



**Supplementary Fig. S3** Standardized coefficient direct, indirect and total effects derived from the PLS-PMs of soil  $\text{N}_2\text{O}/(\text{N}_2\text{O}+\text{N}_2)$  ratio in all sampling sites at regional scale (A), and at sb-regional scale LP (B), IMP (C) and XP (D). LP- Loess Plateau, IMP- Inner Mongolia Plateau, XP- Xizang Plateau.