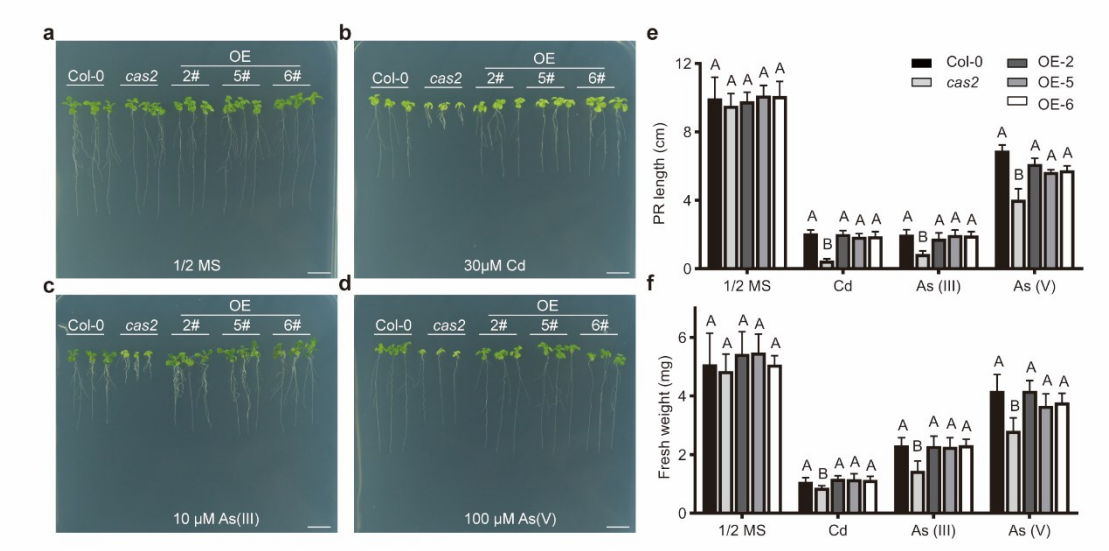
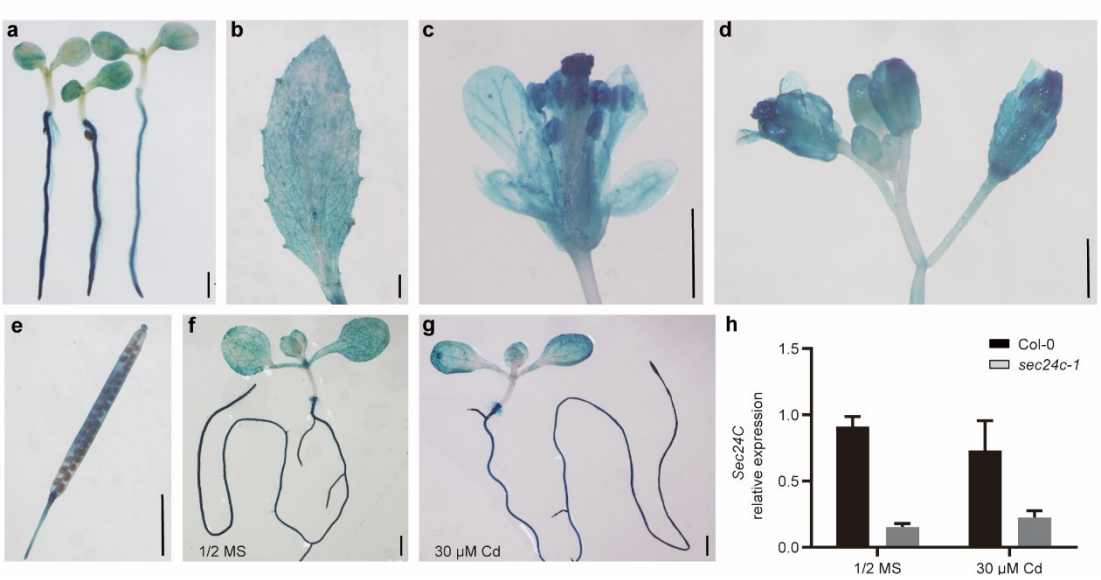
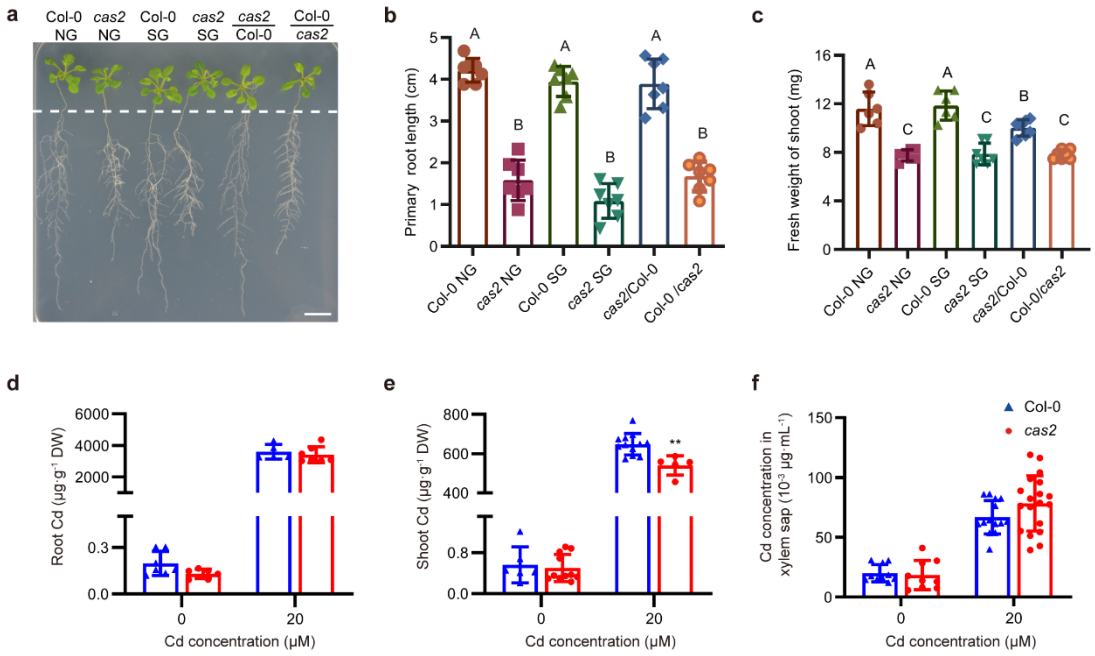


