Dynamical Quasicondensation of Hard-Core Bosons at Finite Momenta: A Non-equilibrium Condensation Effect\footnote{Supported by the DFG via FOR 801.} Fabian Heidrich-Meisner, LMU Munich, L. Vidmar, Penn State University, J.P. Ronzheimer, S. Hodgman, M. Schreiber, S. Braun, LMU Munich & MPQ Garching, S. Langer, Pittsburgh University, I. Bloch, LMU Munich & MPQ Garching, U. Schneider, University of Cambridge, LMU Munich & MPQ Garching — Long-range order in quantum many-body systems is usually associated with equilibrium situations. Here, we experimentally investigate the quasicondensation of strongly interacting bosons at finite momenta in a far-from-equilibrium case \cite{1}. We prepare an inhomogeneous initial state consisting of one-dimensional Mott insulators in the center of otherwise empty one-dimensional chains in an optical lattice with a lattice constant $d$. After suddenly quenching the trapping potential to zero, we observe the onset of coherence in spontaneously forming quasicondensates in the lattice. Remarkably, the emerging phase order differs from the ground-state order and is characterized by peaks at finite momenta $\pm (\pi/2)(\hbar/d)$ in the momentum distribution function. \cite{1} Vidmar et al., Phys. Rev. Lett. 115, 175301 (2015)