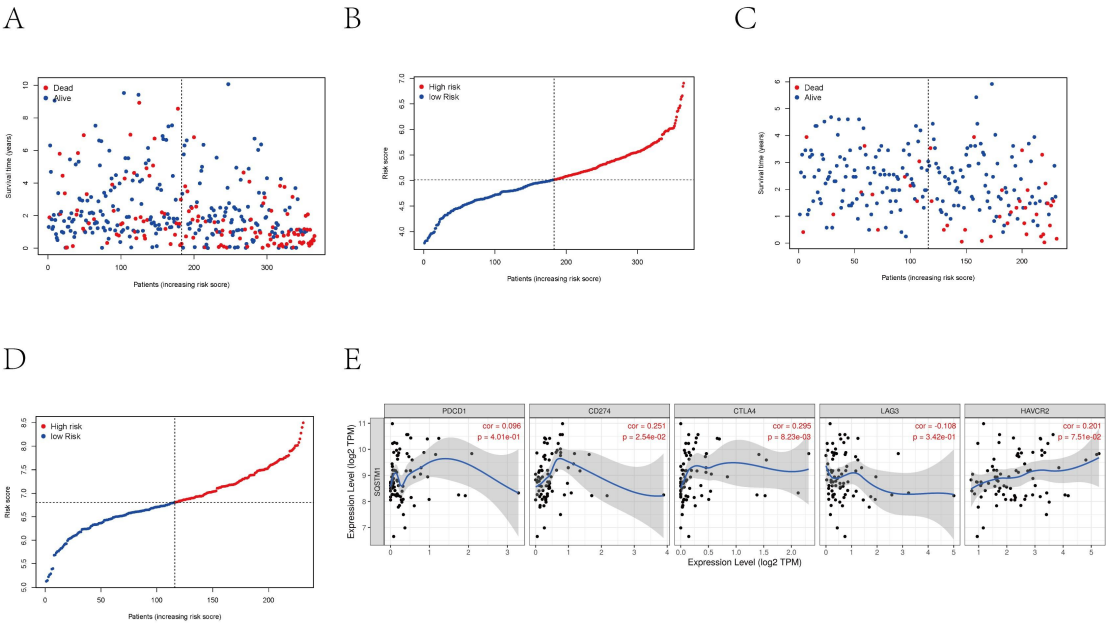
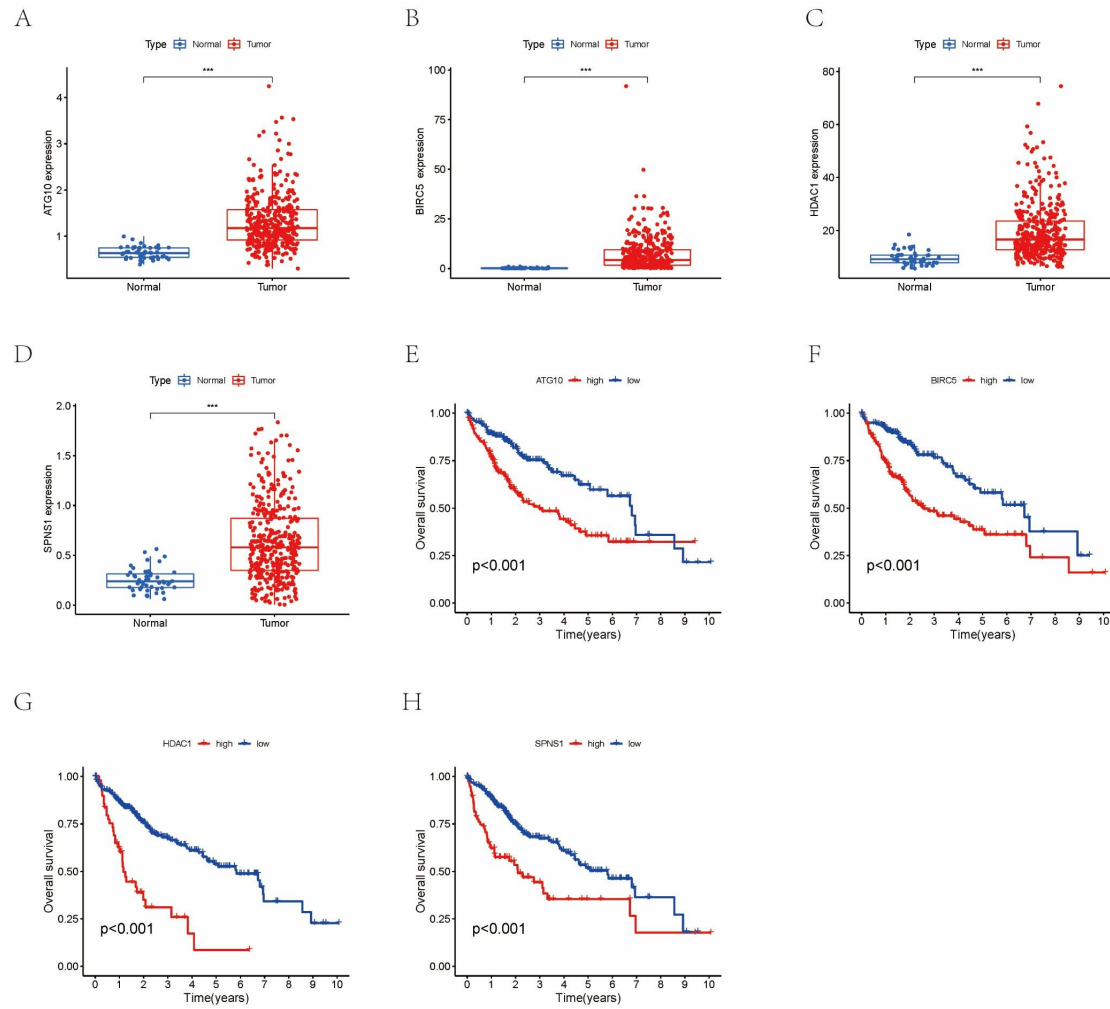


