On the existence of quasi-self-similar solutions of
the weakly shear-thinning equation

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We consider the spreading of a thin droplet of viscous liquid on a plane
surface driven by capillarity alone in the complete wetting regime. In the
case of constant viscosity, the no-slip condition leads to a force singularity
at advancing contact lines. It is well known nowadays that the introduction
of appropriate slip conditions removes this paradox. Here, we investigate
a different approach, which consists in keeping the no-slip condition and
assuming instead a shear-thinning rheology. This relaxation leads, in lu-
brication approximation, to fourth order degenerate parabolic equations of
quasilinear type. We obtain results on the existence of quasi-self-similar
solutions to these equations in the limit of Newtonian rheology.