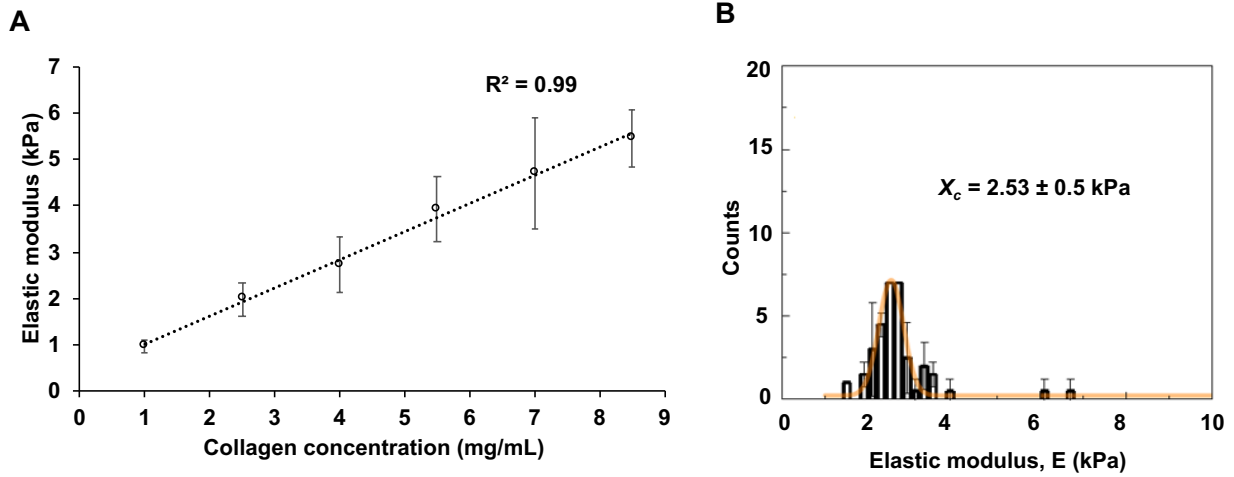
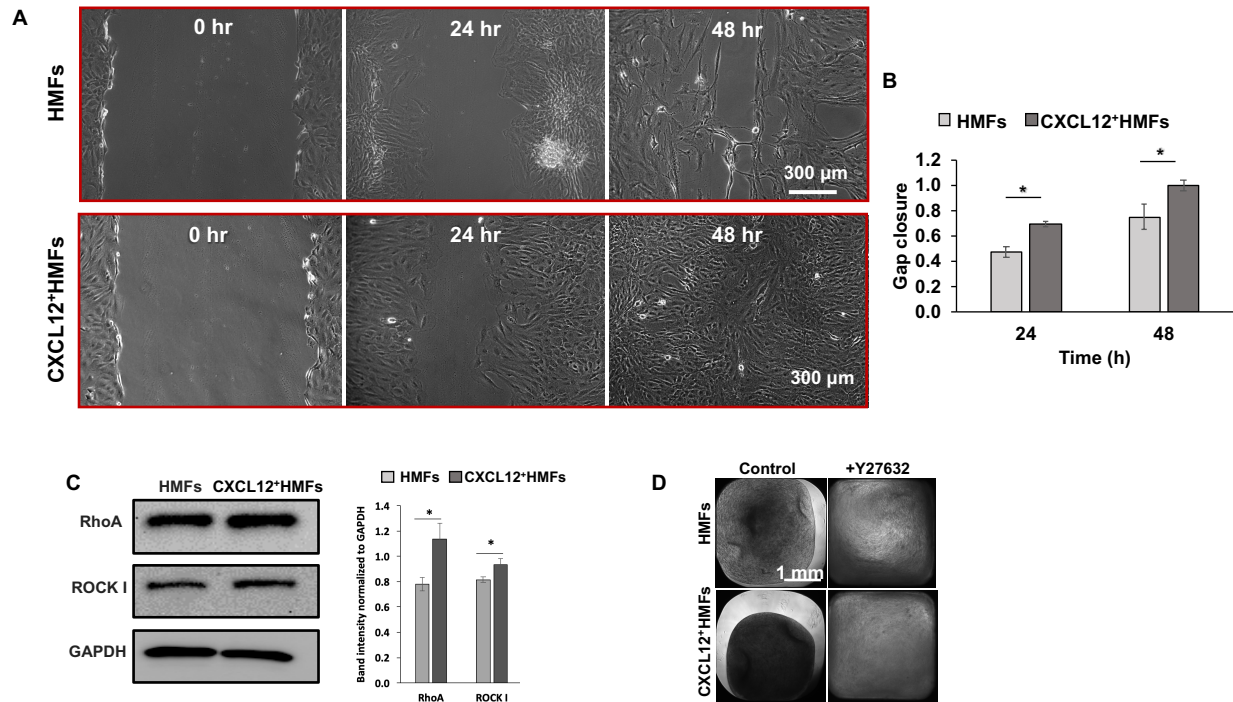