Extended Data Fig. 1 | Phenotypes of *Sec24C* overexpression lines. a-d, Phenotypes of two-week-old Col-0, *cas2* and OE lines (OE 2#, 5# and 6#) grown on 1/2-strength MS media only (**a**) or 1/2-strength MS media supplemented with 30 μM $CdCl_2$ (**b**), 10 μM As(III) (**c**), or 100 μM As(V) (**d**). **e-f**, Statistical analysis of the primary root length (**e**) and fresh weight (**f**) of seedlings in **a-d**. The data represent means ± SDs (n = 21–36 for fresh weight analysis, and n = 13–67 for primary root length measurements). The different letters above the bars indicate significant differences at $P < 0.01$ (one-way ANOVA with Tukey's HSD test). Scale bars, 1 cm.



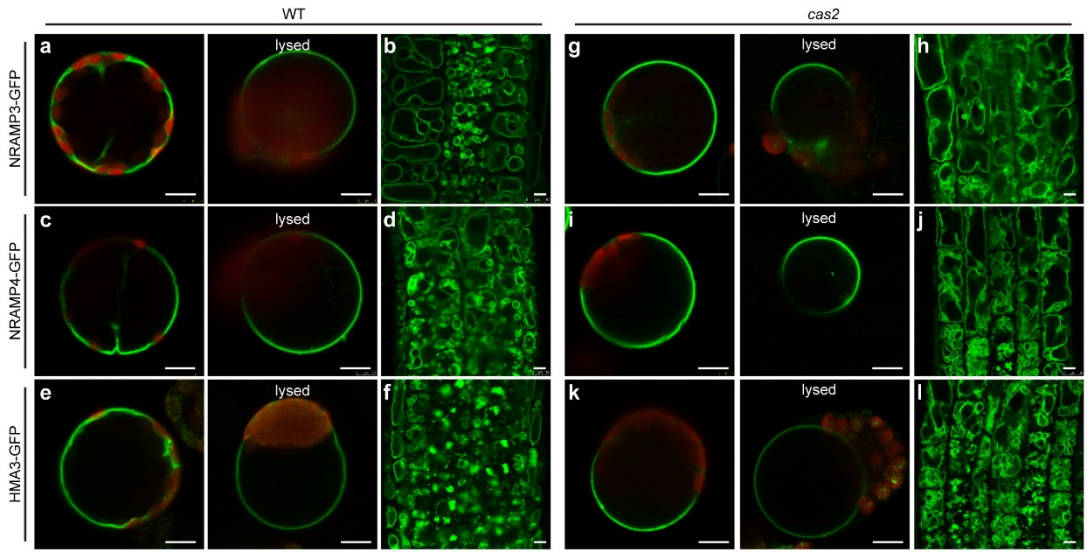
Extended Data Fig. 2 | Expression pattern of *Sec24C* in *A. thaliana*.

a-e, Expression pattern of *Sec24C* in young seedlings (**a**), rosette leaves (**b**), young flowers (**c**), inflorescences (**d**), and young siliques (**e**). **f-g**, Expression patterns of *AtSec24C* under normal conditions (**f**) and Cd treatment (**g**). **h**, Expression level of *Sec24C* in 2-week-old Col-0 and *sec24c-1* seedlings grown on 1/2-strength MS media with or without 30 μM $CdCl_2$. Whole seedlings were used for RNA extraction and real-time PCR, and the ubiquitin gene was used as the internal standard. The data represent the means ± SDs (n = 4–8). Scale bars, 1 mm.