Supplementary figure 1



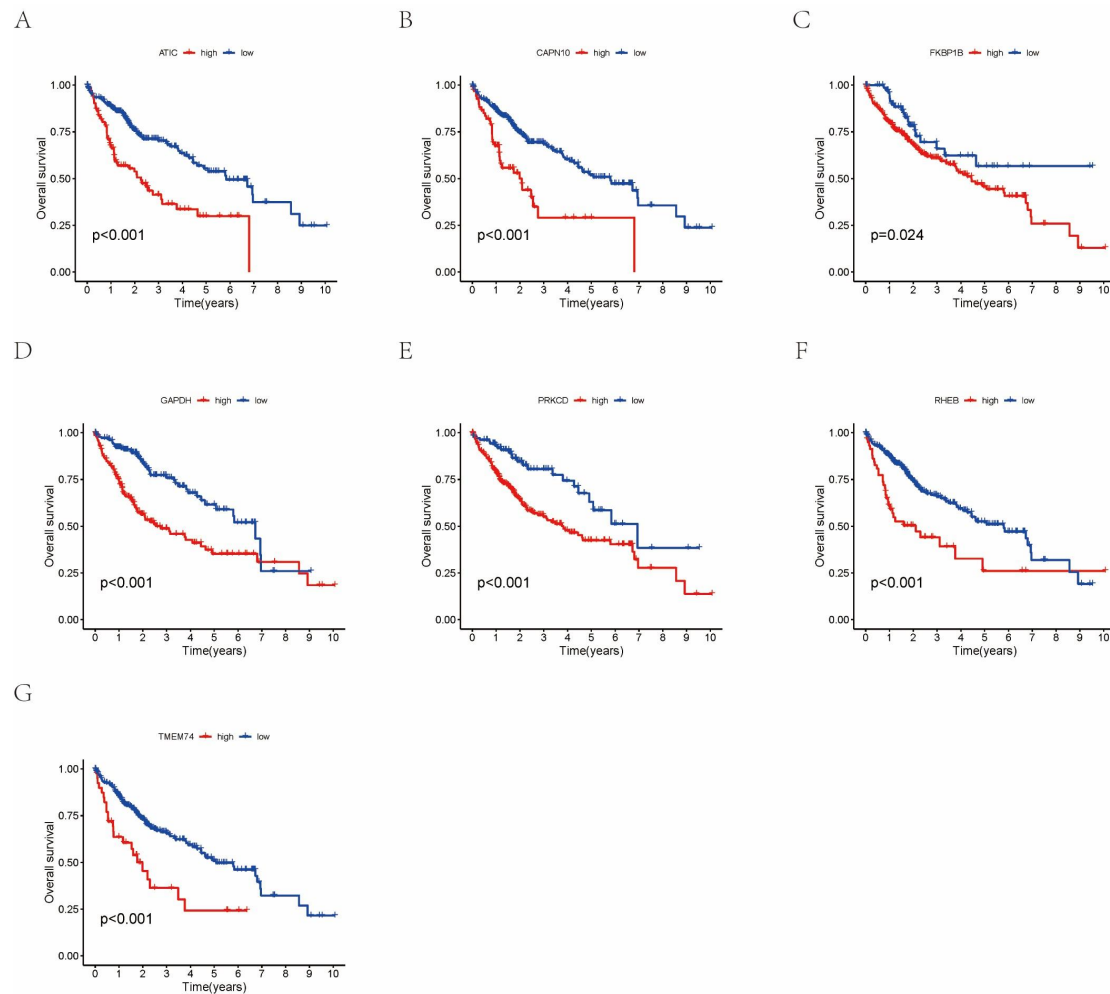
Supplementary figure 1: Survival status of patients in the experimental and control groups, respectively, and immune checkpoint analysis. (A) Survival status of TCGA LIHC patients (B) TCGA Patients with LIHC were divided into two high- and low-risk groups according to the median value of the risk score. (C) Survival status of ICGC LIHC patients. (D) ICGC Patients with LIHC were divided into two high- and low-risk groups according to the median value of the risk score (E) SQSTM1 immune checkpoint analysis.

