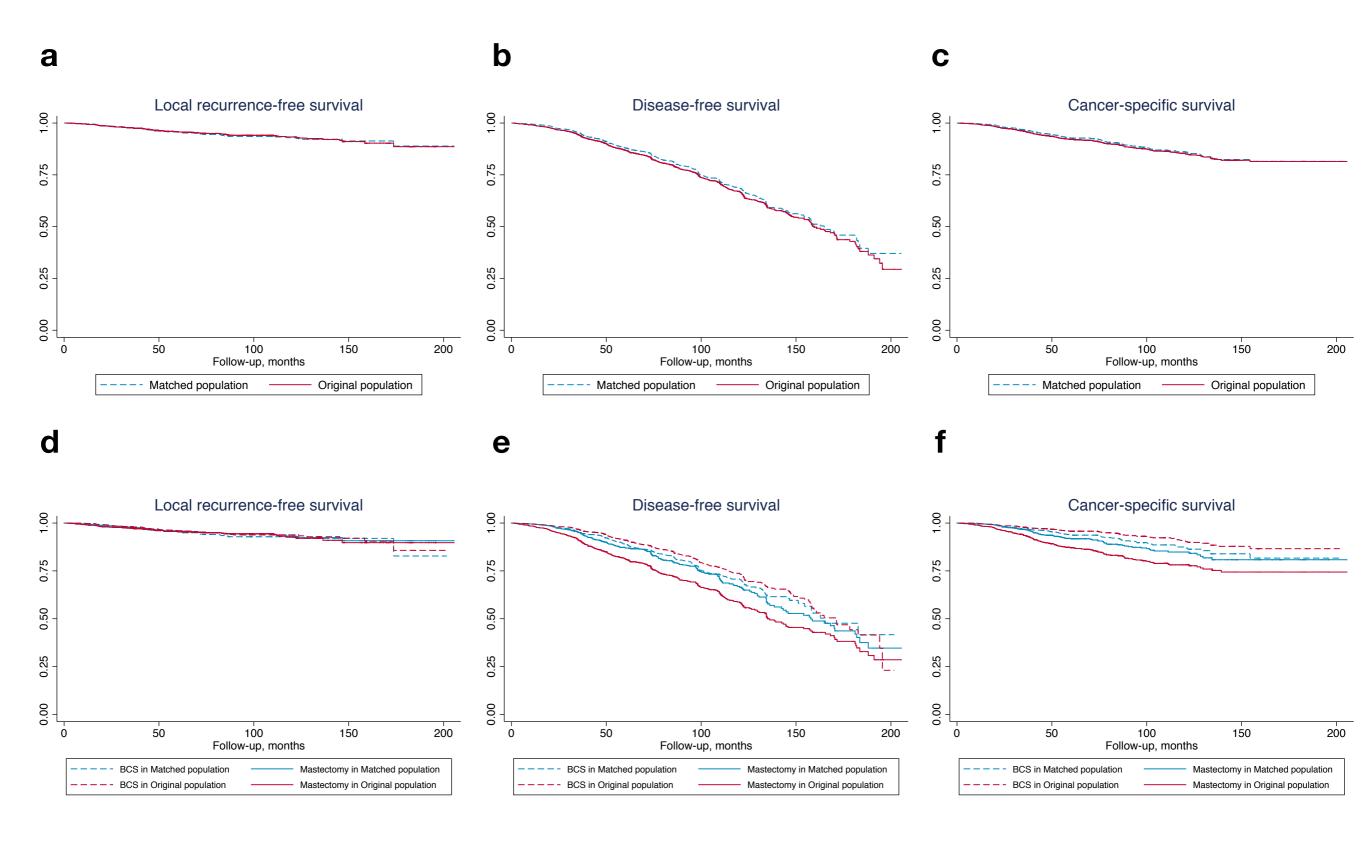
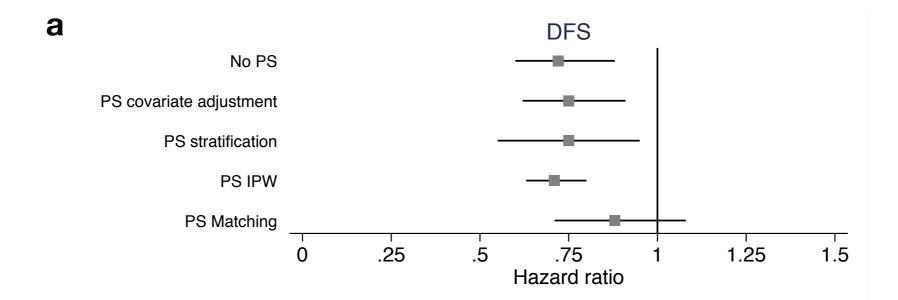
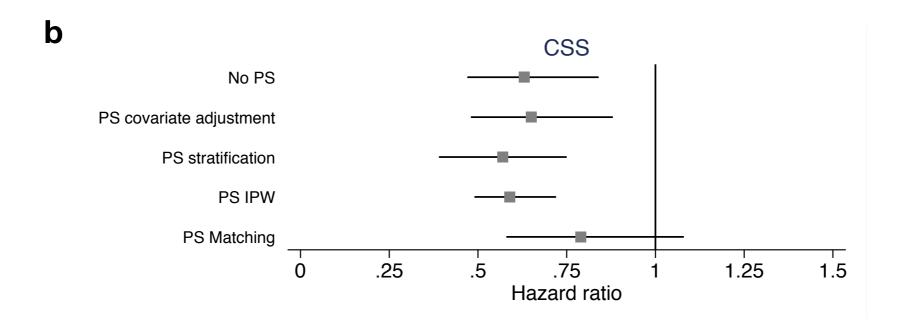
## **Supplemental Figure 1**



