Background and research questions
Although mixed-mode approaches are well suited to deal with the non-coverage issue and the non-response error in sample surveys. In literature there are many examples of surveys that mix web, telephone and F2F modes, adoptingR conditions or sequential designs in experimental or non-experimental studies. The biases of interest are various, e.g., experiments on question format, differences in non-response and coverage, social desirability bias, and data quality estimates. Moreover, the studies differ in the same sampling frame for the mixed-mode survey, and these contrasting findings in the results are mainly due to the different mixtures of sampling techniques and the different sources of bias involved in each methodology. In this paper we apply a mixed-mode survey design to different sampling frames (landline and online panel). The problem with telephone coverage is exacerbated because households with landlines are not equally represented throughout the Italian population. We hypothesize that this source of bias, combined with non-response error, could be reduced adopting asymptotic tests that use different sampling frames. This analysis aims to assess the representativeness of samples from mixed-mode survey design (web-landline) and a telephone survey (calling mobile and landline phone numbers), comparing their estimates to the observed values from registered voters’ registers, and to the socio-economic characteristics of the Italian population.

Method
To assess the representativeness of the samples, we first compared the estimated voting behaviour from the two survey designs to the observed voting behaviour ("true values") in the last political elections. We conducted bivariate analyses and use the mean absolute error, the largest absolute error, and the percentage point differences, as accuracy metrics. In addition, we also compare the employment status and education of our respondents to those of the Labour Force Survey respondents, calculating (as accuracy metrics) the percentage point error for the modal category of the benchmark.

Results: representativeness of voting behaviour
Results from the analyses on the magnitude of bias in the estimates of voting behaviour show some differences between the CAMI- CATI and the CAMI -CATI designs.

In particular, Table 3 focuses on the mean absolute error, and shows that the CAMI- CATI design performs better than the CAMI- CATI one in all the four surveys, when representing voting behaviour.

Table 3. Mean absolute error for each survey sample.

<table>
<thead>
<tr>
<th>Survey</th>
<th>March 2018</th>
<th>April 2018</th>
<th>May 2018</th>
<th>September 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMI CATI</td>
<td>3.75</td>
<td>4.42</td>
<td>3.04</td>
<td>2.95</td>
</tr>
<tr>
<td>CAMI CAWI</td>
<td>4.00</td>
<td>3.90</td>
<td>3.81</td>
<td>3.11</td>
</tr>
</tbody>
</table>

When looking at the parties selected by the respondents, we identified four main patterns:

1) The CAMI- CATI survey design performs better than the CAMI- CATI one in representing the overall voting behaviour:
2) The magnitude of the largest absolute error is smaller for the CAWI -CATI than for the CAMI -CATI survey design; 
3) The CAMI- CATI samples tend to systematically over-estimate people voting Forza Italia; 
4) The CAMI- CATI samples under-represent people voting for Movimento 5 Stelle.

Lastly, looking at the percentage point differences for the main parties (Graphs 1-4), we find some patterns.

RESULTS: REPRESENTATIVENESS OF SOCIO-DEMOGRAPHIC CHARACTERISTICS
The analysis on bias in the estimates of the socio-economic characteristics of our survey samples reports high values for both the CAMI - CATI and the CAMI -CATI survey designs. Graphs 5 and 6 show the percentage point error for the modal categories of the employment status (i.e., inactive people) and education (i.e., lower secondary education). Graph 5 shows the CAMI- CATI vs. CAMI- CATI percentage point error for people in employment.

Graph 5. Percentage point error for inactive people.

Graph 6. Percentage point error for lower secondary education.

Conclusions
We compared the estimates from six telephone and mixedmode surveys with benchmark data and we assessed the sample representativeness. We focused on analyses on voting behaviour, employment status, and education of respondents. The results are consistent with those from our previous work (Bartoli, Respi, and Fornea, 2018), and show that mixing both modes and sampling frame, as in the CAMI- CATI survey design, is a more effective strategy in reducing selection bias. In particular, the following main findings stand out:

1) The CAMI- CATI survey design performs better than the CAMI- CATI one in representing the overall voting behaviour:
2) The magnitude of the largest absolute error is smaller in all the surveys.
3) When looking at the parties selected by the respondents, we identified four main patterns:
   - The CAMI- CATI samples tend to systematically over-estimate people voting Forza Italia;
   - The CAMI- CATI samples tend to systematically under-estimate people voting Movimento 5 Stelle;
   - The CAMI- CATI samples under-represent people voting for the 'Movimento 5 Stelle';
   - There are no differences between the two survey designs when representing people voting Forza Italia.

The 'Movimento 5 Stelle' party does not show a clear pattern in the results from the surveys. We can see that the CAMI -CATI respondents are more likely to be 'Movimento 5 Stelle' voters (except for the survey carried out in September 2018) than the CAMI - CATI interviewers. Moreover, the most recent survey (i.e. January 2019) reports very low (and equal) values of the percentage point difference for both the mixed-mode and the telephone samples.

REFERENCES