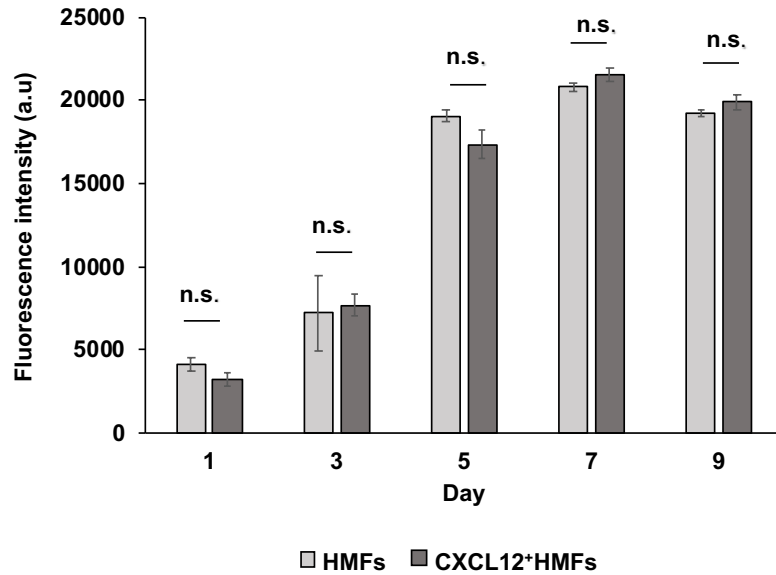
## Supporting Information



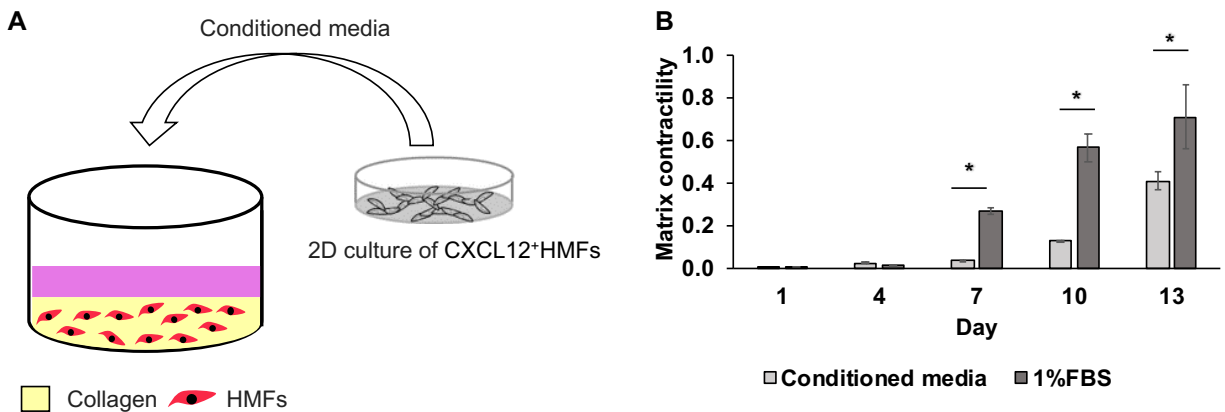
**Fig. S1.** (A) Elastic moduli type I rat tail collagen gels prepared from different protein concentrations and measured using AFM. (B) A typical histogram obtained from force curve fitting result for a 4 mg/ml collagen gel.



