Supplementary Table 4:

Equations governing the dynamics of the carbohydrate metabolism:

$$\frac{d}{dt}Gluc = v_1 - v_2 - Gluc \cdot V_{ratio} \tag{5.1}$$

$$\frac{d}{dt}G6P = v_2 - v_3 - v_{10} - G6P \cdot V_{ratio} \tag{5.2}$$

$$\frac{d}{dt}FBP = v_3 - v_4 - FBP \cdot V_{ratio} \tag{5.3}$$

$$\frac{d}{dt}GAP = v_4 + v_5 - v_6 - GAP \cdot V_{ratio} \tag{5.4}$$

$$\frac{d}{dt}DHAP = v_4 - v_5 - v_{11} - DHAP \cdot V_{ratio} \tag{5.5}$$

$$\frac{d}{dt}Pyr = v_6 - v_7 - v_8 - v_9 - Pyr \cdot V_{ratio} \tag{5.6}$$

$$\frac{d}{dt}G3P = v_{11} - v_{12} - G3P \cdot V_{ratio} \tag{5.7}$$

$$\frac{d}{dt}Glyc = v_{12} - v_{13} - Glyc \cdot V_{ratio} \tag{5.8}$$

$$\frac{d}{dt}Glyc_{ex} = \frac{v_{13}}{k_x} \tag{5.9}$$

$$\frac{d}{dt}NADH = v_6 + 4 \cdot v_7 - v_8 - v_{11} - v_{14} + v_{15} - NADH \cdot V_{ratio} \tag{5.10}$$

$$\frac{d}{dt}NAD^+ = -v_6 - 4 \cdot v_7 + v_8 + v_{11} + v_{14} - v_{15} - NAD^+ \cdot V_{ratio} \tag{5.11}$$

$$\frac{d}{dt}ATP = -v_2 - v_3 + 2 \cdot v_6 + v_7 - v_9 - v_{10} + 3 \cdot v_{14} - v_{16} - ATP \cdot V_{ratio} \tag{5.12}$$

$$\frac{d}{dt}ADP = v_2 + v_3 - 2 \cdot v_6 - v_7 + v_9 + v_{10} - 3 \cdot v_{14} + v_{16} - ADP \cdot V_{ratio} \tag{5.13}$$

$$v_1 = \frac{Protein_1}{Protein_1^0} \cdot v_1^0 \tag{5.14}$$

$$v_2 = \frac{Protein_1}{Protein_1^0} \frac{k_2}{\left(1 + \frac{k_{21}}{ATP}\left(1 + \frac{ADP}{k_{22}}\right) + \frac{k_{23}}{Gluc} + \frac{k_{21}}{ATP} \cdot \frac{k_{23}}{Gluc} \cdot \left(1 + \frac{ADP}{k_{22}}\right)\right)} \tag{5.15}$$

$$v_3 = k_3 \cdot \frac{ATP}{(k_{31} + ATP)} \cdot \frac{G6P}{(k_{32} + G6P)} \tag{5.16}$$

$$v_4 = k_4 \cdot \frac{\left(FBP - \frac{GAP \cdot DHAP}{K_{eq,4}}\right)}{\left(k_{FBP,4} + FBP + \frac{k_{DHAP,4} \cdot GAP}{K_{eq,4} \cdot v_{bf,4}} + \frac{k_{GAP,4}}{K_{eq,4} \cdot v_{bf,4}} + \frac{FBP \cdot GAP}{K_{IGAP,4}} + \frac{GAP \cdot DHAP}{K_{eq,4} \cdot v_{bf,4}}\right)} \tag{5.17}$$

$$v_5 = k_5 \cdot \frac{DHAP - \frac{GAP}{K_{eq,5}}}{\left(K_{DHAP,5} \cdot \left(1 + \frac{GAP}{K_{GAP,5}}\right) + DHAP\right)} \tag{5.18}$$

$$v_6 = k_6 \cdot GAP \cdot NAD \cdot ADP \tag{5.19}$$

$$v_7 = k_7 \cdot \frac{ADP \cdot Pyr \cdot NAD}{\left(K_{NAD,7} \cdot Pyr + K_{Pyr,7} \cdot NAD + K_{I,7} \cdot NADH\right)} \tag{5.20}$$

$$v_8 = k_8 \cdot \frac{Pyr}{(k_{81} + Pyr)} \cdot \frac{NAD}{(k_{82} + NAD)} \tag{5.21}$$

$$v_9 = k_9 \cdot \frac{Pyr}{\left(K_{Pyr,9} + Pyr\right)} \cdot \frac{ATP}{\left(K_{ATP,9} + ATP\right)} \tag{5.22}$$

$$v_{10} = k_{10} \cdot \frac{G6P}{\left(K_{G6P,10} + G6P\right)} \cdot \frac{ATP}{\left(K_{ATP,10} + ATP\right)} \tag{5.23}$$