## **Supplemental Figure 2**





## Supplementary File 1

We performed the following PS analysis in the overall population.

- 1) PS Covariate adjustment. We added PS as a covariate in the multivariate Cox-regression model, so that we can estimate the association between the outcome and the treatment of choice, while adjusting for the probability of receiving the treatment. We observed that BCS (vs. mastectomy) was associated with improved DFS (HR=0.75, 95%CI 0.62-0.91) and CSS (HR=0.65, 95%CI 0.48-0.88) in the overall population.
- 2) IPW with PS. The rational of IPW with PS was to increases the weights of those patients who received unexpected treatments, which can be thought of as producing additional observations for these patients. For example, a patient would have higher weight if she was suitable for BCS but actually received mastectomy. Thus, we applied weights corresponding to 1/PS and 1/(1-PS) for patients receiving BCS and mastectomy, respectively, during the Cox-regression model. IPW with PS showed that BCS (vs. mastectomy) was associated with improved DFS(HR=0.71, 95%CI 0.63-0.80) and CSS(HR=0.59, 95%CI 0.49-0.72) in the overall population.
- 3) PS stratification. We split the overall population into 5 strata, as Rosenbaum et al.<sup>2</sup> had shown that 5 strata may be sufficient to reduce the bias by up to 90%. The treatment effects of BCS (vs. mastectomy) was estimated within each stratum. The overall treatment effect was calculated by pooling the treatment effects from different stratum using inverse variance weighting. We observed that BCS (vs. mastectomy) was associated with improved DFS (HR=0.75, 95%CI 0.55-0.95) and CSS (HR=0.57, 95%CI 0.39-0.75) in the overall population.

All of the results estimated by different PS methods were summarized in Figure S2.