Supplementary figure 2



Supplementary figure 2: The difference of gene expression between tumor group and normal group and the prediction of prognosis. Difference analysis: (A)ATG10, (B)BIRC5, (C)HDAC1, (D)SPNS1, Prognostic analysis: (E)ATG10, (F)BIRC5, (G)HDAC1, (H)SPNS1.

Supplementary figure 3



Supplementary figure 3: OS Kaplan-Meier curves of autophagy related genes: (A)ATIC, (B)CAPN10, (C)FKBP1B, (D)CAPDH, (E)PRKCD, (F)RHEB, (G)TMEM74.

Supplemental table s1: Differential analysis of all genes

gene	conMean	treatMean	logFC	pValue	fdr
TBK1	3.241288	4.590455	0.50207	2.65E-10	5.39E-10
CHMP2B	7.371213	9.876101	0.42204	1.91E-05	2.73E-05
CFLAR	2.675428	3.4309	0.358817	0.00011	0.000149
NBR1	13.67961	17.3217	0.340553	0.005153	0.006177
BNIP3	22.50361	25.23572	0.165311	0.25237	0.265312
GABARAPL1	29.29484	20.99723	-0.48045	8.06E-09	1.45E-08
VAMP7	10.89329	18.78679	0.786278	3.25E-11	7.16E-11
PPP1R15A	15.55741	12.96852	-0.26259	6.77E-05	9.44E-05

