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| Supplementary Table 1 Differential expression levels of PTPRD in pan-cancer by the TIMER database |
| Tumor | Normal | p |
| LUAD.Tumor (n=515) | LUAD.Normal (n=59) | 3.86E-18 |
| UCEC.Tumor (n=545) | UCEC.Normal (n=35) | 6.46E-11 |
| KIRC.Tumor (n=533) | KIRC.Normal (n=72) | 8.67E-09 |
| BLCA.Tumor (n=408) | BLCA.Normal (n=19) | 1.35E-08 |
| HNSC-HPV+.Tumor (n=97) | HNSC-HPV-.Tumor (n=421) | 2.51E-06 |
| LIHC.Tumor (n=371) | LIHC.Normal (n=50) | 2.64E-06 |
| LUSC.Tumor (n=501) | LUSC.Normal (n=51) | 1.58E-05 |
| GBM.Tumor (n=153) | GBM.Normal (n=5) | 1.96E-04 |
| THCA.Tumor (n=501) | THCA.Normal (n=59) | 3.40E-04 |
| PRAD.Tumor (n=497) | PRAD.Normal (n=52) | 1.90E-03 |
| CESC.Tumor (n=304) | CESC.Normal (n=3) | 0.006  |
| HNSC.Tumor (n=520) | HNSC.Normal (n=44) | 0.010  |
| STAD.Tumor (n=415) | STAD.Normal (n=35) | 0.017  |
| KIRP.Tumor (n=290) | KIRP.Normal (n=32) | 0.041  |
| COAD.Tumor (n=457) | COAD.Normal (n=41) | 0.079  |
| SKCM.Tumor (n=103) | SKCM.Metastasis (n=368) | 0.097  |
| BRCA.Tumor (n=1093) | BRCA.Normal (n=112) | 0.100  |
| PCPG.Tumor (n=179) | PCPG.Normal (n=3) | 0.139  |
| PAAD.Tumor (n=178) | PAAD.Normal (n=4) | 0.207  |
| ESCA.Tumor (n=184) | ESCA.Normal (n=11) | 0.392  |
| KICH.Tumor (n=66) | KICH.Normal (n=25) | 0.673  |
| READ.Tumor (n=166) | READ.Normal (n=10) | 0.766  |
| CHOL.Tumor (n=36) | CHOL.Normal (n=9) | 0.878  |

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| Supplementary Table 2 Tumor abbreviations in TCGA database |
| TCGA | Detail |
| ACC | Adrenocortical carcinoma |
| BLCA | Bladder Urothelial Carcinoma |
| BRCA | Breast invasive carcinoma |
| CESC | Cervical squamous cell carcinoma and endocervical adenocarcinoma |
| CHOL | Cholangio carcinoma |
| COAD | Colon adenocarcinoma |
| DLBC | Lymphoid Neoplasm Diffuse Large B-cell Lymphoma |
| ESCA | Esophageal carcinoma |
| GBM | Glioblastoma multiforme |
| HNSC | Head and Neck squamous cell carcinoma |
| KICH | Kidney Chromophobe |
| KIRC | Kidney renal clear cell carcinoma |
| KIRP | Kidney renal papillary cell carcinoma |
| LAML | Acute Myeloid Leukemia |
| LGG | Brain Lower Grade Glioma |
| LIHC | Liver hepatocellular carcinoma |
| LUAD | Lung adenocarcinoma |
| LUSC | Lung squamous cell carcinoma |
| MESO | Mesothelioma |
| OV | Ovarian serous cystadenocarcinoma |
| PAAD | Pancreatic adenocarcinoma |
| PCPG | Pheochromocytoma and Paraganglioma |
| PRAD | Prostate adenocarcinoma |
| READ | Rectum adenocarcinoma |
| SARC | Sarcoma |
| SKCM | Skin Cutaneous Melanoma |
| STAD | Stomach adenocarcinoma |
| TGCT | Testicular Germ Cell Tumors |
| THCA | Thyroid carcinoma |
| THYM | Thymoma |
| UCEC | Uterine Corpus Endometrial Carcinoma |
| UCS | Uterine Carcinosarcoma |
| UVM | Uveal Melanoma |

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| Supplementary Table 3 the relationship between PTPRD expression and prognosis of patients with different cancers using the PrognoScan database. |
| Dataset | Cancer type | Endpoint | N | P | HR |
| GSE2034 | Breast cancer | DMFS | 286 | 0.030  | 1.31 [1.03 - 1.67] |
| GSE26712 | Ovarian cancer | OS | 185 | 0.002  | 1.38 [1.13 - 1.69] |
| GSE30929 | Liposarcoma | DRFS | 140 | 0.003  | 1.42 [1.13 - 1.78] |
| GSE3494 | Breast cancer | DSS | 236 | 0.003  | 0.64 [0.48 - 0.86] |
| GSE9891 | Ovarian cancer | OS | 278 | 0.001  | 1.27 [1.10 - 1.46] |

DMFS: Distant metastasis-free survival; OS: Overall survival; DRFS: Distant recurrence-free survival; DSS: Disease-specific survival.

