

unpaired two-tail t-test statistical analysis was used to obtain level of significance between different experiment conditions.

### **Supplementary References**

- 31 Debnath, J. *et al.* The role of apoptosis in creating and maintaining luminal space within normal and oncogene-expressing mammary acini. *Cell* **111**, 29-40, (2002).
- 32 Schafer, Z. T. *et al.* Antioxidant and oncogene rescue of metabolic defects caused by loss of matrix attachment. *Nature* **461**, 109-113, (2009).
- 33 Gunawardane, R. N. *et al.* Novel role for PDEF in epithelial cell migration and invasion. *Cancer Res* **65**, 11572-11580, (2005).
- 34 Xiang, B. & Muthuswamy, S. K. Using three-dimensional acinar structures for molecular and cell biological assays. *Methods Enzymol* **406**, 692-701, (2006).
- 35 Paszek, M. J. & Weaver, V. M. The tension mounts: mechanics meets morphogenesis and malignancy. *J Mammary Gland Biol Neoplasia* **9**, 325-342, (2004).
- 36 Gaggioli, C. *et al.* Fibroblast-led collective invasion of carcinoma cells with differing roles for RhoGTPases in leading and following cells. *Nat Cell Biol* **9**, (2007).
- 37 Nystrom, M. L. *et al.* Development of a quantitative method to analyse tumour cell invasion in organotypic culture. *J Pathol* **205**, 468-475, (2005).
- 38 Campeau, E. *et al.* A versatile viral system for expression and depletion of proteins in mammalian cells. *PLoS One* **4**, e6529, (2009).
- 39 Godar, S. *et al.* Growth-inhibitory and tumor-suppressive functions of p53 depend on its repression of CD44 expression. *Cell* **134**, 62-73, (2008).
- 40 Hoffman, D. B., Pearson, C. G., Yen, T. J., Howell, B. J. & Salmon, E. D. Microtubule-dependent changes in assembly of microtubule motor proteins and mitotic spindle checkpoint proteins at PtK1 kinetochores. *Mol Biol Cell* **12**, 1995-2009 (2001).
- 41 Azioune, A., Carpi, N., Tseng, Q., They, M. & Piel, M. Protein micropatterns: A direct printing protocol using deep UVs. *Methods Cell Biol* **97**, 133-146, (2010).
- 42 Zhan, L., Xiang, B. & Muthuswamy, S. K. Controlled activation of ErbB1/ErbB2 heterodimers promote invasion of three-dimensional organized epithelia in an ErbB1-dependent manner: implications for progression of ErbB2-overexpressing tumors. *Cancer Res* **66**, 5201-5208, (2006).
- 43 Yuan, K. *et al.* Primary cilia are decreased in breast cancer: analysis of a collection of human breast cancer cell lines and tissues. *J Histochem Cytochem* **58**, 857-870, (2010).
- 44 Sonnen, K. F., Gabryjonczyk, A. M., Anselm, E., Stierhof, Y. D. & Nigg, E. A. Human Cep192 and Cep152 cooperate in Plk4 recruitment and centriole duplication. *J Cell Sci*, (2013).
- 45 Edgar, R., Domrachev, M., Lash, A.E. Gene expression and hybridization array data repository. *Nucleic Acids Res.* **30**, 207-10, (2002).