**Large scale spatio-temporal patterns of road development in the Amazon rainforest**

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**APPENDIX 1**

**Experimentation with different functional transformations in equations 5–8 in the main text**

We considered three different functions for use in Equations 5–8 in the main text, representing different hypotheses about the relationship between the difference in neighbourhood density and the size of the neighbourhood effect. Here we denote these as $F\left(y\right)$, where $F\left(y\right) = exp⁡(y)$ is the functional transformation used in the main text because that functional form performed marginally better based on our range of performance metrics. These alternatives are illustrated in Figure S1. The first is trivially ‘no transformation’, of the form $F\left(y\right) = y$. The second is an exponential function of the form $F\left(y\right) = exp⁡(y)$. The third is a saturating function of the form$ F\left(y\right) = y/(φ+y)$ where $φ$ is a half saturation constant.

Assuming different functional forms for Equations 5-8 using different functional transformations illustrates that the different equations with different functional forms predict similar magnitudes of neighbourhood effects (Fig. S1), with the most notable difference being the inference of a positive threshold at which neighbourhood effects occur, τ, for the neighbourhood effects models that lack the additional multiplication factor of the local road density (Eqs 4 and 5, red and green lines in Fig.S1). However, note that these differences in functional forms only have minor effects on predictive performance. These results indicate that the larger the net difference between two neighbours, the larger the neighbourhood effect is on the neighbour with the lower road density

**Figure S1** Mean dispersal effects graphs for four neighbour models (Eqs 4–7 with exponential, linear or saturating functional forms) with 95% confidence intervals (grey bands). Note, dispersal effect magnitude change between dispersal types. Lines: red = NEm1, green = NEm2, dark blue = NEm3, light blue = NEm4.

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**Figure S2** Parameter estimation from the wave model for four parameters, at two scales: (1) Amazon wide and (2) quadrants (NW, NE, SW and SE) that correspond to the quadrants displayed in Figure 2 in the main text. Mean parameter estimates and 95% confidence intervals are displayed. R = rate of road density change (km km–2 yr–1), c = speed of wave (km yr–1), Angle = angle of the travelling wave relative to north (degrees), K = maximum road density behind wave (km km–2).