PEX14	7.815119	8.262929	0.080385	0.881319	0.881319
EEF2	268.4094	389.7672	0.538177	1.05E-08	1.88E-08
RGS19	2.019039	4.37576	1.115865	5.15E-10	1.02E-09
CASP3	4.186012	8.440812	1.011805	1.98E-17	6.98E-17
ATG7	1.023593	1.851177	0.8548	1.89E-22	1.44E-21
SAR1A	9.170063	12.57976	0.456101	3.39E-12	8.09E-12
TP63	0.032491	0.121942	1.908063	0.00237	0.002927
SIRT1	3.355222	3.212806	-0.06257	0.066843	0.072887
WDR45	6.123623	10.01855	0.710216	6.59E-18	2.50E-17
SQSTM1	29.98683	99.91757	1.736409	9.02E-17	2.89E-16
CLN3	2.44659	7.973022	1.704354	7.73E-27	4.29E-25
ATF6	6.044788	10.50126	0.796799	6.83E-13	1.75E-12
EIF2AK2	2.386024	3.420289	0.51951	8.90E-07	1.41E-06
RB1	2.418639	3.221056	0.413338	0.069443	0.075322
ATG101	5.176723	6.118417	0.241119	0.008626	0.010222
ATG4D	2.450245	4.637562	0.920441	2.56E-12	6.26E-12
GAPDH	278.5148	661.6961	1.248415	5.02E-20	2.64E-19
VMP1	10.12502	20.76723	1.036384	1.06E-18	4.45E-18
KLHL24	3.395535	4.318505	0.346893	0.004792	0.005779
ST13	46.11052	54.4539	0.239939	0.001228	0.001573
BAG3	9.001669	13.63912	0.599486	5.90E-06	8.64E-06
CAPN2	4.520563	12.0896	1.419192	3.60E-17	1.23E-16
RAB5A	7.720427	9.975231	0.36967	3.37E-07	5.53E-07
IKBKE	0.548463	2.003158	1.86881	1.30E-11	2.93E-11
ATG3	3.368979	5.589313	0.730359	5.80E-19	2.53E-18
GABARAPL2	11.33232	16.68804	0.558372	5.07E-13	1.34E-12
GOPC	3.259501	4.31854	0.405892	0.000282	0.000372
CCL2	12.78403	7.827972	-0.70763	5.47E-07	8.90E-07

GNAI3	1.496497	2.230662	0.575882	2.26E-10	4.64E-10
ITGA3	0.642552	2.748765	2.096898	0.000448	0.000589
ATG9B	0.066885	0.138715	1.052369	5.60E-06	8.32E-06
MAPK1	4.494924	7.752071	0.786285	7.34E-13	1.86E-12
CASP1	2.356665	2.667478	0.17873	0.697343	0.707699
ITPR1	0.520472	0.934722	0.844718	0.001689	0.002111
ATG2B	1.70555	1.918097	0.169439	0.460585	0.472099
PARP1	7.888009	20.10034	1.349487	6.82E-23	6.08E-22
PINK1	9.085302	6.857325	-0.40589	1.44E-06	2.26E-06
RELA	8.40284	12.90865	0.619389	7.56E-17	2.46E-16
SH3GLB1	5.882321	7.652551	0.379555	0.001396	0.001767
DLC1	4.386156	2.795294	-0.64996	1.55E-10	3.32E-10
FAS	3.603357	3.464696	-0.05661	0.041556	0.046049
CXCR4	10.60367	12.76883	0.268064	0.167799	0.177314
LAMP1	51.88317	71.08869	0.454353	2.72E-06	4.19E-06
TP53	4.954549	8.223167	0.73094	5.80E-06	8.55E-06
TSC2	2.495921	5.605779	1.167343	4.51E-22	3.08E-21
SPHK1	0.74171	5.34772	2.849998	8.75E-05	0.000121
ULK2	0.50491	0.706008	0.483658	0.742383	0.749697
CALCOCO2	9.085171	11.7129	0.366513	1.12E-05	1.63E-05
EIF2S1	5.737592	7.850116	0.452269	2.30E-08	4.03E-08
FOS	113.2005	21.1632	-2.41925	6.68E-21	4.15E-20
VAMP3	12.28937	17.87864	0.540826	6.95E-08	1.19E-07
MLST8	4.34761	8.973867	1.045507	4.72E-23	4.84E-22
PEX3	6.599593	5.506434	-0.26126	3.27E-05	4.65E-05
BID	5.536573	10.65509	0.944478	9.98E-15	2.88E-14
RAF1	9.168085	14.0219	0.612989	7.54E-13	1.88E-12
CHMP4B	32.05286	59.56277	0.893958	6.59E-18	2.50E-17