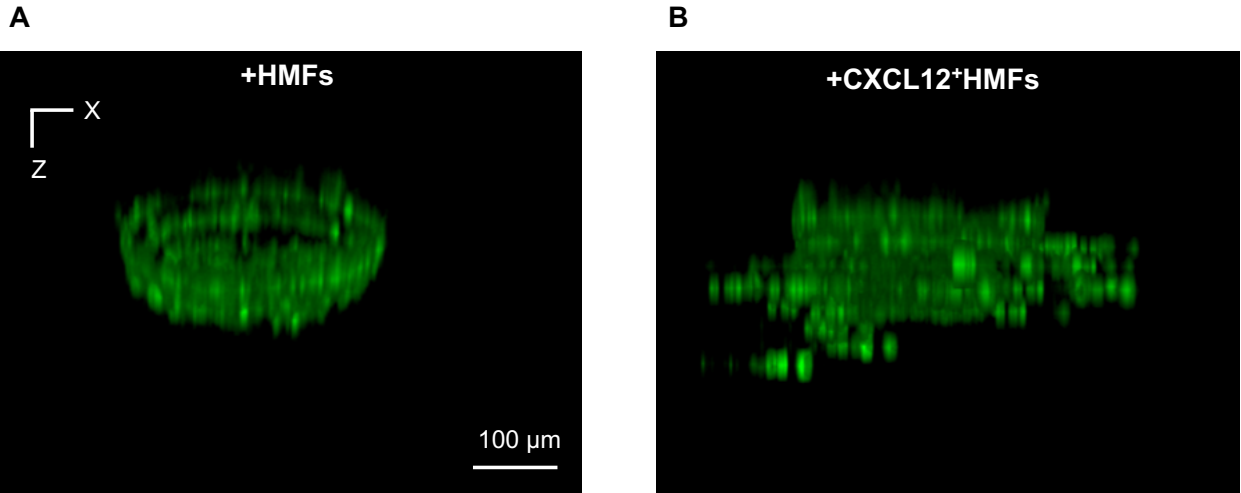
**Fig. S2.** (A) Wound healing assay to study migration of HMFs and CXCL12<sup>+</sup>HMFs. (B) Migration of cells is quantified as gap closure =  $1 - A_2/A_1$ , where  $A_1$  is the initial gap area and  $A_2$  is final gap area. \* $p < 0.05$  was calculated using two-tailed, unpaired t-test with  $n = 12$ . (C) Western blot analysis of expression levels of contractility-associated proteins in HMFs and CXCL12<sup>+</sup>HMFs cultured in collagen with quantified protein expression after normalizing with GAPDH. Data represent three separate experiments. \* $p < 0.05$  was calculated using two-tailed, unpaired t-test. (D) Phase contrast images of cultures of fibroblasts dispersed in collagen gels on day 5 showing inhibition of collagen contraction using 10  $\mu\text{M}$  of a ROCK inhibitor (Y27632, Selleckchem).



**Fig. S3.** Metabolic activities of HMFs and CXCL12<sup>+</sup>HMFs dispersed in collagen gels measured using a Prestoblue assay. \* $p < 0.05$  was calculated using two-tailed, unpaired t-test with  $n = 16$ .

