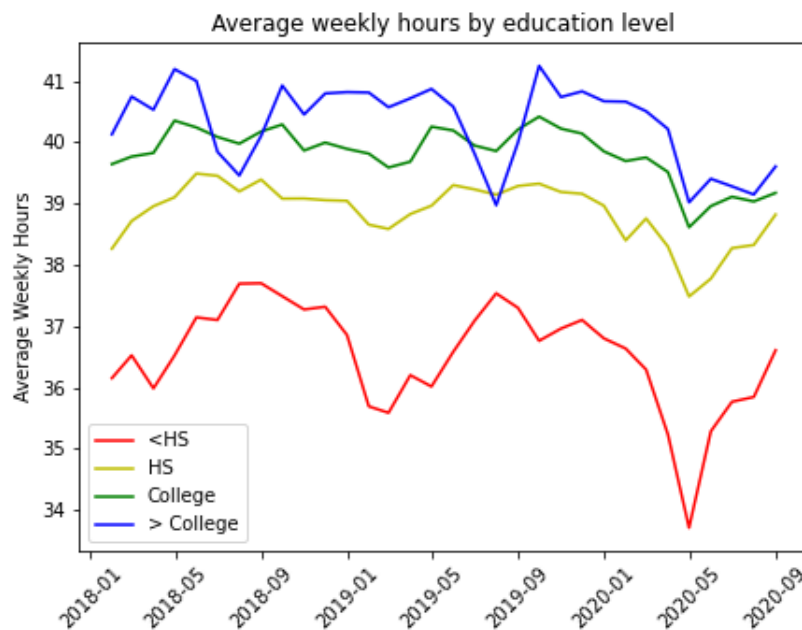- **Redo by education group as < HS, HS, College and > College.**

Figure 6: Average weekly hours by education level

In figure 6, we can see that the decrease in average weekly hours was higher for those with a lower education level ("<HS") but they have already recovered the hours worked

as of pre-covid levels, but still two hours less a week compared to those of next education level ("HS"). Another surprising thing about this graph is that the ">College" workers have a higher volatility of average weekly hours compared to those with "College" and "HS" levels, may be due to the fact that they have the ability of changing jobs more easily. Another aspect that it is worth mentioning is that the average weekly hours of the three highest educations levels seems to be converging a bit.

- **Redo by industry (for example, create two groups of industries according to their ability to telework).**
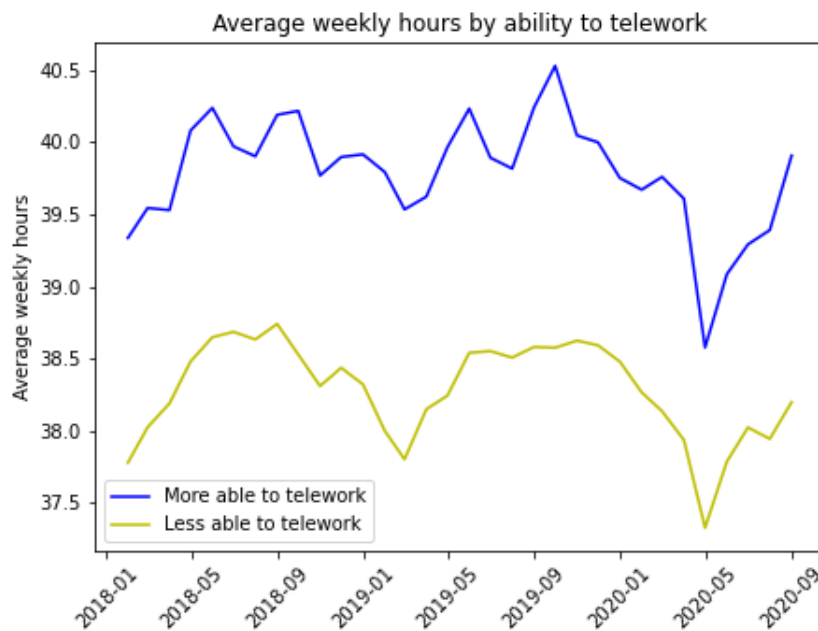

Figure 7: Average weekly hours by education level

In figure 7, we can see that there is not much difference between pre and post-covid since the workers classified as "More able to telework" were already working more hours than those "Less able to telework". The difference seems to be of about 1.5 hours. I would expect this difference to widen after the covid but it has not happened. A potential explanation is that this difference has not widened since the workers classified as "Able to telework" also depend on the real economy, which has been affected by the pandemics. The evolution of this variable may provide more information to answer the questions arisen from this point.