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| Supplementary Table 4 A combined study containing 10967 samples from 32 studies was extracted from the TCGA database for the genetic alteration analysis in pan-cancer. |
| Cancer study | Sample number |
| Acute Myeloid Leukemia (TCGA, PanCancer Atlas) | 200 |
| Adrenocortical Carcinoma (TCGA, PanCancer Atlas) | 92 |
| Bladder Urothelial Carcinoma (TCGA, PanCancer Atlas) | 411 |
| Brain Lower Grade Glioma (TCGA, PanCancer Atlas) | 514 |
| Breast Invasive Carcinoma (TCGA, PanCancer Atlas) | 1084 |
| Cervical Squamous Cell Carcinoma (TCGA, PanCancer Atlas) | 297 |
| Cholangiocarcinoma (TCGA, PanCancer Atlas) | 36 |
| Colorectal Adenocarcinoma (TCGA, PanCancer Atlas) | 594 |
| Diffuse Large B-Cell Lymphoma (TCGA, PanCancer Atlas) | 48 |
| Esophageal Adenocarcinoma (TCGA, PanCancer Atlas) | 182 |
| Glioblastoma Multiforme (TCGA, PanCancer Atlas) | 592 |
| Head and Neck Squamous Cell Carcinoma (TCGA, PanCancer Atlas) | 523 |
| Kidney Chromophobe (TCGA, PanCancer Atlas) | 65 |
| Kidney Renal Clear Cell Carcinoma (TCGA, PanCancer Atlas) | 512 |
| Kidney Renal Papillary Cell Carcinoma (TCGA, PanCancer Atlas) | 283 |
| Liver Hepatocellular Carcinoma (TCGA, PanCancer Atlas) | 372 |
| Lung Adenocarcinoma (TCGA, PanCancer Atlas) | 566 |
| Lung Squamous Cell Carcinoma (TCGA, PanCancer Atlas) | 487 |
| Mesothelioma (TCGA, PanCancer Atlas) | 87 |
| Ovarian Serous Cystadenocarcinoma (TCGA, PanCancer Atlas) | 585 |
| Pancreatic Adenocarcinoma (TCGA, PanCancer Atlas) | 184 |
| Pheochromocytoma and Paraganglioma (TCGA, PanCancer Atlas) | 178 |
| Prostate Adenocarcinoma (TCGA, PanCancer Atlas) | 494 |
| Sarcoma (TCGA, PanCancer Atlas) | 255 |
| Skin Cutaneous Melanoma (TCGA, PanCancer Atlas) | 448 |
| Stomach Adenocarcinoma (TCGA, PanCancer Atlas) | 440 |
| Testicular Germ Cell Tumors (TCGA, PanCancer Atlas) | 149 |
| Thymoma (TCGA, PanCancer Atlas) | 123 |
| Thyroid Carcinoma (TCGA, PanCancer Atlas) | 500 |
| Uterine Carcinosarcoma (TCGA, PanCancer Atlas) | 57 |
| Uterine Corpus Endometrial Carcinoma (TCGA, PanCancer Atlas) | 529 |
| Uveal Melanoma (TCGA, PanCancer Atlas) | 80 |

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| Supplementary Table 5 A combined cohort of 2185 immune checkpoint blockade (ICB)-treated samples |
| Cancer study | Sample number |
| TMB and Immunotherapy (MSKCC, Nat Genet 2019) | 1661 |
| MSS Mixed Solid Tumors (Broad/Dana-Farber, Nat Genet 2018) | 249 |
| Non-Small Cell Lung Cancer (MSKCC, J Clin Oncol 2018) | 240 |
| Lung Adenocarcinoma (MSKCC, Science 2015) | 35 |

