Supplementary Figure 1

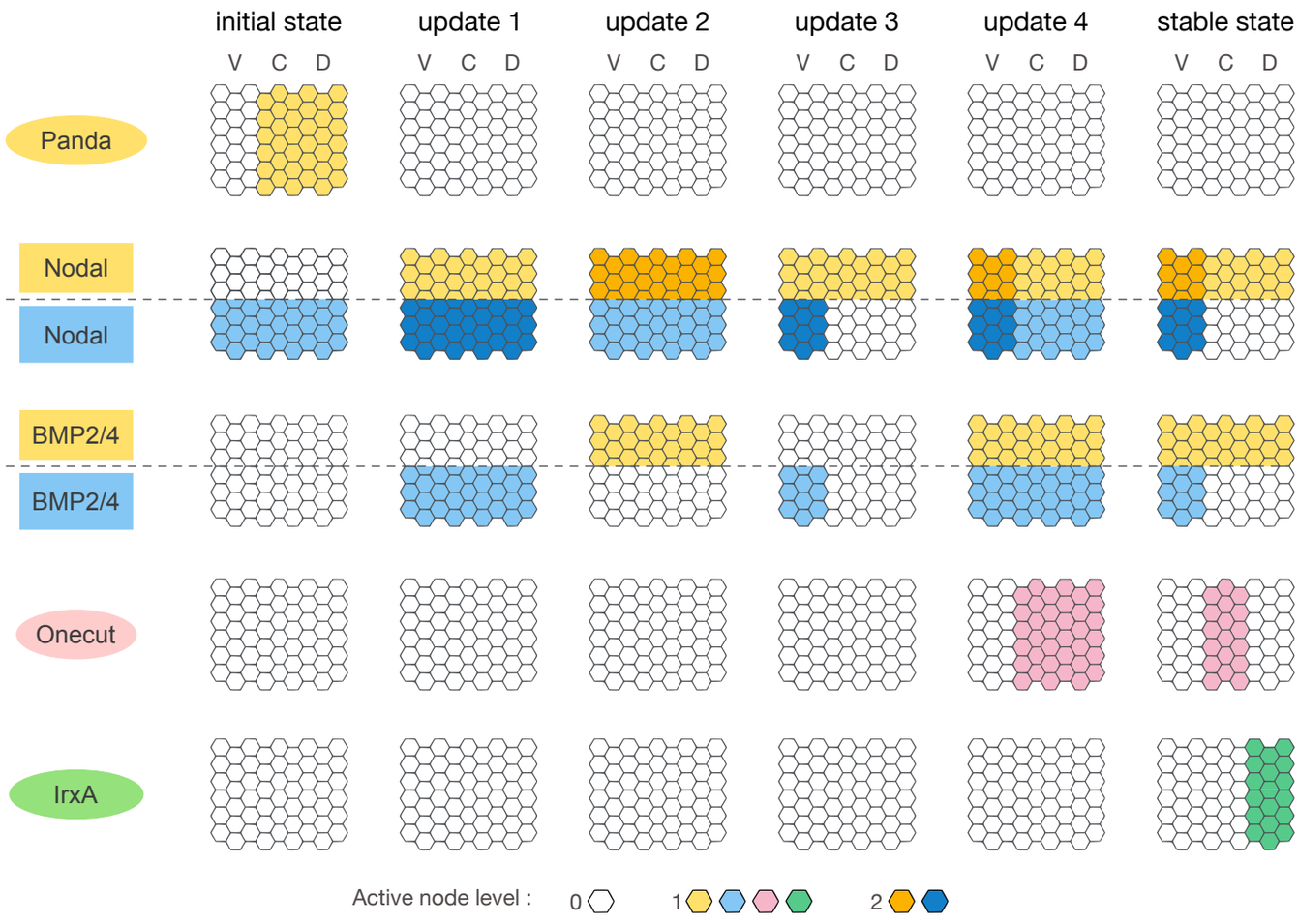

Figure S1. Intermediary states reached during wild-type simulation with EpiLog.
Starting from the initial state (left) with Nodal ubiquitously expressed and Panda activity restricted to the ciliary and dorsal presumptive territories, the EpiLog simulation of the wild-type condition first predicts a transient expression of *nodal* in the whole ectoderm (Nodal output node in dark and light blue), which is then restricted to the ventral region in the stable state (right), although Nodal proteins still diffuse toward the dorsal region (Nodal input node in yellow). In parallel, the *bmp2/4* expression becomes restricted to the ventral side (BMP2/4 output node in blue) and BMP2/4 protein diffuses toward the dorsal region (BMP2/4 input node in yellow). The activity dynamics of the two markers genes *onecut* (pink, ciliary) and *irxA* (green, dorsal) denotes the progressive restriction of the ciliary band in the central region, as both Nodal and BMP2/4 cascades take place in the ventral and dorsal territories. For the multilevel node Nodal, higher activity levels are depicted by darker colours.