- **Redo by occupation. Hint: Find an interesting way to split occupations (2 or 3 groups) that you think is useful to learn the effects of COVID19.**

In figure 8, we can partially answer a question that it has arisen when looking at the employment rate by occupation (figure 4). Although the employment rate of those "self-employed" was the highest of the three occupations considered post-covid, the shock in the number hours worked has been reduced the most of the three groups
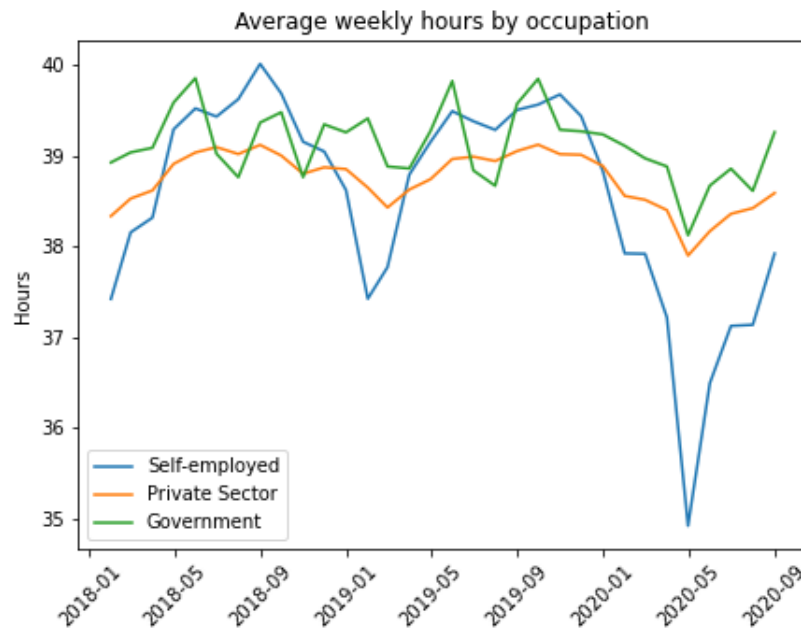
Figure 8: Average weekly hours by occupation

studied. However, the recovery of those "self-employed" to pre-covid weekly hours, has been quite fast. As expected, for me, the "government" workers have the higher number of hours worked, almost approaching the 40 weekly hours, on average. The "Private sector" workers, have not had a substantial change. A potential explanation, given what we can see in figure 4, is that there have been fired workers, but those still employed have worked the same (more or less) number of weekly hours.

Is the behavior of aggregate hours driven by employment or by average weekly hours. Decompose using percentage deviations from the predicted value of these items. Discuss your results.

In figure 9, we can see that the change aggregate hours has been mainly driven by the employment rate, not so much by the average of weekly hours. That is, there has been more changes, from what we could expect with the detrended estimations, in terms of workers being fired than workers working less hours than before to the covid, as introduced during the previous points.

Redo for wages (or earnings). Discuss your results.

