

**ONLINE APPENDIX TO**

**THE TRILLION DOLLAR CONUNDRUM:  
COMPLEMENTARITIES AND HEALTH INFORMATION TECHNOLOGY**

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**NOT FOR PUBLICATION**

**Appendix Table A.1: Comparing Hospitals With and Without IT Data**

<b>Variable</b>	<b>Reports Data on Basic EMR Adoption</b>	<b>Does Not Report Data on Basic EMR Adoption</b>	<b>Difference Significant?</b>
Total costs per admission	9137.7	9497.4	**
Total hospital beds	222.2	151.0	***
Residency or Member of Council Teaching Hospitals	0.247	0.148	***
MSA dummy	0.673	0.509	***
Total admissions	8662.9	5308.6	***
Independent practice association hospital	0.264	0.238	**
Management service organization hospital	0.222	0.183	
Equity model hospital	0.075	0.080	
Foundation hospital	0.157	0.155	
Inpatient days	51540.7	32979.0	***
Outpatient visits	118441.2	74780.9	***
Births	1075.7	638.0	***
<b>Number of Observations</b>	1488	2567	

Columns 1 and 2 report mean 1996 values for each of the variables for hospitals who do and do not report whether they have adopted basic EMR. Column 3 reports whether the means are statistically different from one another. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.2: Comparing Hospitals With and Without EMR in 2009**

<b>Variable</b>	<b>No EMR</b>	<b>Basic EMR Only</b>	<b>Basic and Advanced EMR</b>
Total costs per admission	26467.7	23553.8	21510.3
Total hospital beds	64.3	154.6	227.1
Residency or Member of Council Teaching Hospitals	0.036	0.139	0.256
MSA dummy	0.273	0.535	0.627
Total admissions	2028.0	6666.5	10594.5
Independent practice association hospital	0.191	0.100	0.126
Management service organization hospital	0.065	0.068	0.066
Equity model hospital	0.065	0.017	0.015
Foundation hospital	0.065	0.038	0.029
Inpatient days	12991.6	35810.1	56812.4
Outpatient visits	43075.5	115006.2	198163.8
Births	212.4	780.9	1143.0
<b>Number of observations+</b>	278	807	802

Columns report mean 2009 values for hospitals based on whether they have adopted basic or advanced EMR, among those who report EMR adoption for both basic and advanced. + Number of observations for inpatient days is 277 in column 1, 801 in column 2, and 792 in column 3.

**Appendix Table A.3: Comparing Hospitals by Timing of Basic EMR Adoption**

<b>Variable</b>	<b>Never Adopt</b>	<b>Adopt after 2002</b>	<b>Adopt by 2002</b>
Total costs per admission	26629.7	25285.4	18423.4
Total hospital beds	64.1	166.8	230.7
Residency or Member of Council Teaching Hospitals	0.036	0.179	0.243
MSA dummy	0.272	0.516	0.677
Total admissions	2021.1	7520.4	10687.4
Independent practice association hospital	0.190	0.108	0.118
Management service organization hospital	0.065	0.069	0.053
Equity model hospital	0.065	0.018	0.009
Foundation hospital	0.065	0.033	0.032
Inpatient days	12947.2	40642.9	56383.7
Outpatient visits	42941.6	141704.3	185681.5
Births	211.6	853.4	1207.2
<b>Number of observations+</b>	279	1096	774

Columns report mean 2009 values for hospitals based on whether they have adopted basic or advanced EMR, among those who report EMR adoption for both basic. + Number of observations for inpatient days is 278 in column 1, 1087 in column 2, and 766 in column 3.

