

Figure S1. $Inv^L/E:N^H$ cells preferentially exhibit collective, epithelial migration compared to $Inv^H/E:N^L$, especially on soft substrates. (top) Brightfield microscopy demonstrating cell morphology for $Inv^L/E:N^H$ and $Inv^H/E:N^L$ cells after being cultured on soft and stiff substrates for two days. (bottom) Plot indicates the frequency of single cell or clustered migration. Numbers in parentheses indicate the number of cells in each analysis.

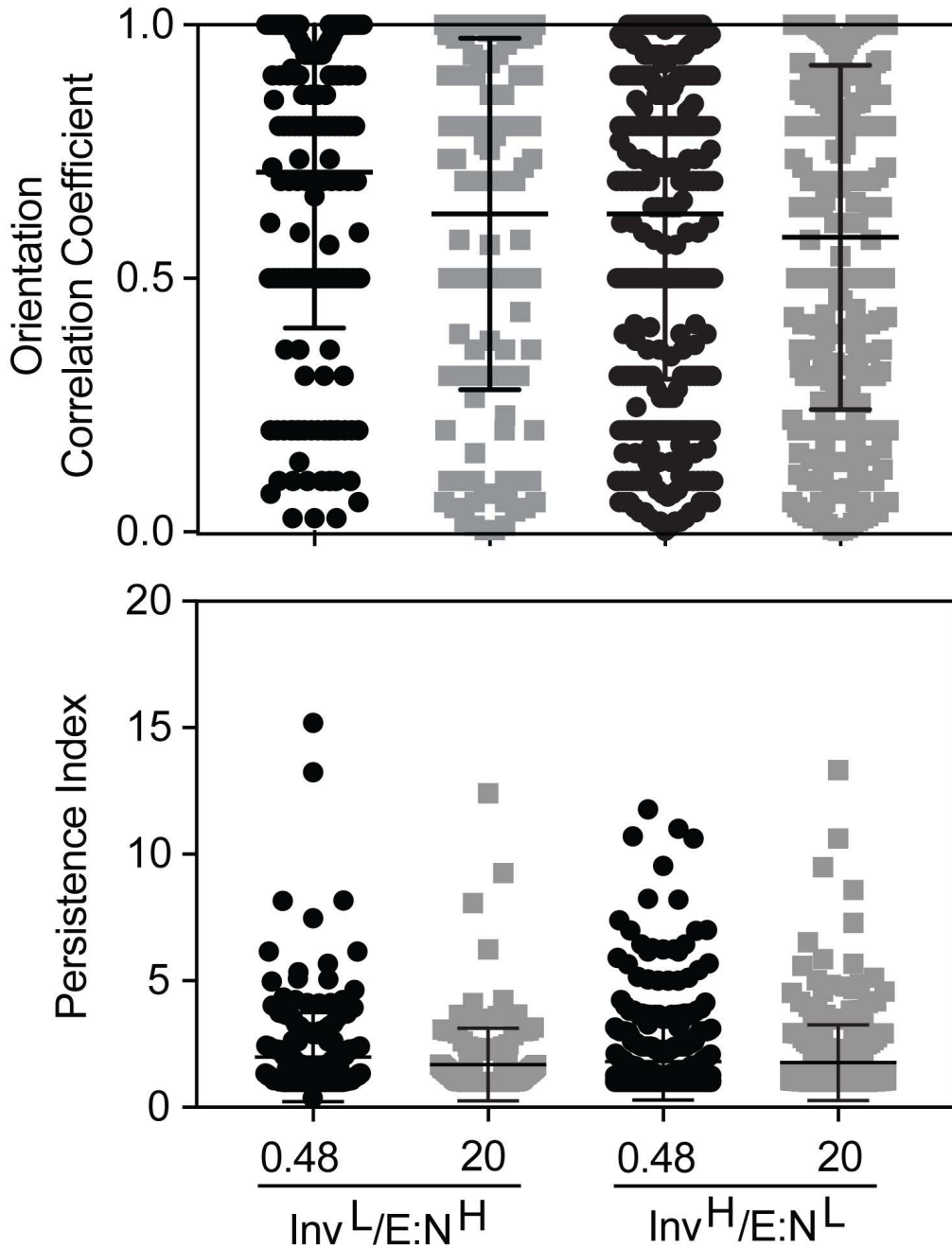


Figure S2. Migration Analyses. (top) Orientation correlation coefficient, i.e. $0.5 \cdot (\cos(2\theta) + 1)$, is plotted for $Inv^L/E:N^H$ and $Inv^H/E:N^L$ single cells migrating on the indicated substrates using a time step of 1 hour between cell vectors. $n = 207, 135, 442,$ and 284 for each group (left to right) counting individual angles over triplicate experiments. (bottom) Plot indicates migration persistence via a ratio of total migration path length divided by total displacement. Data is shown for $Inv^L/E:N^H$ and $Inv^H/E:N^L$ single cells migrating on the indicated substrates. $n = 207, 135, 442,$ and 284 paths analyzed for each group.

Table S1: Patient Demographic Information

Patient data is shown for all tumors examined in Figure 6. Dates are shown in the MM/DD/YY format. Note that patient data was retrieved on 08/01/18. Cancer stage is classified according to the Eight Edition Cancer Staging Manual of the American Joint Committee on Cancer. Cancer stage is classified according to clinical and pathologic characteristics of the tumor (T) and lymph nodes metastasis (N)⁶¹. The first number corresponds to the tumor stage and second to the lymph node. Note that for the latter number, zero denotes no metastases detected in the node.