In figure 10 we can see, from my point of view, a quite surprising figure since the average weekly earnings have increased from the deseasonalized trend. A potential explanation from this figure is that, as we have seen during the exercise, that the jobs with the lower
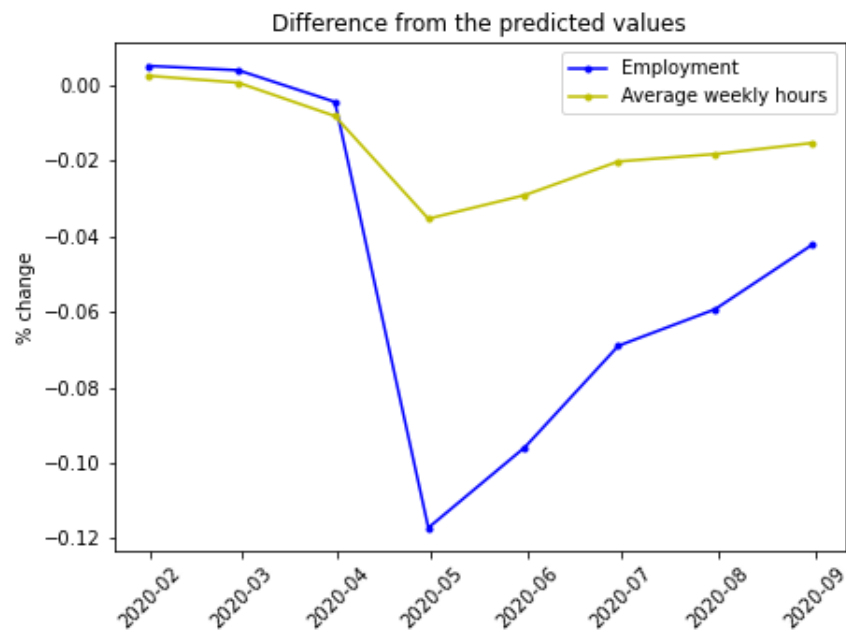
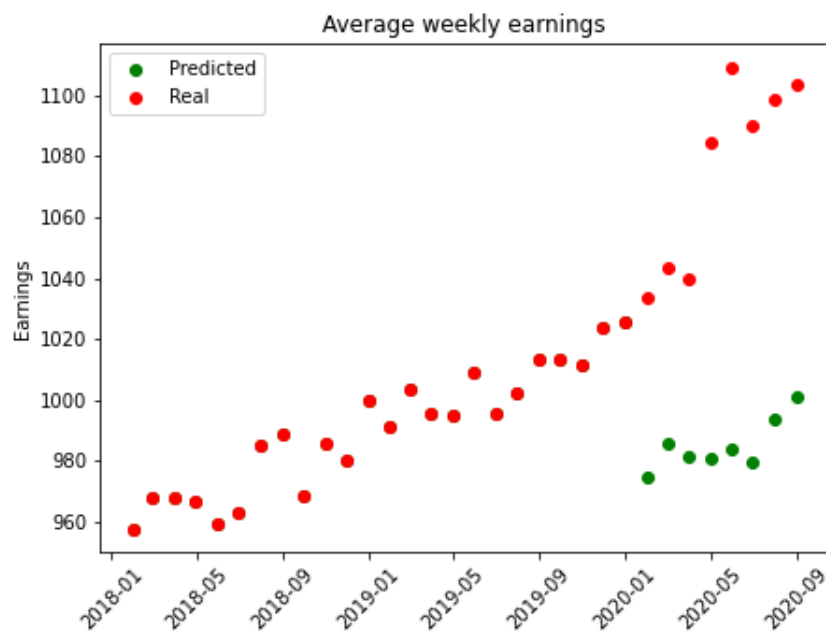Figure 9: Change in the employment rate and the average weekly hours

Figure 10: Average weekly earnings

education level (and potentially with the lower wages) have been the more affected. Then, the remaining jobs in the economy are those with higher salaries and it is the reason why the salaries are higher than the deseasonalized trend.

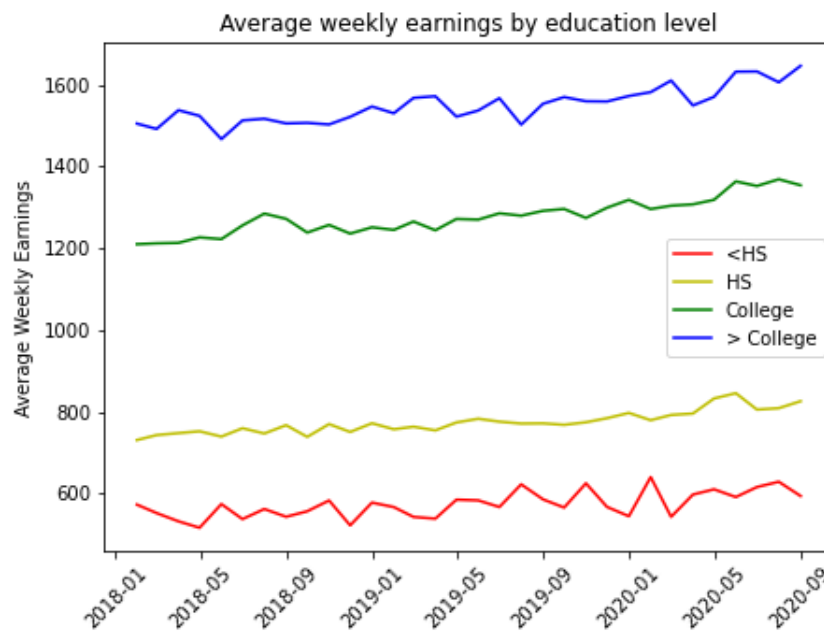- **Redo by education group as <HS, HS, College and > College.**

Figure 11: Average weekly earnings by education level

In figure 11, we can see the evolution of the weekly earnings by education level. In this figure, we can see that the weekly earnings have been slightly increasing for all the education levels, except for "<HS". We can't clearly see any shock due to the covid in this figure so that the wages does not seem to be cut by the covid. As suggested during the exercise, the firms seem to have decide to fire the employees rather than adjusting the wage or the hours worked.

