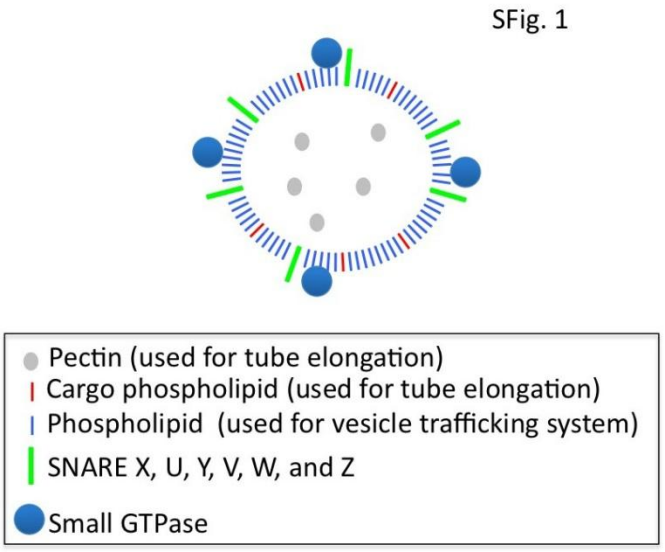
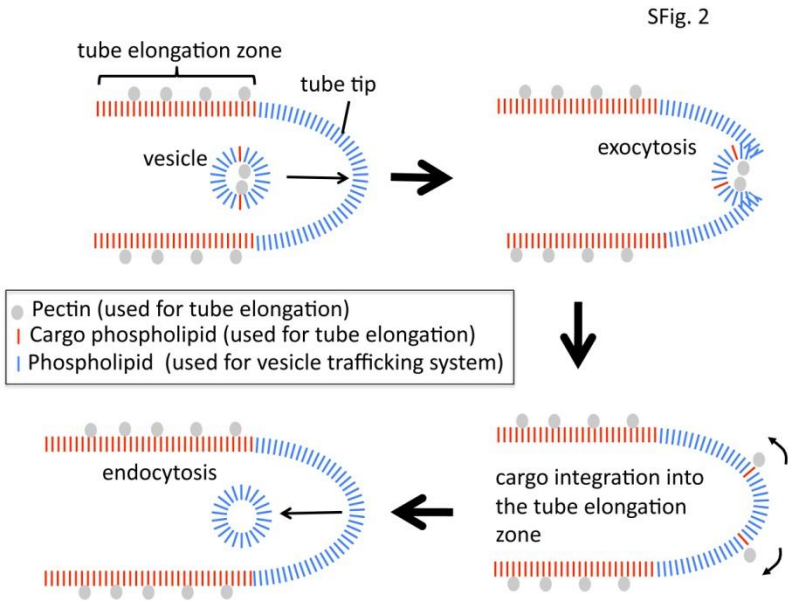
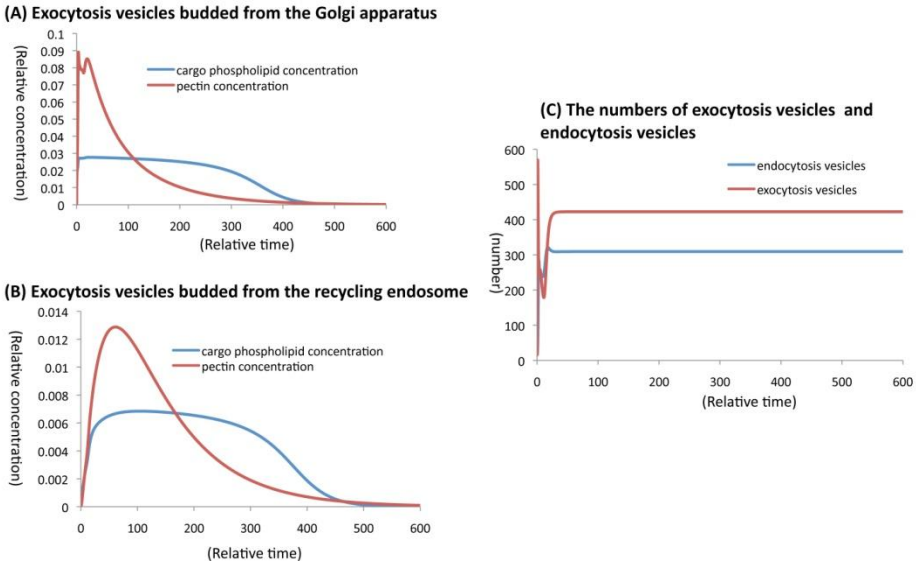


Supplemental Figure 1 Vesicle composition in the mathematical model. Small GTPase defines the destination of the vesicle. SNAREs X, U, Y, V, W, and Z are used to fuse the vesicle at the destination compartment. Pectin and cargo phospholipids are carried by the vesicle. They are used to elongate the pollen tube when the vesicle fuses at the tube tip.



