Supplementary materials:

- **Supplementary material I: Biomass composition.** File that describes in detail all the measurements and literature data used to define the biomass composition and construct the biomass equation accordingly.
- **Supplementary material II: Fermentation analysis.** This document gives the fermentation data on the amino acids, and details on the catabolism of amino acids via transamination, with valine as the example.
- **Supplementary material III: Metabolic pathway analysis**. This file describes the results of metabolic pathway analysis using elementary flux mode analysis, and the comparison with flux variability analysis. An example of variability in serine catabolism is shown.
- **Supplementary material IV: Model details.** All reactions and their many-to-many associations with proteins and genes are given, together with abbreviations of metabolites and reactions. EC codes are provided if they exist.