EIF4G1	34.90929	47.35036	0.439764	2.80E-09	5.22E-09
ZFYVE1	2.959463	3.786587	0.355563	0.000103	0.000141
VEGFA	5.897694	10.54617	0.838496	1.07E-07	1.82E-07
NKX2-3	0.012394	0.073484	2.567762	0.004498	0.005456
CASP4	4.200851	5.106819	0.281743	0.032861	0.037218
CTSL	68.53658	59.90916	-0.1941	0.00014	0.000187
CTSB	152.5674	135.956	-0.16631	0.00089	0.001147
RPS6KB1	1.816079	3.019499	0.733482	4.33E-12	1.01E-11
FKBP1A	22.16021	49.66569	1.164278	2.89E-23	3.37E-22
CAMKK2	4.482704	7.135553	0.670656	3.70E-12	8.72E-12
ARSA	13.84392	23.18198	0.743751	1.06E-09	2.03E-09
ITGA6	2.511066	10.46721	2.059504	1.59E-23	2.18E-22
GAA	20.41744	34.96541	0.776126	1.55E-11	3.46E-11
ERBB2	6.045692	9.435531	0.642196	0.02745	0.031263
ATG4B	3.06116	6.377107	1.058824	4.52E-24	7.13E-23
ATG16L1	2.518682	3.699242	0.554561	3.39E-12	8.09E-12
HGS	2.408296	7.270746	1.594091	3.22E-22	2.28E-21
EIF2AK3	1.950976	2.560898	0.392454	0.00089	0.001147
PRKAB1	2.656504	5.086577	0.937166	1.52E-20	8.91E-20
FADD	2.299216	4.460191	0.955964	1.97E-15	5.84E-15
NFKB1	4.589571	5.149336	0.166027	0.312172	0.326075
CDKN1B	11.14478	15.33985	0.460916	6.79E-07	1.09E-06
DRAM1	1.683909	3.868698	1.200034	1.11E-11	2.54E-11
HSPB8	1.747227	7.097465	2.022237	0.009573	0.011278
EIF4EBP1	19.2051	34.869	0.860455	1.76E-05	2.55E-05
ATG16L2	0.738395	1.50266	1.025053	2.00E-13	5.40E-13
HSPA8	97.46119	145.4438	0.577562	5.94E-07	9.59E-07
BAK1	2.432961	7.457171	1.615915	1.55E-17	5.67E-17

MTOR	2.937851	5.183881	0.819272	3.61E-10	7.26E-10
USP10	6.70473	8.552399	0.35115	0.000122	0.000165
MYC	25.68397	17.36399	-0.56477	0.000101	0.000139
RAB1A	30.59168	47.1999	0.625644	2.09E-14	5.87E-14
RB1CC1	3.718498	7.510566	1.014202	4.73E-14	1.29E-13
DNAJB1	21.30383	32.89538	0.626772	1.52E-06	2.38E-06
LAMP2	37.76364	56.20368	0.573666	2.89E-06	4.42E-06
CAPN1	9.064998	17.45443	0.945215	4.40E-17	1.45E-16
ATIC	7.758022	18.69462	1.268862	1.56E-23	2.18E-22
NAF1	0.831826	0.961361	0.208797	0.048238	0.053165
RAB33B	2.341522	2.006833	-0.22253	0.000503	0.000656
IKBKB	1.318682	2.238643	0.763527	1.74E-10	3.67E-10
TM9SF1	1.040221	1.732934	0.736327	5.75E-13	1.49E-12
ATF4	66.09523	102.7828	0.636981	4.89E-09	8.95E-09
DIRAS3	2.884784	0.621648	-2.21429	2.04E-22	1.49E-21
IRGM	0.010701	0.058548	2.45185	0.003984	0.004861
ATG4A	4.140872	5.870546	0.50356	5.97E-09	1.08E-08
CAPN10	0.579849	1.639383	1.499404	4.96E-26	1.68E-24
WIPI1	2.610446	5.012314	0.94118	1.77E-07	2.98E-07
ATG12	2.153676	3.803706	0.820604	1.68E-22	1.32E-21
MBTPS2	2.208361	2.960074	0.422657	0.000192	0.000255
ULK1	4.469007	8.454619	0.919785	1.58E-15	4.76E-15
DAPK1	5.525508	5.522408	-0.00081	0.0144	0.016584
MAP2K7	4.067998	6.771537	0.735164	1.66E-19	7.75E-19
NRG2	0.04252	0.312966	2.879786	1.43E-09	2.68E-09
RPTOR	1.577082	3.888593	1.301991	4.43E-25	8.26E-24
HDAC1	9.672532	19.69688	1.026001	6.77E-19	2.89E-18
MTMR14	3.94737	7.201177	0.867341	5.74E-23	5.42E-22