T-stage	Supplemental Table 1, Propensity score model						
T-stage T1 1.00 T2 1.97 1.62 2.40 3.00 T3.4 8.23 4.62 14.65 3.00 Tis 0.87 0.55 1.40 0.58 Tx 0.93 0.68 1.28 0.67 N-stage N0 1.00 N1 1.61 1.30 1.98 3.00 N2 2.76 2.01 3.80 3.00 N3 5.24 3.44 7.97 3.00 N1 Nx 5.04 3.25 7.81 3.00 Positive 0.74 0.55 0.99 0.04 Unknown 0.51 0.31 0.83 0.01 PR Negative 1.00 Positive 3.19 2.24 4.53 3.00 Unknown 7.83 5.37 11.40 3.01 Her2 Negative 1.00 Positive 1.18 0.94 1.48 0.14 Unknown 1.17 0.89 1.53 0.25 Histology IDC 1.00 DCIS 1.10 DCIS 1.10 OCIS 1.10 OCIS 1.10 OCIS 0.100 CIS 0.100 After 2010, Grade II After 2010, Grade II After 2010, Grade III After 2010, Unknown 1.43 1.11 1.83 0.01 Age <50yrs 1.00 Chemotherapy No chemotherapy		Odda Datia	959	95%CI			
T1		Odds Ratio	LL	UL	r		
T2         1.97         1.62         2.40         <0.01	T-stage						
T3-4     8.23     4.62     14.65     <0.01	T1	1.00					
Tis     0.87     0.55     1.40     0.58       Tx     0.93     0.68     1.28     0.67       N-stage     N0     1.00     N1     1.61     1.30     1.98     <0.01	T2	1.97	1.62	2.40	< 0.01		
Tx       0.93       0.68       1.28       0.67         N-stage       N0       1.00       N1       1.61       1.30       1.98       <0.01	T3-4	8.23	4.62	14.65	< 0.01		
N-stage	Tis	0.87	0.55	1.40	0.58		
NO	Tx	0.93	0.68	1.28	0.67		
N1       1.61       1.30       1.98       <0.01	N-stage						
N2     2.76     2.01     3.80     <0.01	N0	1.00					
N3       5.24       3.44       7.97       <0.01         Nx       5.04       3.25       7.81       <0.01	N1	1.61	1.30	1.98	< 0.01		
Nx     5.04     3.25     7.81     <0.01       ER       Negative     1.00       Positive     0.74     0.55     0.99     0.04       Unknown     0.51     0.31     0.83     0.01       PR     1.00     1.00     1.00     1.00       Positive     3.19     2.24     4.53     <0.01	N2	2.76	2.01	3.80	< 0.01		
ER       Negative       1.00       Positive       0.74       0.55       0.99       0.04         Unknown       0.51       0.31       0.83       0.01         PR       Negative       1.00       Positive       1.00       Positive       1.00       Positive       1.18       0.94       1.48       0.14         Unknown       1.17       0.89       1.53       0.25         Histology       IDC       1.00       DCIS       1.14       0.68       1.92       0.61         Others       0.79       0.59       1.05       0.10         Grade       Before 2010       1.00         After 2010, Grade I       0.46       0.28       0.75       <0.01	N3	5.24	3.44	7.97	< 0.01		
Negative       1.00         Positive       0.74       0.55       0.99       0.04         Unknown       0.51       0.31       0.83       0.01         PR       Negative       1.00       Positive       3.19       2.24       4.53       <0.01	Nx	5.04	3.25	7.81	< 0.01		
Positive       0.74       0.55       0.99       0.04         Unknown       0.51       0.31       0.83       0.01         PR       Negative       1.00       Positive       2.24       4.53       <0.01	ER						
Unknown       0.51       0.31       0.83       0.01         PR       Negative       1.00	Negative	1.00					
PR       1.00         Positive       3.19       2.24       4.53       <0.01	Positive	0.74	0.55	0.99	0.04		
Negative       1.00         Positive       3.19       2.24       4.53       <0.01	Unknown	0.51	0.31	0.83	0.01		
Positive       3.19       2.24       4.53       <0.01	PR						
Unknown       7.83       5.37       11.40       <0.01         Her2       1.00       1.00       1.18       0.94       1.48       0.14         Positive       1.18       0.94       1.48       0.14         Unknown       1.17       0.89       1.53       0.25         Histology       IDC       1.00       1.00       1.00       1.00       1.00       1.00       0.61       0.61       0.61       0.10       0.61       0.10       0.10       0.10       0.10       0.10       0.10       0.10       0.10       0.10       0.10       0.10       0.10       0.01       0.10       0.01       0.	Negative	1.00					