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| Supplementary Table 6 The top 50 PTPRD-related genes in the protein-protein interaction network using the STRING database. |
| #Node1 | Node2 | Node1\_string\_id | Node2\_string\_id | Combined score |
| PTPRD | SLITRK1 | 9606.ENSP00000370593 | 9606.ENSP00000366288 | 0.96 |
| IL1RAPL1 | PTPRD | 9606.ENSP00000368278 | 9606.ENSP00000370593 | 0.811 |
| PTPRD | SLITRK2 | 9606.ENSP00000370593 | 9606.ENSP00000359521 | 0.809 |
| IRS1 | PTPRD | 9606.ENSP00000304895 | 9606.ENSP00000370593 | 0.521 |
| PPFIA1 | PTPRD | 9606.ENSP00000253925 | 9606.ENSP00000370593 | 0.52 |
| BMX | PTPRD | 9606.ENSP00000350224 | 9606.ENSP00000370593 | 0.45 |
| EPHA8 | PTPRD | 9606.ENSP00000166244 | 9606.ENSP00000370593 | 0.45 |
| PTPRD | TBK1 | 9606.ENSP00000370593 | 9606.ENSP00000329967 | 0.45 |
| PTPRD | STAT3 | 9606.ENSP00000370593 | 9606.ENSP00000264657 | 0.413 |
| PPFIA2 | PTPRD | 9606.ENSP00000450337 | 9606.ENSP00000370593 | 0.412 |
| PPFIA3 | PTPRD | 9606.ENSP00000335614 | 9606.ENSP00000370593 | 0.412 |
| MTSS1 | PTPRD | 9606.ENSP00000322804 | 9606.ENSP00000370593 | 0.379 |
| NFASC | NRCAM | 9606.ENSP00000344786 | 9606.ENSP00000368314 | 0.379 |
| PTPRD | PTPRS | 9606.ENSP00000370593 | 9606.ENSP00000349932 | 0.379 |
| PTPRD | TSSK2 | 9606.ENSP00000370593 | 9606.ENSP00000382544 | 0.378 |
| PTPRD | SMTNL2 | 9606.ENSP00000370593 | 9606.ENSP00000373964 | 0.378 |
| ABLIM1 | PTPRD | 9606.ENSP00000277895 | 9606.ENSP00000370593 | 0.373 |
| AURKA | PTPRD | 9606.ENSP00000216911 | 9606.ENSP00000370593 | 0.373 |
| CSNK1D | PTPRD | 9606.ENSP00000324464 | 9606.ENSP00000370593 | 0.373 |
| CSNK1E | PTPRD | 9606.ENSP00000380044 | 9606.ENSP00000370593 | 0.373 |
| DDX54 | PTPRD | 9606.ENSP00000323858 | 9606.ENSP00000370593 | 0.373 |
| MARK2 | PTPRD | 9606.ENSP00000385751 | 9606.ENSP00000370593 | 0.373 |
| NEK1 | PTPRD | 9606.ENSP00000424757 | 9606.ENSP00000370593 | 0.373 |
| NEK2 | PTPRD | 9606.ENSP00000355966 | 9606.ENSP00000370593 | 0.373 |
| NEK6 | PTPRD | 9606.ENSP00000362702 | 9606.ENSP00000370593 | 0.373 |
| PLK1 | PTPRD | 9606.ENSP00000300093 | 9606.ENSP00000370593 | 0.373 |
| PTPRD | SLAIN2 | 9606.ENSP00000370593 | 9606.ENSP00000264313 | 0.373 |
| LRRC4B | PTPRD | 9606.ENSP00000471502 | 9606.ENSP00000370593 | 0.299 |
| PTPRA | PTPRD | 9606.ENSP00000369756 | 9606.ENSP00000370593 | 0.294 |
| PTPRD | PTPRE | 9606.ENSP00000370593 | 9606.ENSP00000254667 | 0.294 |
| PTPRD | PTPRF | 9606.ENSP00000370593 | 9606.ENSP00000353030 | 0.294 |
| FN1 | PTPRD | 9606.ENSP00000346839 | 9606.ENSP00000370593 | 0.29 |
| IRS2 | PTPRD | 9606.ENSP00000365016 | 9606.ENSP00000370593 | 0.268 |
| IRS4 | PTPRD | 9606.ENSP00000361202 | 9606.ENSP00000370593 | 0.268 |