- **Redo by industry (for example, create two groups of industries according to their ability to telework).**

In figure 12, we can see that the weekly earnings have been increasing, without any clear shock associated to the covid. The trend seems to be quite similar for both groups depending on their ability to telework.

- **Redo by occupation. Hint: Find an interesting way to split occupations (2 or 3 groups) that you think is useful to learn the effects of COVID19.**

In this case, it worth noticing that there is not data available for the "self-employed" group so that we can only compare "government" workers and "private sector" workers. In figure 13, we can see that the two lines were converging but post-covid, but the gap between "government" workers and "private sector" have widened in the last months.
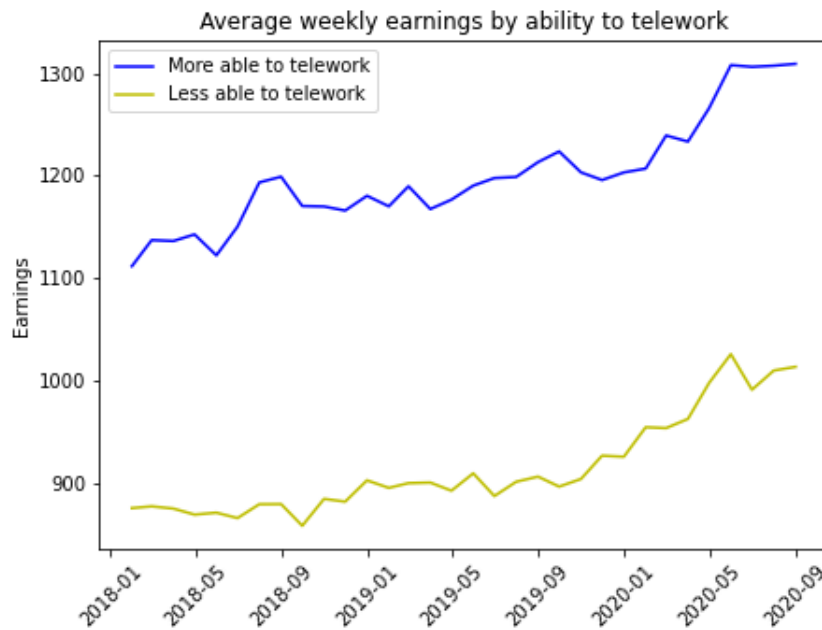
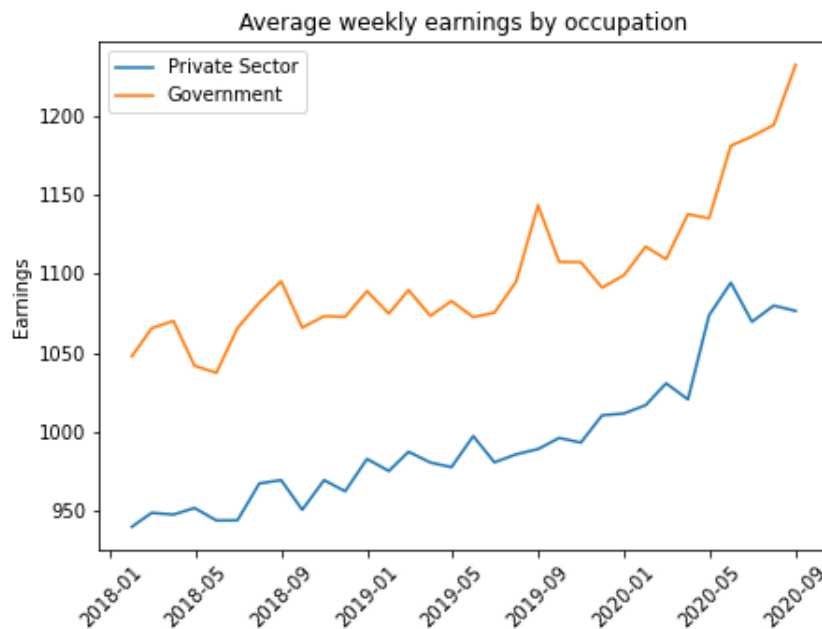Figure 12: Average weekly earnings by ability to telework

Figure 13: Average weekly earnings by occupation

Redo for your own country. Discuss difficulties (if any) in getting the data. Discuss your results.