Supplementary Figure 2

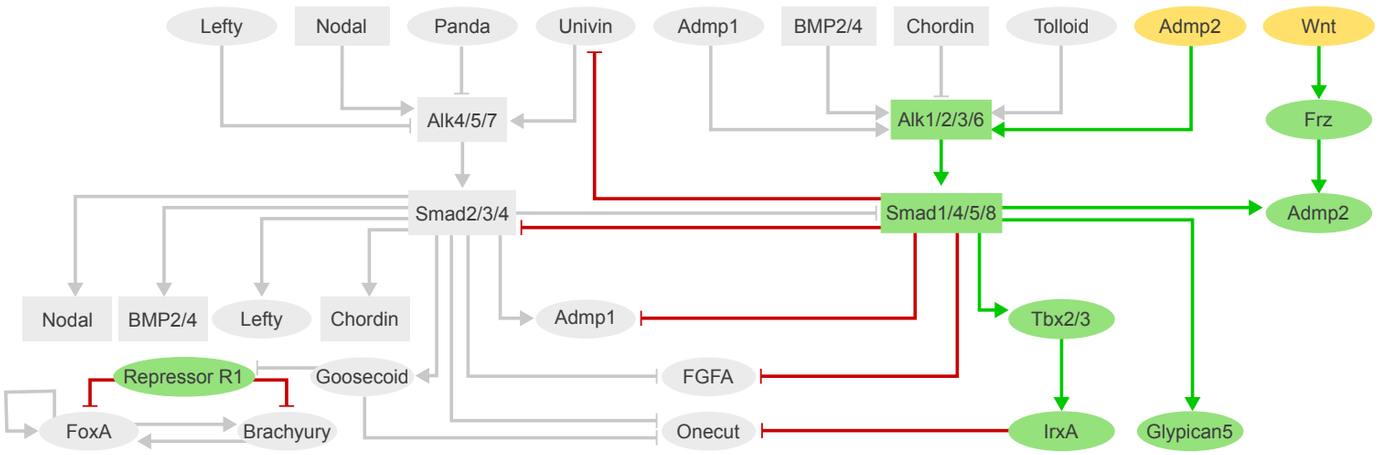

Figure S2. Stable states corresponding to the boundary ectoderm in the unicellular model. The stable state obtained with the unicellular model when considering Admp2 and Wnt inputs active is displayed on the regulatory graph (Fig. 3). Active nodes (yellow for inputs and green for dorsal nodes) and edges (green for activation and red for inhibition) are shown in colour, inactive ones are shown in grey. This stable state corresponds to the dorsal stable state shown in Figure 6.

Supplementary Figure 3

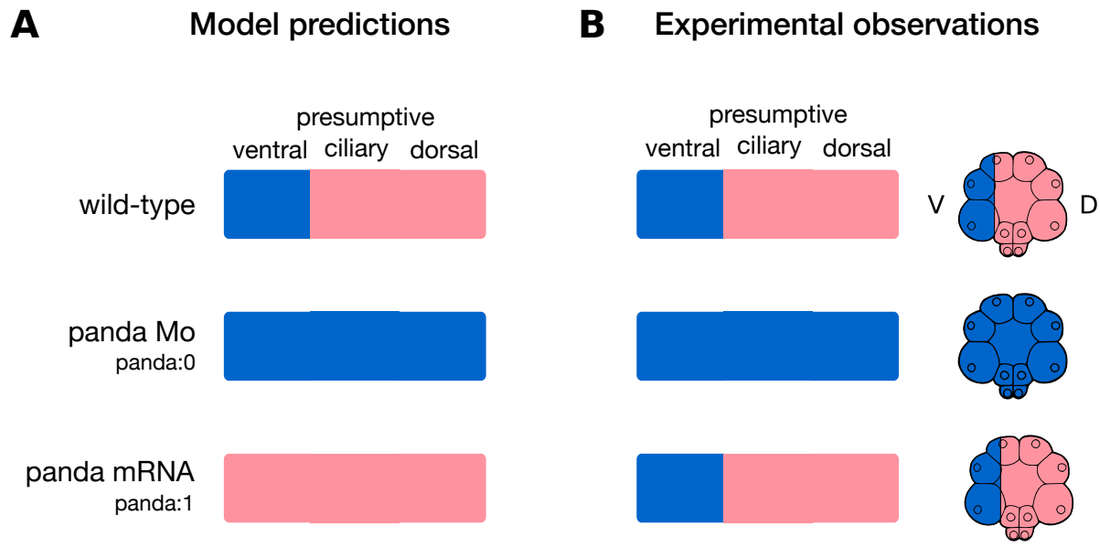

Figure S3. Simulation of *panda* perturbations at the 32-cell stage.

Starting with a restricted combination of inputs with Nodal and Panda, we simulated the 32-cell stage D/V patterning using the unicellular model. In wild-type condition, model predictions (A) correctly recapitulate experimental observations (B). It is also the case for the simulation of Panda loss-of function, mirroring the fully ventralised phenotype observed upon *panda* Mo injection. Simulations of *panda* overexpression fully abrogate ventral specification and result in a global ciliary phenotype (A), whereas experimental evidences show no impact of global overexpression of *panda* on the onset of D/V patterning (Haillot et al., 2015) (B).

Table S1. Annotations for the components of the unicellular model.

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