**Appendix Table A.4: Main effects by technology—Full set of coefficients for table 3**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs	Log total costs
Technology	CDR	CDSS	Order entry	Basic EMR adoption	CPOE	Physician documentation	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
<b>Adopted EMR</b>	0.0123 (0.0055)**	0.0114 (0.0059)*	0.0018 (0.0053)	0.0045 (0.0064)	0.0103 (0.0068)	0.0248 (0.0075)***	0.0195 (0.0070)***	0.0195 (0.0062)***	0.0387 (0.0070)***
<b>Observations</b>	31175	27849	33388	23418	38167	37519	34407	23418	34407
<b># of hospitals</b>	2964	2679	3161	2228	3653	3597	3306	2228	3306
<b>R-squared</b>	0.58	0.57	0.58	0.58	0.56	0.56	0.56	0.74	0.71
<b>CONTROLS</b>									
<b>Log inpatient days</b>	-0.5061 (0.1476)***	-0.4917 (0.1688)***	-0.5331 (0.1736)***	-0.4476 (0.1873)**	-0.5564 (0.1433)***	-0.6086 (0.1380)***	-0.6094 (0.1433)***	-0.2584 (0.0974)***	-0.1279 (0.0762)*
<b>Log outpatient visits</b>	-0.0493 (0.0960)	-0.0386 (0.0977)	-0.0561 (0.0987)	-0.0605 (0.1190)	-0.0545 (0.0878)	-0.0572 (0.0878)	-0.0581 (0.0903)	-0.0975 (0.0542)*	-0.0613 (0.0467)
<b>Log inpatient days x Log inpatient days</b>	0.0280 (0.0079)***	0.0257 (0.0080)***	0.0317 (0.0073)***	0.0298 (0.0086)***	0.0276 (0.0071)***	0.0309 (0.0067)***	0.0299 (0.0070)***	0.0264 (0.0052)***	0.0205 (0.0038)***
<b>Log outpatient visits x Log outpatient visits</b>	0.0123 (0.0059)**	0.0102 (0.0054)*	0.0150 (0.0056)***	0.0171 (0.0067)**	0.0105 (0.0050)**	0.0112 (0.0050)**	0.0104 (0.0050)**	0.0088 (0.0019)***	0.0088 (0.0013)***
<b>Log inpatient days x Log outpatient visits</b>	-0.0211 (0.0129)	-0.0180 (0.0127)	-0.0267 (0.0120)**	-0.0306 (0.0143)**	-0.0173 (0.0115)	-0.0181 (0.0115)	-0.0165 (0.0118)	-0.0020 (0.0060)	-0.0048 (0.0047)
<b>Log total costs per admission in 1996 x year</b>	-0.0234 (0.0026)***	-0.0221 (0.0029)***	-0.0221 (0.0024)***	-0.0202 (0.0030)***	-0.0228 (0.0022)***	-0.0229 (0.0023)***	-0.0230 (0.0024)***	-0.0118 (0.0027)***	-0.0141 (0.0022)***
<b>Log total hospital beds x year</b>	-0.0077 (0.0020)***	-0.0082 (0.0021)***	-0.0090 (0.0019)***	-0.0083 (0.0024)***	-0.0092 (0.0018)***	-0.0091 (0.0019)***	-0.0098 (0.0020)***	-0.0016 (0.0020)	-0.0029 (0.0016)*
<b>Independent practice assn. hospital x year</b>	-0.0003 (0.0013)	-0.0005 (0.0014)	-0.0000 (0.0013)	-0.0009 (0.0015)	0.0008 (0.0012)	-0.0001 (0.0012)	0.0001 (0.0013)	-0.0016 (0.0015)	-0.0012 (0.0013)
<b>Mngmt service org. hospital x year</b>	-0.0017 (0.0013)	-0.0017 (0.0014)	-0.0024 (0.0012)**	-0.0021 (0.0015)	-0.0033 (0.0012)***	-0.0024 (0.0012)*	-0.0028 (0.0013)**	-0.0026 (0.0017)	-0.0024 (0.0014)*
<b>Equity model hospital x year</b>	-0.0027 (0.0027)	-0.0022 (0.0028)	-0.0041 (0.0027)	-0.0025 (0.0032)	-0.0024 (0.0024)	-0.0025 (0.0025)	-0.0016 (0.0025)	0.0016 (0.0034)	0.0002 (0.0027)
<b>Foundation hospital x year</b>	0.0017 (0.0016)	0.0023 (0.0017)	0.0018 (0.0016)	0.0022 (0.0019)	0.0017 (0.0015)	0.0014 (0.0015)	0.0015 (0.0016)	-0.0016 (0.0022)	-0.0008 (0.0019)
<b>Log admissions x year</b>	0.0011 (0.0020)	0.0021 (0.0020)	0.0034 (0.0019)*	0.0027 (0.0022)	0.0035 (0.0018)*	0.0033 (0.0019)*	0.0040 (0.0020)**	-0.0045 (0.0019)**	-0.0028 (0.0016)*
<b>Births (000s) x year</b>	0.0016 (0.0007)**	0.0021 (0.0007)***	0.0014 (0.0006)**	0.0018 (0.0008)**	0.0017 (0.0006)***	0.0016 (0.0006)***	0.0018 (0.0007)***	0.0013 (0.0007)*	0.0014 (0.0006)**
<b>For-profit ownership x year</b>	-0.0101 (0.0021)***	-0.0102 (0.0021)***	-0.0105 (0.0019)***	-0.0105 (0.0022)***	-0.0096 (0.0018)***	-0.0096 (0.0019)***	-0.0097 (0.0019)***	-0.0079 (0.0024)***	-0.0056 (0.0019)***
<b>Non-secular nonprofit ownership x year</b>	0.0004 (0.0015)	-0.0000 (0.0015)	-0.0004 (0.0014)	0.0005 (0.0016)	-0.0004 (0.0013)	0.0000 (0.0013)	-0.0004 (0.0014)	0.0022 (0.0016)	0.0014 (0.0014)
<b>Non-profit church ownership x year</b>	-0.0009 (0.0018)	-0.0007 (0.0020)	-0.0013 (0.0017)	-0.0007 (0.0021)	-0.0008 (0.0017)	-0.0005 (0.0017)	-0.0002 (0.0018)	-0.0004 (0.0022)	-0.0012 (0.0019)