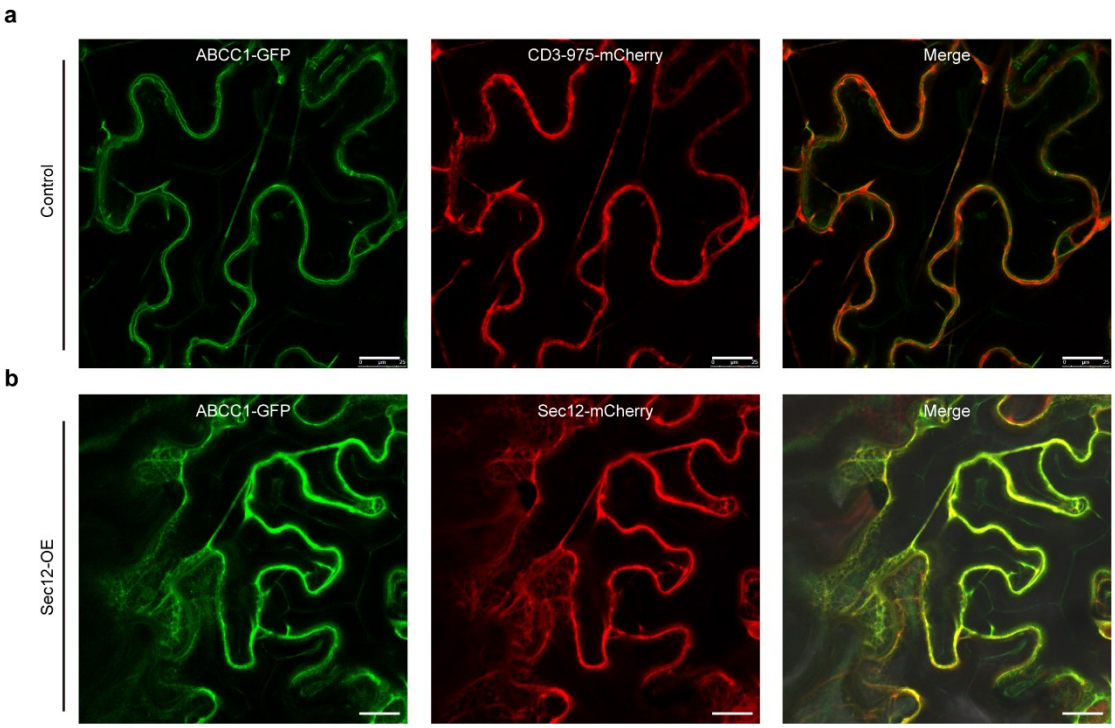
Extended Data Fig. 3 | Sec24C does not affect Cd uptake or long-distance transport.

a, Growth phenotype of representative three-week-old grafted Col-0 and *cas2* seedlings under Cd-exposure conditions (30 μM $CdCl_2$). NG, non-grafted seedlings; SG, self-grafted seedlings; *cas2*/Col-0, grafted plants with *cas2* shoots and Col-0 roots; Col-0/*cas2*, grafted plants with Col-0 shoots and *cas2* roots. **b**,**c**, Statistical analysis of the primary root length (**b**) and fresh weight of shoots (**c**) of seedlings shown in **a** (n = 7). The different letters represent significant differences at $P < 0.01$ (one-way ANOVA followed by Tukey's test corrections for multiple comparisons). **d**-**e**, Cd contents in the roots (**d**) and shoots (**e**) of Col-0 and *cas2*. The plants were grown under normal hydroponic culture for 3 weeks and then treated with 20 μM $CdCl_2$ for 4 days (n = 6). **f**, Concentrations of Cd in the xylem sap of 32-day-old Col-0 and *cas2* seedlings grown on normal soil or soil supplied with 20 μM Cd (n = 9–19). Scale bars, 1 cm.



Extended Data Fig. 4 | Loss of function of *Sec24C* does not affect tonoplast localization of NRAMP3, NRAMP4 or HMA3.

a-f, Subcellular localization of NRAMP3 (**a**,**b**), NRAMP4 (**c**,**d**), and HMA3 (**e**,**f**) with C-terminal-fused GFP in intact protoplasts (left panel), osmotic lysed protoplasts (middle panel) and root cortical cells (right panel) of Col-0. **g-l**, Subcellular localization of NRAMP3 (**g**,**h**), NRAMP4 (**i**,**j**), and HMA3 (**k**,**l**) in intact protoplasts (left panel), osmotic lysed protoplasts (middle panel) and root cortical cells (right panel) of the *cas2* mutant. Images were obtained by confocal laser scanning micrograph with GFP shown in green, and the chlorophyll autofluorescence shown in red. Bars, 5 μm.



Extended Data Fig. 5 | Exiting of ABCC1 from the ER requires the COPII complex.

a, **b**, Localization of ABCC1-GFP in tobacco leaves when co-infiltrated with tonoplast marker CD3-975-mCherry (**a**) or Sec12-mCherry vector (**b**). The green channel shows the GFP signal (left panels), the red channel shows the mCherry signal (middle panels), and the merged images are shown in the right panels. Bars, 10 μm.