Analysis of possible join orders for Borrower |X| BookAuthor |X| Checkout

Assumptions:

$n(Borrower) = 2000$ $V(borrowerID, Borrower) = 2000$ (since a superkey)
$n(BookAuthor) = 10{,}000$ $V(callNumber, BookAuthor) = 5000$ (assumed)
$n(Checkout) = 1000$ $V(borrowerID, Checkout) = 100$ (assumed)
                              $V(callNumber, Checkout) = 500$ (assumed)
                              - $V(borrowerID+callNumber, Checkout) =$
                                 $500 * 100 = 50{,}000$

Analysis of (Borrower |X| BookAuthor) |X| Checkout
 - A temporary table (t) is created for Borrower |X| BookAuthor:
   - Cartesian product $n_t = 2000 * 10{,}0000 = 20{,}000{,}000$
                           $V(borrowerID, t) = 2000$ (all come from Borrower)
                           $V(callNumber, t) = 5000$ (all come from BookAuthor)
                           - $V(borrowerID + callNumber, t) =$
                           $2000 * 5000 = 10{,}000{,}000$
 - Result table from second join (r) = t |X| Checkout
   - join on BorrowerID + callNumber
   $n_r = 20{,}000{,}000 * 1000 / \max(50{,}000, 10{,}000{,}000) = 2000$

Analysis of Borrower |X| (BookAuthor) |X| Checkout)
 - A temporary table (t) is created for BookAuthor |X| Checkout
   - Join on callNumber: $n_t = 10{,}000 * 1000 / \max(5000, 500) = 2000$
                          $V(borrowerID, t) = 100$ (all come from Checkout)
   Result table from second join (r) = Borrower |X| t
   - join on BorrowerID
   $n_r = 2000 * 2000 / \max(2000, 100) = 2000$

Analysis of (Borrower |X| Checkout) |X| BookAuthor
 - A temporary table (t) is created for Borrower |X| Checkout
   - Join on borrowerID: $n_t = 2000 * 1000 / \max(2000, 100) = 1000$
                          $V(callNumber, t) = 500$ (all come from Checkout)
   Result table from second join (r) = t |X| BookAuthor
   - join on callNumber
   $n_r = 1000 * 10{,}000 / \max(500, 5000) = 2000$

All three orders estimate the same size result table (which should be the case), but the third order produces a smaller temporary table so we prefer that!