<b>Number of discharges Medicare (000s) x year</b>	0.0003 (0.0003)	0.0003 (0.0003)	0.0002 (0.0003)	0.0001 (0.0004)	0.0002 (0.0003)	0.0003 (0.0003)	0.0002 (0.0003)	0.0005 (0.0003)	0.0004 (0.0003)
<b>Number of discharges Medicaid (000s) x year</b>	0.0004 (0.0004)	0.0003 (0.0004)	0.0003 (0.0004)	0.0002 (0.0005)	0.0004 (0.0004)	0.0006 (0.0004)	0.0005 (0.0004)	-0.0007 (0.0004)*	-0.0005 (0.0004)
<b>Residency/Mmbr Council Teaching Hosps x year</b>	0.0036 (0.0015)**	0.0032 (0.0016)**	0.0039 (0.0014)***	0.0031 (0.0018)*	0.0028 (0.0014)**	0.0026 (0.0014)*	0.0028 (0.0015)*	0.0019 (0.0019)	0.0012 (0.0016)
<b>Year 1997</b>	0.2244 (0.0414)***	0.1872 (0.0421)***	0.2002 (0.0389)***	0.1744 (0.0449)***	0.2103 (0.0370)***	0.2217 (0.0381)***	0.2127 (0.0398)***	0.0690 (0.0461)	0.0920 (0.0390)**
<b>Year 1998</b>	0.4411 (0.0821)***	0.3730 (0.0840)***	0.3891 (0.0770)***	0.3399 (0.0893)***	0.4115 (0.0736)***	0.4324 (0.0755)***	0.4155 (0.0790)***	0.1164 (0.0917)	0.1574 (0.0771)**
<b>Year 1999</b>	0.6618 (0.1227)***	0.5606 (0.1257)***	0.5843 (0.1150)***	0.5077 (0.1336)***	0.6222 (0.1099)***	0.6522 (0.1129)***	0.6295 (0.1181)***	0.1728 (0.1366)	0.2359 (0.1151)**
<b>Year 2000</b>	0.8973 (0.1633)***	0.7641 (0.1674)***	0.7903 (0.1532)***	0.6987 (0.1778)***	0.8397 (0.1465)***	0.8827 (0.1505)***	0.8525 (0.1575)***	0.2578 (0.1820)	0.3378 (0.1533)**
<b>Year 2001</b>	1.1234 (0.2043)***	0.9622 (0.2094)***	0.9869 (0.1915)***	0.8770 (0.2224)***	1.0528 (0.1831)***	1.1018 (0.1882)***	1.0656 (0.1969)***	0.3313 (0.2274)	0.4252 (0.1915)**
<b>Year 2002</b>	1.3838 (0.2448)***	1.1876 (0.2509)***	1.2240 (0.2295)***	1.0860 (0.2665)***	1.2987 (0.2195)***	1.3614 (0.2256)***	1.3172 (0.2360)***	0.4202 (0.2727)	0.5396 (0.2297)**
<b>Year 2003</b>	1.6243 (0.2855)***	1.3972 (0.2927)***	1.4375 (0.2678)***	1.2787 (0.3109)***	1.5223 (0.2561)***	1.5947 (0.2632)***	1.5428 (0.2754)***	0.4992 (0.3181)	0.6341 (0.2679)**
<b>Year 2004</b>	1.8421 (0.3264)***	1.5819 (0.3345)***	1.6271 (0.3059)***	1.4423 (0.3553)***	1.7264 (0.2927)***	1.8067 (0.3008)***	1.7488 (0.3147)***	0.5501 (0.3636)	0.7080 (0.3062)**
<b>Year 2005</b>	2.0953 (0.3671)***	1.8078 (0.3763)***	1.8492 (0.3441)***	1.6494 (0.3997)***	1.9646 (0.3292)***	2.0578 (0.3383)***	1.9914 (0.3539)***	0.6339 (0.4092)	0.8105 (0.3445)**
<b>Year 2006</b>	2.3531 (0.4079)***	2.0338 (0.4182)***	2.0802 (0.3823)***	1.8581 (0.4441)***	2.2093 (0.3657)***	2.3127 (0.3759)***	2.2389 (0.3933)***	0.7091 (0.4545)	0.9042 (0.3828)**