In this case, I am going to try to replicate the figures provided above for the case of Spain. The main problem of the Spanish data (provided by the Spanish public institution

INE and supported by Eurostat) is that there is not disaggregated data so that the flexibility that CPS gives to collect different kind of information will not be available. Moreover, INE only provides data for each trimester so that the trends are much more difficult to follow. For example, the only data available which will allow us to see the effects of covid on the Spanish labor market is going to be "2020Q2". Some of the variables used for the case of US, are not provided in neither INE nor Eurostat (the weekly earnings, for example). I have been able to replicate some of the figures provided above, which are going to be provided above.
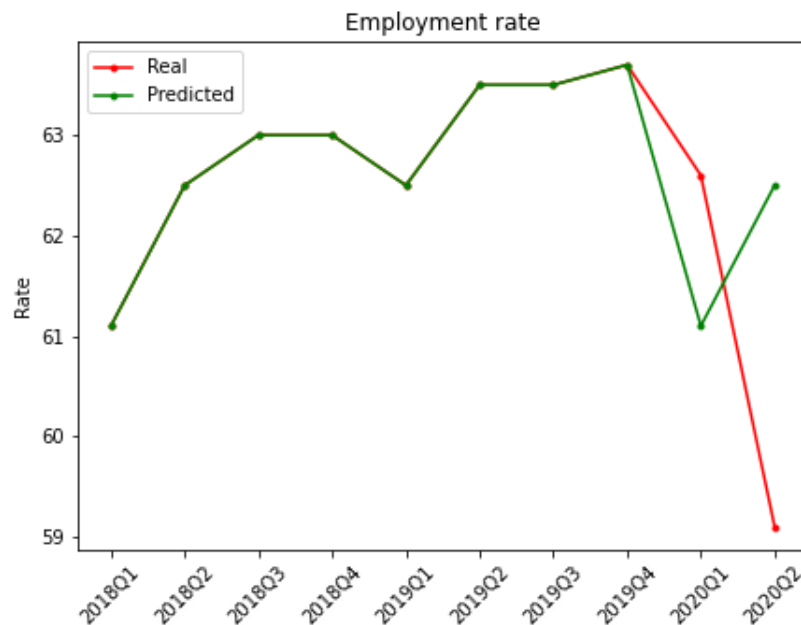

Figure 14: Employment rate in Spain

Firstly, I have calculated the employment rate in Spain using data from Eurostat (from the database: "Employment rates by sex, age and country of birth (%)"). This figure, with the detrended series, can be observed in figure 14 below. In this figure, we can see that the employment rate is below the expected one for the 2020Q2 data. That is, the only data available to capture the effect of the health crisis (since the pandemic has had effects in Spain since mid-March). It is worth noticing the huge difference between the rate observed in the US (around between 86% and above 96%) and the one observed in Spain (between 59% and 64%), which suggests big differences in both economies that should be further studied.

Secondly, I have calculated the employment rate by education level using the same database as the employment rate. This database divides the workers in three education levels:

- Less than primary, primary and lower secondary education (levels 0-2).