| Patient ID | Sex | Date of birth | Tumor Resection Date | Tumor Recurrence or End of Clinical Records Date | Cancer Stage |
|------------|-----|---------------|----------------------|--|--------------|
| A601746 | F | 7/4/34 | 01/09/12 | 04/05/18 | T2N0 |
| A608766 | F | 6/24/26 | 03/06/12 | 12/12/13 | T2N0 |
| A609290 | M | 8/19/65 | 03/09/12 | 03/15/13 | T2N0 |
| A611141 | F | 1/28/28 | 03/23/12 | 07/24/12 | T3N2b |
| A615386 | M | 6/24/71 | 04/25/12 | 10/25/12 | T3N0 |
| A621413 | F | 6/21/48 | 06/09/12 | 08/01/18 | T2N0 |
| A623667 | F | 3/9/44 | 06/26/12 | 02/15/18 | T3N0 |
| A625701 | F | 8/25/51 | 07/10/12 | 08/04/15 | T1N0 |
| A629186 | F | 4/6/47 | 08/03/12 | 07/20/18 | T2N0 |
| A632028 | F | 6/15/43 | 08/23/12 | 08/01/18 | T3N0 |
| A634944 | M | 8/20/50 | 09/14/12 | 07/19/17 | T3N0 |
| A643839 | F | 8/19/55 | 11/22/12 | 01/25/13 | T3N0 |
| A650695 | M | 1/4/52 | 01/21/13 | 08/01/18 | T2N0 |
| A655663 | M | 12/13/65 | 03/02/13 | 11/01/13 | T3N3b |
| A656900 | M | 11/13/50 | 03/12/13 | 07/05/13 | T3N0 |
| A682347 | M | 11/2/59 | 09/11/13 | 01/17/17 | T1N0 |
| A683808 | F | 11/15/58 | 09/23/13 | 04/08/14 | T3N2b |
| A696349 | F | 6/25/33 | 12/17/13 | 03/07/18 | T2N0 |
| A704061 | M | 4/21/59 | 02/21/14 | 03/22/18 | T2N0 |
| A705137 | F | 1/7/55 | 03/05/14 | 03/22/15 | T3N0 |
| A705225 | F | 9/24/58 | 03/05/14 | 09/16/14 | T3N2b |
| A 729110 | M | 8/8/51 | 08/19/14 | 11/01/14 | T3N0 |
| A731358 | M | 11/29/55 | 09/03/14 | 04/27/18 | T3N1 |
| A731691 | M | 7/20/43 | 09/05/14 | 07/05/18 | T1N0 |
| A744266 | M | 1/30/59 | 11/26/14 | 08/01/18 | T1N2b |
| A745066 | F | 11/23/35 | 12/02/14 | 06/18/18 | T2N0 |
| A664542 | M | 8/26/60 | 05/07/13 | 03/23/16 | T1N0 |
| A667482 | F | 6/15/37 | 05/28/13 | 11/19/13 | T3N2b |
| A711885 | M | 12/24/41 | 04/22/14 | 06/26/14 | T3N0 |