$$v_{11} = \frac{Protein_1}{Protein_1^0} \cdot k_{11} \cdot \frac{DHAP \cdot NADH - \frac{G3P \cdot NAD}{K_{eq,11}}}{\left(1 + \frac{DHAP}{k_{d,11}} + \frac{NADH}{k_{n,11}} + \frac{G3P \cdot NAD}{k_{h,11}}\right)} \tag{5.24}$$

$$v_{12} = \frac{Protein_1}{Protein_1^0} \cdot k_{12} \cdot G3P \tag{5.25}$$

$$v_{13} = k_{13}(t) \cdot \left(Glyc - Glyc_{ex}\right) \tag{5.26}$$

with $k_{13}(t) = k_{13}^0 \cdot \left(\frac{\Pi_t(t)}{\Pi_t^0}\right)^{n_{13}}$ (compare with main text)

$$v_{14} = k_{14} \cdot \frac{NADH \cdot ADP}{\left(K_{ADP,14} + ADP\right)} \tag{5.27}$$

$$v_{15} = k_{15} \cdot NAD \tag{5.28}$$

$$v_{16} = k_{16} \cdot \frac{ATP}{\left(K_{ATP,16} + ATP\right)} \tag{5.29}$$

Parameters

$v_1^0 = 1.296 m\mathrm{M} \cdot \mathrm{s}^{-1}$

$k_2 = 1.777 m\mathrm{M} \cdot \mathrm{s}^{-1}$	$k_{21} = 0.2 m\mathrm{M}$	$k_{22} = 1.2 m\mathrm{M}$	$k_{23} = 0.2 m\mathrm{M}$
$k_3 = 0.895 m\mathrm{M} \cdot \mathrm{s}^{-1}$	$k_{31} = 0.01 m\mathrm{M}$	$k_{32} = 0.012 m\mathrm{M}$	
$k_4 = 1.8764 \cdot 10^3 m\mathrm{M} \cdot \mathrm{s}^{-1}$	$K_{eq,4} = 0.81 m\mathrm{M}$	$k_{FBP,4} = 0.054 m\mathrm{M}$	
	$k_{DHAP,4} = 2.0 m\mathrm{M}$	$k_{GAP,4} = 2.0 m\mathrm{M}$	
	$v_{bf,4} = 5.0 m\mathrm{M}^{-1}$	$K_{IGAP,4} = 10.0 m\mathrm{M}$	
$k_5 = 190 m\mathrm{M} \cdot \mathrm{s}^{-1}$	$K_{eq,5} = 0.045$	$K_{DHAP,5} = 0.38 m\mathrm{M}$	
	$K_{GAP,5} = 0.064 m\mathrm{M}$		
$k_6 = 45.127 m\mathrm{M}^{-2} s^{-1}$			
$k_7 = 639.137\ \mathrm{s}^{-1}$	$K_{Pyr,7} = 70.0 m\mathrm{M}$	$K_{NAD,7} = 160.0 m\mathrm{M}$	
	$K_{I,7} = 20.0 m\mathrm{M}$		
$k_8 = 5.6425 m\mathrm{M} \cdot \mathrm{s}^{-1}$	$k_{81} = 1.2 m\mathrm{M}$	$k_{82} = 0.6 m\mathrm{M}$	
$k_9 = 0.8090 m\mathrm{M} \cdot \mathrm{s}^{-1}$	$K_{Pyr,9} = 0.92 m\mathrm{M}$	$K_{ATP,9} = 13.2 m\mathrm{M}$	
$k_{10} = 1.9377 m\mathrm{M} \cdot \mathrm{s}^{-1}$	$K_{G6P,10} = 2.7 m\mathrm{M}$	$K_{ATP,10} = 0.4 m\mathrm{M}$	
$k_{11} = 7.1507 \left(m\mathrm{M} \cdot \mathrm{s}\right)^{-1}$	$k_{d,11} = 0.0037 m\mathrm{M}$	$k_{n,11} = 0.6 m\mathrm{M}$	
	$k_{h,11} = 0.2 m\mathrm{M}$	$K_{eq,11} = 37$	
$k_{12} = 0.0162\ \mathrm{s}^{-1}$			
$k_{13}^0 = 0.005\ \mathrm{s}^{-1}$	$k_x = 6.67 \cdot 10^{-10}$	$n_{13} = 4$	
$k_{14} = 384.024\ \mathrm{s}^{-1}$	$K_{ADP,14} = 0.42 m\mathrm{M}$		
$k_{15} = 1.1235\ \mathrm{s}^{-1}$			
$k_{16} = 99.887 m\mathrm{M} \cdot \mathrm{s}^{-1}$	$K_{ATP,16} = 5.0 m\mathrm{M}$		

Initial concentration values

$Gluc^0 = 1mM$

$G6P^0 = 0.93mM$

$FBP^0 = 0.11mM$

$GAP^0 = 0.063mM$

$DHAP^0 = 1.41mM$

$Pyr^0 = 0.79mM$

$G3P^0 = 0.063mM$

$Glyc_{in}^0 = 0.2mM$

$Glyc_{ex}^0 = 0.2mM$

$NADH^0 = 0.04mM$

$NAD^0 = 1.03mM$

$ATP^0 = 2.1mM$

$ADP^0 = 0.6mM$