**Real-time PCR**

Total RNA from human B cells was extracted with RNAPURE kit (RP1202; BioTeke) and reverse-transcribed with a PrimeScript™ RT reagent Kit (RR037A; Takara). The resulting cDNA was analyzed for the expression of various genes with SsoAdvancedTM SYBR® Green supermix (Bio-Rad) on a CFX96 Touch Real-Time System (Bio-Rad) and the appropriate primers for 'test genes'. *cd 19* 5' primer: cccaccaggagattcttcaa, *cd 19* 3' primer : gggcacatacaggctttgtt. fcγrⅡb 5' primer : actcatccaagcctgtgacc, fcγrⅡb 3'primer: attgtgttctcagcccccaac. *btk* 5' primer : gcaccagtctccacaagtga, *btk* 3' primer : tcctgcccatttttatctcg.

# Fig.S1

**A**



**B**



BCR

**C**



pY

**D**



pBtk

**E**

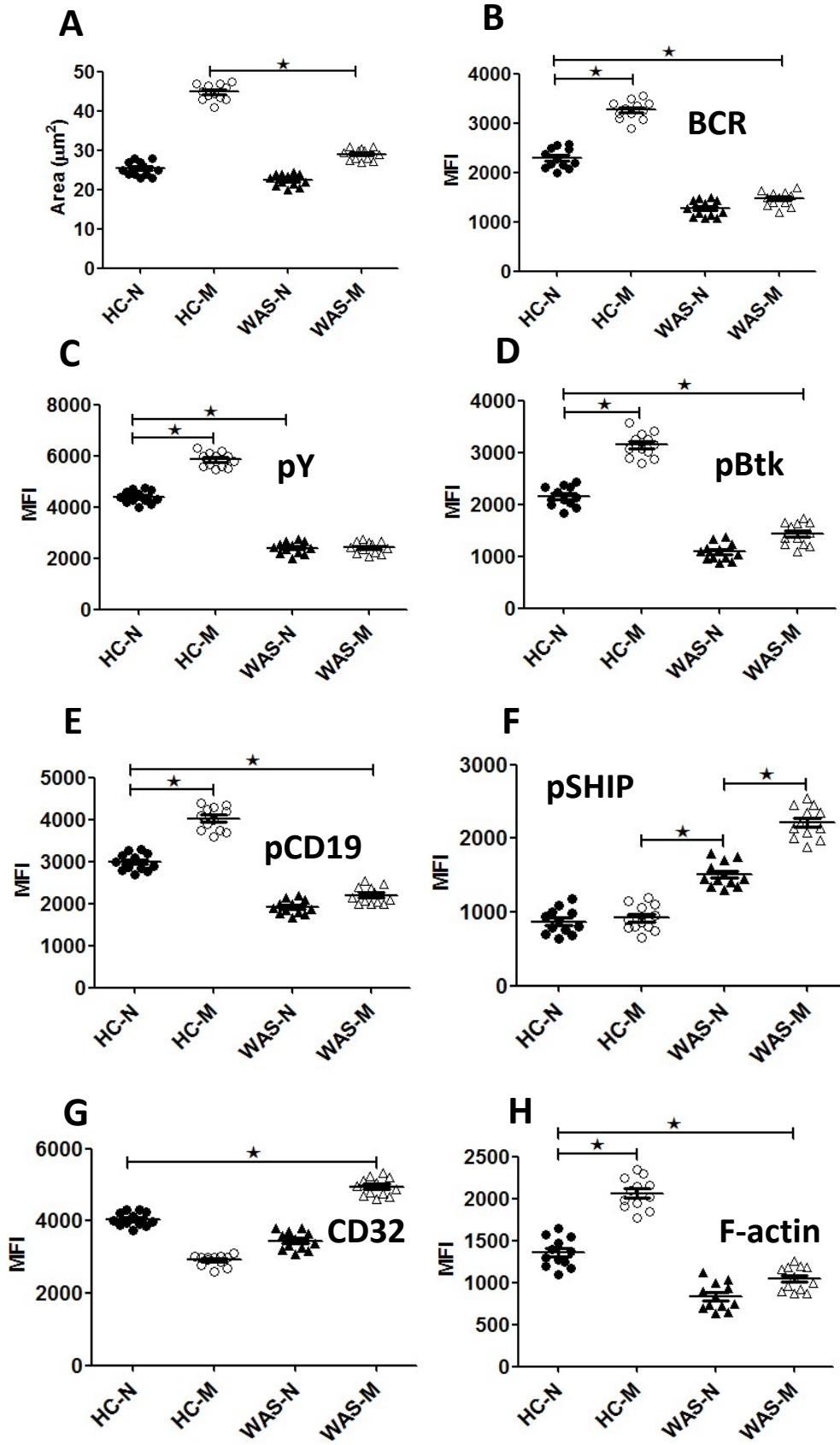

pCD19

**F**



pSHIP

**G**



CD32

**H**



F-actin

**Fig S1. A combined data of TIRFM analysis from 12 patients.**
IRM and TIRFM analysis of PBMCs (P1-12) that were incubated with membrane-tethered Fab'–anti-Ig. The quantification of B-cell contact area (A) at 5 min from the average of HCs and WAS (P1-12) B cells .The quantification of MFI of BCR (B) at 5 min, pY (C) at 3 min, pBtk (D) at 5 min, pCD19 (E) at 5 min, pSHIP (F) at 5 min, CD32 (G) at 5 min and F-actin (H) at 3 min in the B-cell contact zone from the average of HCs and WAS (P1-12) B cells and each dot represents one patient. TIRFM analysis is from >300 individual cells of three individual experiments. *$p < 0.01$, compared to WAS naïve or memory B cells.