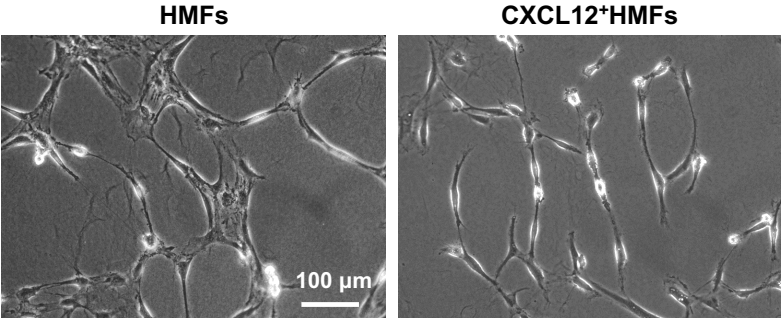


**Fig. S4.** (A) Collagen gel containing dispersed HMFs supplemented with conditioned medium from monoculture of CXCL12<sup>+</sup>HMFs. (B) Matrix contractility of HMFs-containing collagen gels with and without CXCL12<sup>+</sup>HMFs conditioned medium. \* $p < 0.05$  was calculated using two-tailed, unpaired t-test with  $n = 16$ .

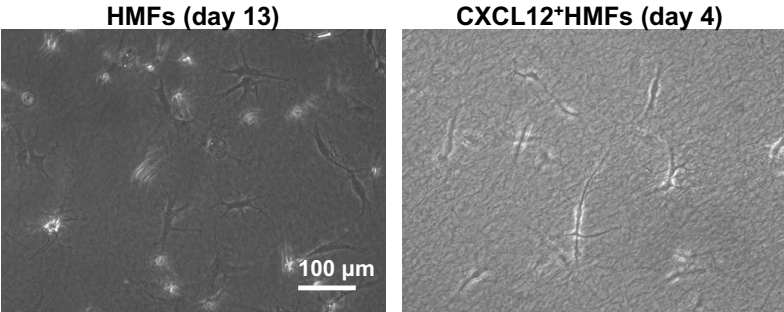


**Fig. S5.** XZ images showing the lower hemisphere of a CXCR4<sup>+</sup>TNBC spheroid (green) in microtissues containing dispersed (A) HMFs or (B) CXCL12<sup>+</sup>HMFs reconstructed from confocal z-stack images.

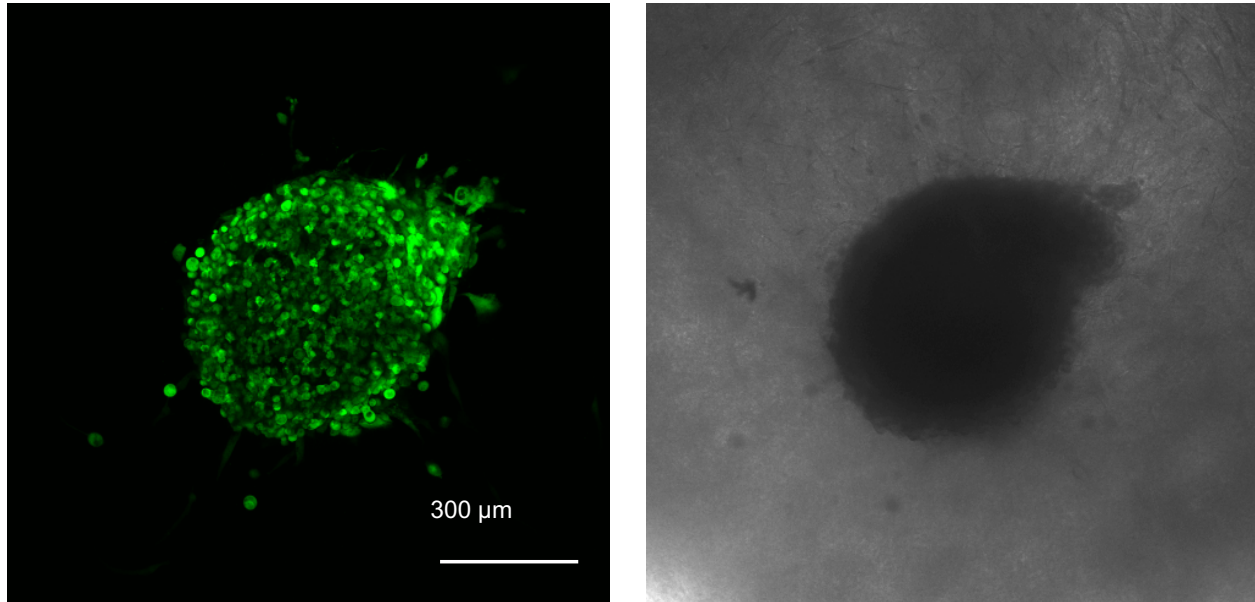
**A Fibroblasts seeded on collagen gel**