| LRRK2 | PTPRD | 9606.ENSP00000298910 | 9606.ENSP00000370593 | 0.267 |
| PTPRD | USH2A | 9606.ENSP00000370593 | 9606.ENSP00000305941 | 0.267 |
| DSC3 | PTPRD | 9606.ENSP00000353608 | 9606.ENSP00000370593 | 0.265 |
| CHL1 | PTPRD | 9606.ENSP00000256509 | 9606.ENSP00000370593 | 0.264 |
| CNTN1 | PTPRD | 9606.ENSP00000447006 | 9606.ENSP00000370593 | 0.264 |
| CNTN2 | PTPRD | 9606.ENSP00000330633 | 9606.ENSP00000370593 | 0.264 |
| CNTN3 | PTPRD | 9606.ENSP00000263665 | 9606.ENSP00000370593 | 0.264 |
| CNTN4 | PTPRD | 9606.ENSP00000380602 | 9606.ENSP00000370593 | 0.264 |
| CNTN5 | PTPRD | 9606.ENSP00000435637 | 9606.ENSP00000370593 | 0.264 |
| CNTN6 | PTPRD | 9606.ENSP00000407822 | 9606.ENSP00000370593 | 0.264 |
| L1CAM | PTPRD | 9606.ENSP00000359077 | 9606.ENSP00000370593 | 0.264 |
| NFASC | PTPRD | 9606.ENSP00000344786 | 9606.ENSP00000370593 | 0.264 |
| NRCAM | PTPRD | 9606.ENSP00000368314 | 9606.ENSP00000370593 | 0.264 |
| ARRDC1 | PTPRD | 9606.ENSP00000360475 | 9606.ENSP00000370593 | 0.262 |
| ARRDC2 | PTPRD | 9606.ENSP00000222250 | 9606.ENSP00000370593 | 0.262 |
| ARRDC3 | PTPRD | 9606.ENSP00000265138 | 9606.ENSP00000370593 | 0.262 |
| ARRDC4 | PTPRD | 9606.ENSP00000268042 | 9606.ENSP00000370593 | 0.262 |

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| Supplementary Table 7 The top 100 genes related to PTPRD expression in the GEPIA2 database. |
| Gene Symbol | Gene ID | PCC |
| PTPRD-AS1 | ENSG00000225706.1 | 0.75 |
| QKI | ENSG00000112531.16 | 0.59 |
| NRXN1 | ENSG00000179915.20 | 0.58 |
| RP11-566E18.1 | ENSG00000279348.1 | 0.58 |
| GATS | ENSG00000239521.7 | 0.58 |
| KIF1B | ENSG00000054523.16 | 0.57 |
| KLHL32 | ENSG00000186231.16 | 0.57 |
| PURG | ENSG00000172733.11 | 0.57 |
| AMER2 | ENSG00000165566.12 | 0.57 |
| WDFY3-AS2 | ENSG00000180769.8 | 0.57 |
| ID2-AS1 | ENSG00000235092.5 | 0.57 |
| SOGA3 | ENSG00000255330.8 | 0.57 |
| APC | ENSG00000134982.16 | 0.57 |
| TMOD2 | ENSG00000128872.9 | 0.57 |
| SYT11 | ENSG00000132718.8 | 0.56 |
| SPAG9 | ENSG00000008294.20 | 0.56 |
| SEPT8 | ENSG00000164402.13 | 0.56 |
| GPM6A | ENSG00000150625.16 | 0.56 |
| ADAM22 | ENSG00000008277.14 | 0.56 |
| PRKCA | ENSG00000154229.11 | 0.56 |
| PCYT1B | ENSG00000102230.13 | 0.56 |
| NKAIN3 | ENSG00000185942.11 | 0.55 |
| FAM168A | ENSG00000054965.10 | 0.55 |
| RFTN2 | ENSG00000162944.10 | 0.55 |
| GPM6B | ENSG00000046653.14 | 0.55 |
| ADCYAP1R1 | ENSG00000078549.14 | 0.55 |
| UG0898H09 | ENSG00000274956.2 | 0.55 |
| NCAM1 | ENSG00000149294.16 | 0.55 |
| PHYHIPL | ENSG00000165443.11 | 0.55 |
| NRXN2 | ENSG00000110076.18 | 0.54 |
| FUT9 | ENSG00000172461.10 | 0.54 |
| DCLK2 | ENSG00000170390.14 | 0.54 |