GABARAP	16.29925	19.10438	0.229098	0.005475	0.006526
ITGB1	20.42828	34.85765	0.770908	6.33E-05	8.88E-05
PIK3R4	4.419551	4.64565	0.071981	0.813967	0.817957
RAC1	34.80497	64.05616	0.880044	1.71E-20	9.73E-20
NAMPT	30.2945	16.41231	-0.88428	2.28E-07	3.80E-07
RAB11A	8.444355	13.8584	0.714701	5.02E-19	2.24E-18
ITGB4	0.692499	3.586313	2.372617	1.85E-10	3.88E-10
ATG10	0.64359	1.307517	1.022617	1.11E-22	9.11E-22
TSC1	0.723672	2.14458	1.567288	2.41E-24	4.11E-23
ATG5	4.758315	5.666518	0.252012	0.001654	0.00208
EDEM1	11.26393	10.17418	-0.1468	0.015995	0.018318
PIK3C3	0.90952	1.266871	0.478092	2.98E-07	4.93E-07
ARNT	6.593058	10.73648	0.703502	1.09E-09	2.07E-09
BCL2	0.5251	0.749869	0.514048	0.159987	0.169935
MAPK8	1.93707	2.331422	0.267334	0.013774	0.015953
DDIT3	9.15751	26.01926	1.506553	3.18E-17	1.10E-16
ATG2A	6.862541	6.165904	-0.15443	0.039042	0.043498
MAP1LC3B	6.99322	8.887481	0.345818	0.012726	0.014822
ARSB	1.361204	2.312439	0.764532	1.93E-06	2.99E-06
ERO1A	5.531836	9.67052	0.805835	6.26E-10	1.22E-09
NLRC4	0.418918	0.373031	-0.16737	0.052874	0.057964
CD46	11.0898	24.19239	1.12532	1.83E-17	6.60E-17
RAB24	1.364916	4.436359	1.700564	8.37E-27	4.29E-25
STK11	3.370517	5.995016	0.830794	3.56E-20	1.92E-19
ULK3	3.681351	8.78539	1.254871	3.47E-23	3.75E-22
ERN1	3.000638	3.68913	0.298011	0.122894	0.132597
BIRC6	2.224989	2.955056	0.409387	0.001255	0.001597
SPNS1	0.255314	0.635611	1.315871	2.15E-14	5.96E-14

TP73	0.030832	0.529801	4.102942	2.96E-23	3.37E-22
APOL1	75.9029	58.25191	-0.38185	3.78E-06	5.74E-06
HSP90AB1	114.1782	354.4065	1.634118	3.53E-26	1.45E-24
HIF1A	9.27624	13.76264	0.569145	0.148617	0.15951
SUPT20H	0.722306	1.416944	0.972102	5.12E-13	1.34E-12
WIPI2	4.772646	8.428914	0.820557	1.76E-23	2.26E-22
P4HB	222.7975	397.6728	0.835849	1.36E-17	5.08E-17
MAPK9	1.896642	3.660025	0.948406	1.34E-19	6.41E-19
NCKAP1	2.108861	3.670998	0.799708	2.19E-10	4.54E-10
FOXO3	3.512213	4.52797	0.366484	0.03546	0.039723
NFE2L2	15.58384	13.16981	-0.24282	0.001995	0.002478
FKBP1B	1.610316	3.816893	1.245054	0.333825	0.345627
HSPA5	110.1952	231.5747	1.071416	1.04E-19	5.18E-19
CDKN2A	0.162719	4.09759	4.65432	1.87E-25	4.26E-24
SERPINA1	5515.472	3838.021	-0.52312	5.35E-10	1.05E-09
RAB7A	54.02592	69.906	0.371765	2.17E-08	3.84E-08
ATG9A	6.233702	10.29821	0.724233	3.76E-17	1.26E-16
NRG1	1.117421	0.460111	-1.28012	5.44E-12	1.25E-11
PEA15	12.16323	43.36824	1.834112	3.57E-27	3.66E-25
TUSC1	4.08852	3.602009	-0.18278	0.00271	0.003327
ATG14	1.450767	2.869186	0.983825	1.06E-19	5.18E-19
PRKCD	2.370244	6.311841	1.413025	8.94E-16	2.82E-15
HDAC6	8.246603	7.594234	-0.1189	0.009955	0.011662
SESN2	5.261391	8.040982	0.611928	4.62E-06	6.91E-06
FOXO1	9.479037	4.497195	-1.07571	4.28E-15	1.25E-14
UVRAG	1.736166	2.472923	0.510312	2.59E-08	4.50E-08
DAPK2	0.207441	0.926243	2.158688	1.19E-20	7.20E-20
TMEM74	0.124972	0.630006	2.333766	3.59E-11	7.83E-11