Her2   Negative   1.00   Positive   1.18   0.94   1.48   0.14   Unknown   1.17   0.89   1.53   0.25   Histology   IDC   1.00   DCIS   1.14   0.68   1.92   0.61   Others   0.79   0.59   1.05   0.10   Grade   Before 2010   1.00   After 2010, Grade II   0.46   0.28   0.75   <0.01   After 2010, Grade II   0.58   0.45   0.75   <0.01   After 2010, Grade III   0.55   0.43   0.72   <0.01   After 2010, Unknown   1.43   1.11   1.83   0.01   Age   <50yrs   1.00   >=50yrs   1.00     Solution   Soluti	9	3.19	2.24	4.53	< 0.01		
Negative       1.00         Positive       1.18       0.94       1.48       0.14         Unknown       1.17       0.89       1.53       0.25         Histology       IDC       1.00       Triangle Problem P	Unknown	7.83	5.37	11.40	< 0.01		
Positive       1.18       0.94       1.48       0.14         Unknown       1.17       0.89       1.53       0.25         Histology       IDC       1.00       DCIS       1.00       DCIS       1.14       0.68       1.92       0.61         Others       0.79       0.59       1.05       0.10         Grade       Before 2010       1.00       After 2010, Grade I       0.46       0.28       0.75       <0.01	Her2						
Unknown       1.17       0.89       1.53       0.25         Histology       IDC       1.00 </td <td>Negative</td> <td>1.00</td> <td></td> <td></td> <td></td>	Negative	1.00					
Histology IDC  DCIS  1.00  DCIS  1.14  0.68  1.92  0.61  Others  0.79  0.59  1.05  0.10  Grade  Before 2010  After 2010, Grade II  After 2010, Grade III  0.58  0.45  0.75  0.01  After 2010, Grade III  0.55  0.43  0.72  0.01  After 2010, Unknown  1.43  1.11  1.83  0.01  Age  <50yrs  1.00  >=50yrs  1.00  Chemotherapy  No chemotherapy  1.00	Positive	1.18	0.94	1.48	0.14		
Histology IDC  DCIS  1.00  DCIS  1.14  0.68  1.92  0.61  Others  0.79  0.59  1.05  0.10  Grade  Before 2010  After 2010, Grade II  After 2010, Grade III  0.58  0.45  0.75  0.01  After 2010, Grade III  0.55  0.43  0.72  0.01  After 2010, Unknown  1.43  1.11  1.83  0.01  Age  <50yrs  1.00  >=50yrs  1.00  Chemotherapy  No chemotherapy  1.00	Unknown	1.17	0.89	1.53	0.25		
IDC							
Others       0.79       0.59       1.05       0.10         Grade       Before 2010       1.00       After 2010, Grade II       0.46       0.28       0.75       <0.01		1.00					
Grade         Before 2010       1.00         After 2010, Grade I       0.46       0.28       0.75       <0.01	DCIS	1.14	0.68	1.92	0.61		
Before 2010       1.00         After 2010, Grade I       0.46       0.28       0.75       <0.01	Others	0.79	0.59	1.05	0.10		
After 2010, Grade I	Grade						
After 2010, Grade II 0.58 0.45 0.75 <0.01 After 2010, Grade III 0.55 0.43 0.72 <0.01 After 2010, Unknown 1.43 1.11 1.83 0.01 Age <50yrs 1.00 >=50yrs 1.03 1.02 1.04 <0.01 Chemotherapy No chemotherapy 1.00	Before 2010	1.00					
After 2010, Grade III 0.55 0.43 0.72 <0.01 After 2010, Unknown 1.43 1.11 1.83 0.01  Age <50yrs 1.00 >=50yrs 1.03 1.02 1.04 <0.01  Chemotherapy No chemotherapy 1.00	After 2010, Grade I	0.46	0.28	0.75	< 0.01		
After 2010, Grade III 0.55 0.43 0.72 <0.01 After 2010, Unknown 1.43 1.11 1.83 0.01  Age <50yrs 1.00 >=50yrs 1.03 1.02 1.04 <0.01  Chemotherapy No chemotherapy 1.00							
After 2010, Unknown  Age <50yrs  >=50yrs  1.00  >=50yrs  1.03  1.02  1.04  <0.01  Chemotherapy  No chemotherapy  1.00		0.55					
Age <50yrs 1.00 >=50yrs 1.03 1.02 1.04 <0.01 Chemotherapy No chemotherapy 1.00					0.01		
<50yrs 1.00 >=50yrs 1.03 1.02 1.04 <0.01 Chemotherapy No chemotherapy 1.00							
>=50yrs 1.03 1.02 1.04 <0.01 Chemotherapy No chemotherapy 1.00	_	1.00					
Chemotherapy No chemotherapy 1.00	•		1.02	1.04	< 0.01		
No chemotherapy 1.00							
• •		1.00					
	* *		1.05	1.93	0.02		

Neoadjuvant chemotherapy	1.88	1.29	2.73	< 0.01
Unknown	1.42	0.87	2.33	0.16
Intercept	0.03	0.02	0.06	< 0.01

LL, lower limits of 95% confidence interval; UL, Upper limits of 95% confidence interval;