| MAP2 | ENSG00000078018.19 | 0.54 |
| OTUD7A | ENSG00000169918.9 | 0.54 |
| FMNL2 | ENSG00000157827.19 | 0.54 |
| PEA15 | ENSG00000162734.12 | 0.54 |
| CLASP2 | ENSG00000163539.15 | 0.54 |
| LRRTM3 | ENSG00000198739.10 | 0.54 |
| SCHIP1 | ENSG00000151967.18 | 0.54 |
| GPR75 | ENSG00000119737.5 | 0.54 |
| AP000708.1 | ENSG00000255537.1 | 0.54 |
| RP11-9G1.3 | ENSG00000250241.5 | 0.54 |
| KCNJ10 | ENSG00000177807.6 | 0.54 |
| GABBR1 | ENSG00000204681.10 | 0.54 |
| CTNND2 | ENSG00000169862.18 | 0.54 |
| CADM2 | ENSG00000175161.13 | 0.53 |
| TMEM257 | ENSG00000221870.2 | 0.53 |
| TMX2-CTNND1 | ENSG00000254462.1 | 0.53 |
| APC2 | ENSG00000115266.11 | 0.53 |
| WASF3 | ENSG00000132970.12 | 0.53 |
| PKI55 | ENSG00000260804.3 | 0.53 |
| THRA | ENSG00000126351.12 | 0.53 |
| CDH10 | ENSG00000040731.10 | 0.53 |
| NLGN2 | ENSG00000169992.9 | 0.53 |
| MAPK10 | ENSG00000109339.18 | 0.53 |
| SLITRK2 | ENSG00000185985.8 | 0.53 |
| LINC00320 | ENSG00000224924.6 | 0.53 |
| NAP1L3 | ENSG00000186310.9 | 0.53 |
| DENND5A | ENSG00000184014.7 | 0.53 |
| SCD5 | ENSG00000145284.11 | 0.52 |
| GNAO1 | ENSG00000087258.13 | 0.52 |
| CDH20 | ENSG00000101542.9 | 0.52 |
| NACC2 | ENSG00000148411.7 | 0.52 |
| JAKMIP2 | ENSG00000176049.15 | 0.52 |
| LINC00461 | ENSG00000245526.8 | 0.52 |
| GAREML | ENSG00000157833.12 | 0.52 |
| APBB1 | ENSG00000166313.18 | 0.52 |
| C8orf46 | ENSG00000169085.11 | 0.52 |
| BBS2 | ENSG00000125124.11 | 0.52 |
| CACNG7 | ENSG00000105605.7 | 0.52 |
| ADGRB3 | ENSG00000135298.13 | 0.52 |
| PNMA2 | ENSG00000240694.8 | 0.52 |
| RAB41 | ENSG00000147127.8 | 0.52 |
| APBA2 | ENSG00000034053.14 | 0.52 |
| SH3GL2 | ENSG00000107295.9 | 0.52 |
| NTRK2 | ENSG00000148053.15 | 0.52 |
| ASTN1 | ENSG00000152092.15 | 0.52 |
| RP11-731J8.2 | ENSG00000260918.1 | 0.52 |
| MTURN | ENSG00000180354.15 | 0.52 |
| ADGRL3 | ENSG00000150471.15 | 0.52 |
| ARHGEF26-AS1 | ENSG00000243069.7 | 0.52 |
| FAM219A | ENSG00000164970.14 | 0.52 |
| AC004158.3 | ENSG00000260664.2 | 0.52 |
| SNN | ENSG00000184602.5 | 0.52 |
| RP11-266K4.14 | ENSG00000275367.1 | 0.52 |
| RP11-441F2.5 | ENSG00000272372.1 | 0.52 |
| LDOC1L | ENSG00000188636.3 | 0.51 |
| BDNF-AS | ENSG00000245573.7 | 0.51 |
| HEPACAM | ENSG00000165478.6 | 0.51 |
| MTSS1L | ENSG00000132613.14 | 0.51 |
| TRIM9 | ENSG00000100505.13 | 0.51 |
| B3GAT1 | ENSG00000109956.12 | 0.51 |
| SHISA7 | ENSG00000187902.11 | 0.51 |
| POU6F1 | ENSG00000184271.15 | 0.51 |
| ABAT | ENSG00000183044.11 | 0.51 |
| ATP6V1G2 | ENSG00000213760.10 | 0.51 |
| TMEM178B | ENSG00000261115.5 | 0.51 |
| C6orf3 | ENSG00000255389.1 | 0.51 |
| ZEB1 | ENSG00000148516.21 | 0.51 |
| ZHX3 | ENSG00000174306.21 | 0.51 |