

Table S2. Carbon distribution and significance between Site-directed mutants and Combined mutants

| Strains     | to Biomass<br>(C-mol/C-mol galactose) |              |                                   | to Ethanol<br>(C-mol/C-mol galactose) |              |                                  | to Carbon dioxide<br>(C-mol/C-mol galactose) |           | from Oxygen<br>(mol/C-mol galactose for oxygen) |              |
|-------------|---------------------------------------|--------------|-----------------------------------|---------------------------------------|--------------|----------------------------------|--|-----------|---|--------------|
|             | Mean<br>(n=2)                         | STD<br>(n=2) | p-value<br>in t-test<br>(S vs.C)* | Mean<br>(n=2)                         | STD<br>(n=2) | p-value<br>in t-test<br>(S vs.C) | Mean<br>(n=2)                                | STD (n=2) | Mean<br>(n=2)                                   | STD<br>(n=2) |
| <b>5DU</b>  | 0.39                                  | ±0.02        |                                   | 0.16                                  | ±0.02        |                                  | 0.35   | ±0.03     | 0.27  | ±0.03        |
| <b>RAU</b>  | 0.35                                  | ±0.00        |                                   | 0.25                                  | ±0.00        |                                  | 0.27   | ±0.01     | 0.18  | ±0.01        |
| <b>RBU</b>  | 0.33                                  | ±0.02        |                                   | 0.24                                  | ±0.00        |                                  | 0.29   | ±0.02     | 0.20  | ±0.02        |
| <b>EBU</b>  | 0.35                                  | ±0.02        |                                   | 0.15                                  | ±0.00        |                                  | 0.32   | ±0.01     | 0.25  | ±0.00        |
| <b>PGM2</b> | 0.35                                  | ±0.02        |                                   | 0.32                                  | ±0.02        |                                  | 0.27   | ±0.03     | 0.17  | ±0.01        |
| <b>RAP</b>  | 0.46                                  | ±0.02        | <b>0.008</b>                      | 0.22                                  | ±0.00        | <b>0.00</b>                      | 0.34   | ±0.01     | 0.23  | ±0.00        |
| <b>RBP</b>  | 0.42                                  | ±0.03        | <b>0.029</b>                      | 0.23                                  | ±0.00        | <b>0.03</b>                      | 0.29   | ±0.04     | 0.20  | ±0.03        |
| <b>EBP</b>  | 0.44                                  | ±0.02        | <b>0.023</b>                      | 0.20                                  | ±0.01        | <b>0.00</b>                      | 0.28   | ±0.01     | 0.20  | ±0.03        |
| <b>7D</b>   | 0.46                                  | ±0.00        |                                   | 0.13                                  | ±0.01        |                                  | 0.39   | ±0.00     | 0.31  | ±0.00        |
| <b>62A</b>  | 0.47                                  | ±0.01        |                                   | 0.14                                  | ±0.00        |                                  | 0.31   | ±0.01     | 0.23  | ±0.00        |
| <b>62B</b>  | 0.45                                  | ±0.00        |                                   | 0.19                                  | ±0.01        |                                  | 0.29   | ±0.00     | 0.23  | ±0.01        |

\* S means site-directed mutants (RAU, RBU and EBU), C indicates combined mutants (RAP, RBP and EBP).

t-test was done between RAU and RBP, RBU and RBP, EBU and EBP.