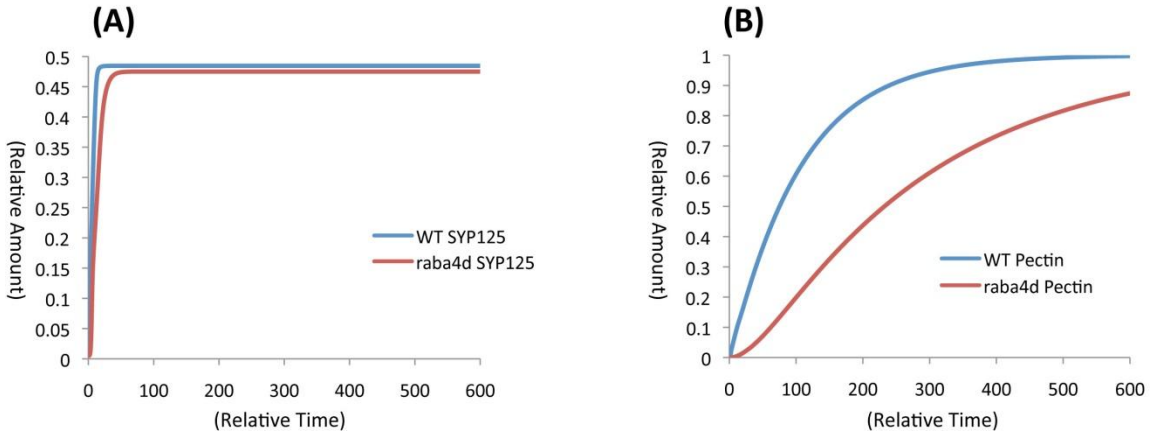
Supplemental Figure 2 Exocytosis and endocytosis at the tube tip in the mathematical model. Small GTPase and SNAREs are not described for simplification. Pectin and cargo phospholipids are carried by a same vesicle. The amounts of pectin and cargo phospholipids carried by vesicles are different depending on the compartment (the Golgi apparatus or recycling endosome) and the time point after pollen germination. When exocytosis occurs at the tube tip, pectin and cargo phospholipids are automatically integrated into the side of the tube. When endocytosis occurs at the tube tip, a vesicle does not contain pectin and cargo phospholipids. Although endocytosis and exocytosis occur spontaneously in the model, these events are separately described in the figure for simplification.

SFig. 3



Supplemental Figure 3 Changes of the concentrations of pectin and cargo phospholipids in exocytosis vesicles in the mathematical model. (A) Relative concentrations of pectin and cargo phospholipids in vesicles budded from the Golgi apparatus were computed. Notice that the concentrations change with a function of time. **(B)** Relative concentrations of pectin and cargo phospholipids in vesicles budded from the recycling endosome were computed. Notice that the concentrations change with a function of time. Also notice that the concentrations are about 10-fold lower than that budded from the Golgi apparatus. **(C)** The numbers of exocytosis vesicles and edocytosis vesicles were computed. The number of exocytosis vesicles is the sum of the vesicle numbers initiated by GTPase B and that by GTPase C. The number of endocytosis vesicles is the sum of the vesicle numbers initiated by GTPase A and that by GTPase D. Notice that the ratio of exocytosis vesicles to endocytosis vesicles is always about 4/3 at the equilibrium of the vesicle trafficking system, suggesting the exocytosis occurs more often than endocytosis at the tube tip in the majority of the time during tube elongation in the model.

SFig. 4



Supplemental Figure 4 Computational predictions of SYP125 and pectin localizations in wild type and *raba4d* knockout Arabidopsis. Changes in amounts of SYP125 and pectin were computed as a function of time. The calculations were done by changing parameters so that a mathematical function of GTPase B (wb=1, 1/kxb=1/kub=1/kpb=0.01, and 1/kyb=1/kvb=1/kzb=1/kwb=1) is halted (wb=0, and 1/kxb=1/kub=1/kyb=1/kvb=1/kzb=1/kwb=1/kpb=0) in a *raba4d* mutant pollen. **(A)** Changes of SYP125 amount in the tube tip. **(B)** Changes of pectin amounts in the tube tip. The computational results indicate that SYP125is rapidly transported in the tube tip in both *raba4d* and wild type pollen, but the transport of pectin is much slower in *raba4d* pollen than a wild type pollen.