Upon absorption of a UV photon, nitrobenzene can dissociate into C₆H₅O and NO through two different mechanisms. Evidence for these mechanisms was obtained from velocity map imaging (VMI) studies and theoretical calculations.⁴ VMI experiments showed NO produced with two distinct rotational distributions, which the calculations explained as a fast and a slow channel for NO production. We have recorded high resolution fluorescence excitation spectra of the NO resulting from photo-fragmented nitrobenzene using a pulsed picosecond tunable laser (pulse width ≈ 15 ps) by means of a two-color process. In the two-color process, photons of a particular energy dissociated the nitrobenzene while photons of a different energy probed the A²Σ⁺ ← X²Π₁/₂,3/₂) NO band system between 225-260 nm. This laser system allowed us to vary the delay between the photolysis and excitation pulses. At longer delays (>1 ns), we observed an increase in the population of NO, which may be evidence that at least two photolysis channels produce NO. We present the spectra we recorded at various photolysis/probe delays ranging from 0.025 to 1.5 ns. The spectral subtraction method we used to observe the production increase is introduced.