- Upper secondary and post-secondary non-tertiary education (levels 3 and 4).
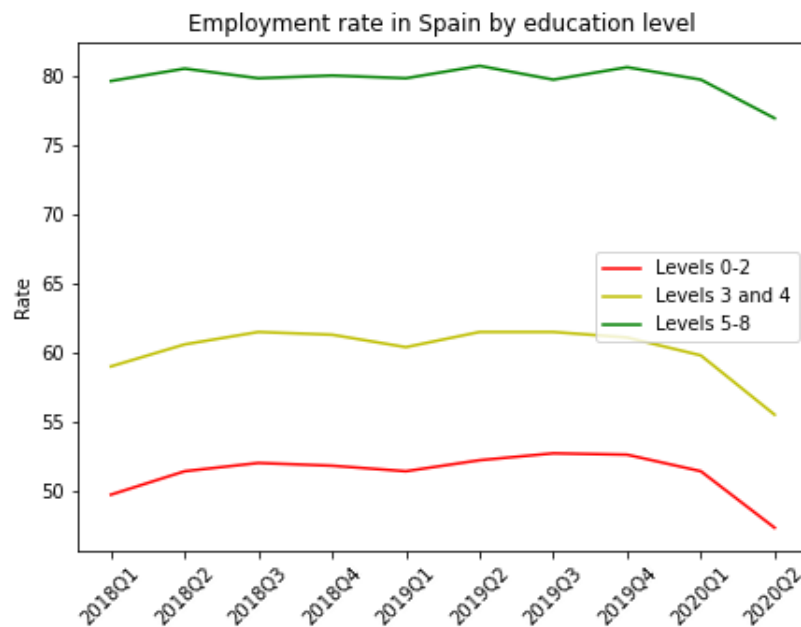
Figure 15: Employment rate by education level in Spain

- Tertiary education (levels 5-8).

For the case of Spain, we can see big differences between each of the education levels, mainly between the highest level and the other two levels. All the employment rates have decreased by the same amount (approximately) in the latest data available, "2020Q2", so that no major differences of the covid effects are seen by education level.

Thirdly, I calculate the average monthly hours worked dividing the total of hours worked divided by the number of workers using data from INE.

The results are presented in figure 17. In this figure, we can see that the average number of hours worked has decreased being 6 hours below the detrended one, for the date "2020Q2". One potential explanation for such a big difference is the fact that firms are changing from full-time employees to part-time ones, leading to a decrease of the hours worked. ERTOs may have also played a role in the sense that some ERTOs were designed to cover a part of the workers salary so that they were still working but less hours compared to the pre-covid situation.

Finally, I have also estimated the monthly earnings. To do so, I have used the variable "total monthly labor cost per worker" as proxy, which I believe that it is a good variable to estimate the labor income received by the workers. However, this variable does not capture well the effect for the self-employed ones, but still provides us with useful information to approximate the monthly earnings.

In figure 17, we can see that labor costs have reduced in "2020Q2" (the variable mainly capturing the covid effects). Without further information, it is difficult to determine the reasons of this decline. A potential reason for this decline could be due to the fact that
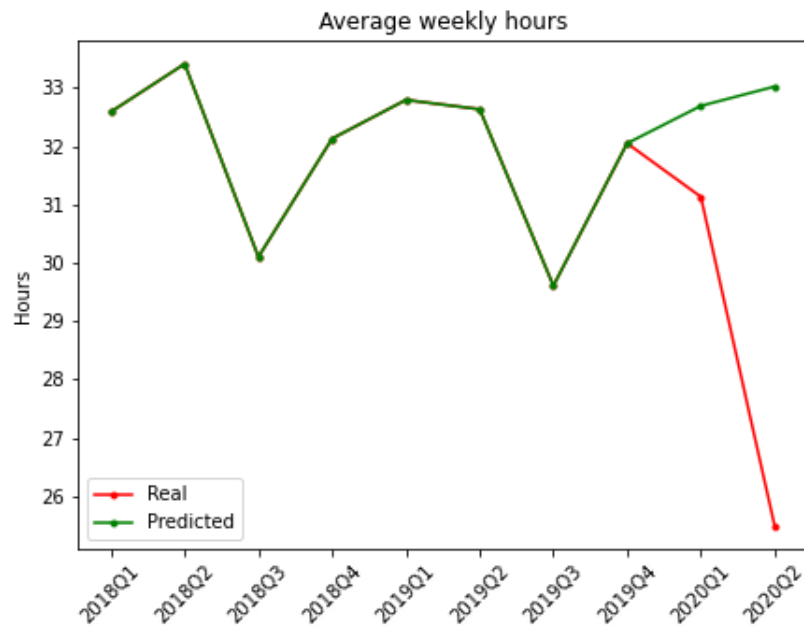
Figure 16: Average weekly hours in Spain

Figure 17: Average monthly labor costs in Spain

firms/governments have reduced the salaries to the employees.

Unfortunately, I have not been able to reproduce the rest of the figures done for the US for the reasons stated at the beginning of this question. I would be important to make the

public institutions in Spain and Europe to provide more public data to better study different important aspects, in this case the effects of covid on the labor market.