Supplementary Figure Legends

Figure S1. Example of intrinsic signal targeting of D-row columns.
(A) Image of blood vessel pattern overlying barrel cortex acquired through thinned skull. Vasculature images are collected under illumination with green light.
(B) Normalized reflectance change images averaged over multiple trials. The brain was illuminated with red light, and images acquired at 5 Hz. Two seconds after the start of the trial, the whisker (D2 in this example) was deflected 10 times at 5 Hz. The dark spot corresponds to decreased reflection of light (relative to pre-stimulus baseline) due to changes in hemoglobin oxygenation, blood volume and light scattering. Top left frame is the start of the trial. Time proceeds rightwards across this row, then across the second row, and so on.
(C) An 80% contour line denoting region of maximal signal change in B is overlaid onto vasculature image from panel A. Surface blood vessels can be used by the experimenter to target placement of the craniotomy.
(D) Average image 1 second before stimulus onset (5^{th} frame in panel B).
(E) Average image 2 seconds following stimulus onset (20^{th} frame in panel B).
(F) Time course of average reflectance change within the region of interest indicated in panel C.

Figure S2. Gallery of L2/3 components of axons in control animals in tangential projections. *Red*, axon. *Blue*, dendrite. *Grey*, barrel field. *Number*, cell identification numbers.

Figure S3. Gallery of L2/3 components of axons in deprived animals as in Fig. S2.

Figure S4. Gallery of L4-6 components of axons in control animals as in Fig. S2.

Figure S5. Gallery of L4-6 components of axons in deprived animals as in Fig. S2.

Figure S6. Distributions of mean axonal segment length (distance between branch points) for (A) L2/3 and (B) L4-6. Data points have been horizontally jittered for visualization. *Filled*, axons filled in control animals; *open*, axons filled in trimmed animals; *lines*, group medians.