RUBCN	0.702311	1.462236	1.057994	1.65E-18	6.76E-18
MAPK3	3.657011	9.508188	1.378505	5.73E-26	1.68E-24
PELP1	3.788194	7.723468	1.027739	5.19E-20	2.66E-19
PTEN	5.55218	6.026167	0.118186	0.435589	0.448723
MAPK8IP1	1.51634	2.149051	0.503107	0.31335	0.326075
ATG4C	2.131541	3.044659	0.514384	3.97E-09	7.34E-09
BCL2L1	20.4155	34.11326	0.740668	2.90E-08	5.00E-08
CANX	60.54517	129.9874	1.102288	2.00E-21	1.32E-20
CAPNS1	31.4329	67.47792	1.10214	5.81E-23	5.42E-22
CTSD	272.8137	482.4807	0.822555	6.30E-10	1.22E-09
KIF5B	7.164565	13.38185	0.901326	1.39E-12	3.45E-12
BAG1	5.270785	7.050046	0.419615	5.05E-05	7.14E-05
NPC1	1.411265	3.746964	1.408733	1.77E-20	9.80E-20
ATG13	5.435218	10.07108	0.889809	1.10E-25	2.82E-24
BNIP1	1.864545	3.503519	0.909981	4.57E-18	1.84E-17
TP53INP2	12.59506	15.80121	0.327178	0.157807	0.168492
EEF2K	1.693265	3.160031	0.900131	1.50E-15	4.65E-15
CASP8	1.376885	2.831424	1.040119	1.52E-15	4.65E-15
CDKN1A	50.49138	48.3062	-0.06383	0.572328	0.583718
PRKN	0.433081	0.811871	0.906614	0.033572	0.037814
BAX	7.321618	21.10099	1.527077	7.52E-23	6.42E-22
AMBRA1	1.920238	3.655058	0.928609	3.52E-19	1.60E-18
BECN1	3.103691	5.087718	0.713034	4.76E-11	1.03E-10
RACK1	66.62575	132.2249	0.988842	5.73E-18	2.26E-17
BIRC5	0.250505	7.04958	4.814625	2.35E-28	4.82E-26
PRKAR1A	18.72622	27.63749	0.561567	3.84E-06	5.80E-06
WDR45B	9.908806	20.31989	1.03611	4.09E-21	2.62E-20
RHEB	6.865925	15.94084	1.215202	2.98E-25	6.10E-24

SIRT2	5.520819	8.401282	0.605727	1.19E-14	3.38E-14
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Supplemental table s2: Attachment values of 12 genes

Gene	Coef
ATG10	0.289825
ATIC	0.214439
BIRC5	0.062231
CAPN10	0.049905
FKBP1A	0.126706
GAPDH	0.028357
HDAC1	0.234363
PRKCD	0.021467
RHEB	0.192527
SPNS1	0.212674
SQSTM1	0.097704
TMEM74	0.169838