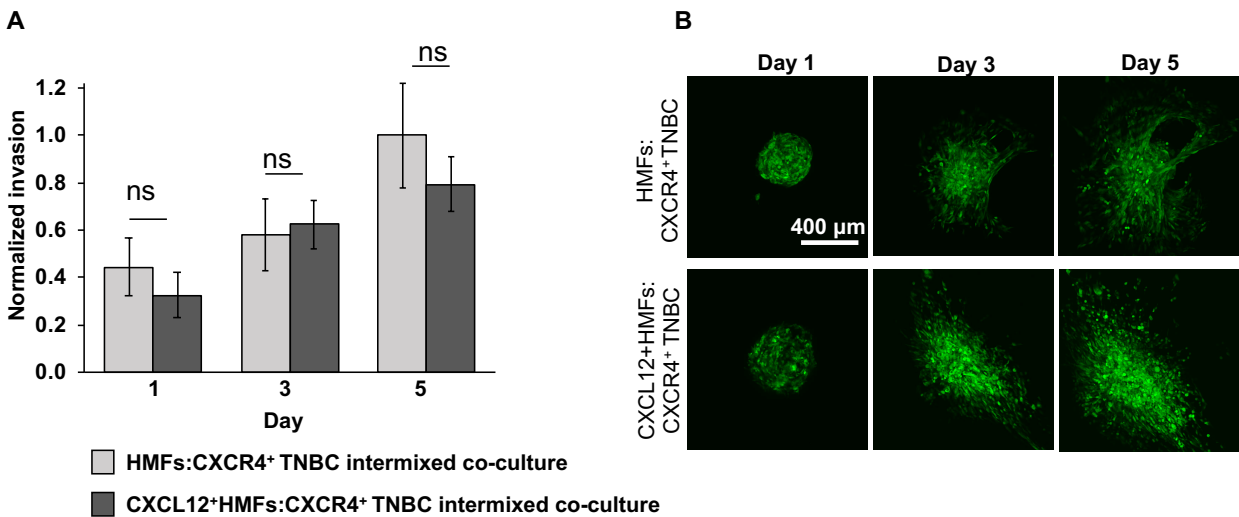
**B Fibroblasts embedded in collagen at the same contractile time point**



**Fig. S6.** (A) Phase contrast images of HMFs and CXCL12<sup>+</sup>HMFs captured 24 h after seeding on collagen gels. (B). Phase contrast images of HMFs and CXCL12<sup>+</sup>HMFs dispersed in collagen gels on day 13 and day 4, respectively, when they have comparable matrix contractility. HMFs showed a branched morphology, whereas CXCL12<sup>+</sup>HMFs had an elongated morphology.



**Fig. S7.** Parental TNBC cells in the collagen gel containing dispersed CXCL12<sup>+</sup>HMFs show minimal invasion on day 5 of culture.



**Fig. S8.** (A) Normalized invasion of CXCR4<sup>+</sup>TNBC cells from intermixed fibroblast-TNBC co-culture spheroids into collagen matrix. (B) Representative fluorescent images of cancer cells spreading from intermixed co-culture spheroids into the collagen matrix.