<b>Year 2007</b>	2.6015 (0.4489)***	2.2542 (0.4604)***	2.3023 (0.4207)***	2.0581 (0.4888)***	2.4429 (0.4025)***	2.5551 (0.4137)***	2.4736 (0.4327)***	0.7775 (0.5000)	0.9870 (0.4211)**
<b>Year 2008</b>	2.8390 (0.4895)***	2.4531 (0.5021)***	2.5108 (0.4589)***	2.2439 (0.5330)***	2.6635 (0.4390)***	2.7864 (0.4513)***	2.6971 (0.4720)***	0.8364 (0.5455)	1.0649 (0.4594)**
<b>Year 2009</b>	3.0933 (0.5301)***	2.6777 (0.5439)***	2.7375 (0.4971)***	2.4494 (0.5775)***	2.9075 (0.4755)***	3.0419 (0.4888)***	2.9475 (0.5113)***	0.8960 (0.5912)	1.1451 (0.4979)**
<b>Log population in 2000 census x year</b>	-0.0008 (0.0006)	-0.0015 (0.0006)**	-0.0010 (0.0005)*	-0.0013 (0.0007)*	-0.0012 (0.0005)**	-0.0014 (0.0005)***	-0.0014 (0.0006)**	0.0000 (0.0007)	-0.0005 (0.0005)
<b>% Black in 2000 census x year</b>	-0.0202 (0.0042)***	-0.0207 (0.0043)***	-0.0215 (0.0040)***	-0.0198 (0.0046)***	-0.0197 (0.0038)***	-0.0183 (0.0039)***	-0.0180 (0.0041)***	-0.0142 (0.0049)***	-0.0129 (0.0042)***
<b>% age 65+ in 2000 census x year</b>	-0.0460 (0.0172)***	-0.0306 (0.0178)*	-0.0355 (0.0163)**	-0.0333 (0.0188)*	-0.0409 (0.0157)***	-0.0436 (0.0161)***	-0.0344 (0.0166)**	-0.0221 (0.0207)	-0.0286 (0.0182)
<b>% age 25-64 in 2000 census x year</b>	-0.0216 (0.0133)	-0.0384 (0.0133)***	-0.0212 (0.0127)*	-0.0311 (0.0137)**	-0.0189 (0.0126)	-0.0163 (0.0132)	-0.0181 (0.0139)	-0.0462 (0.0144)***	-0.0472 (0.0129)***
<b>% university education in 2000 census x year</b>	0.0379 (0.0133)***	0.0290 (0.0142)**	0.0301 (0.0126)**	0.0267 (0.0154)*	0.0413 (0.0120)***	0.0470 (0.0125)***	0.0498 (0.0131)***	0.0278 (0.0150)*	0.0429 (0.0128)***
<b>Log median hh income in 2000 census x year</b>	0.0082 (0.0041)**	0.0117 (0.0042)***	0.0088 (0.0038)**	0.0107 (0.0045)**	0.0080 (0.0037)**	0.0071 (0.0038)*	0.0076 (0.0040)*	0.0175 (0.0044)***	0.0174 (0.0038)***

Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. Columns 8 and 9 are not shown in the published paper \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.5: Main effects by technology, by years since adoption**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs per admission	Log total costs	Log total costs
Technology	CDR	CDSS	Order entry	Basic EMR adoption	CPOE	Physician documentation	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
<b>Adopt this year</b>	0.0121 (0.0058)**	0.0072 (0.0063)	-0.0041 (0.0057)	0.0023 (0.0067)	0.0114 (0.0068)*	0.0228 (0.0085)***	0.0189 (0.0074)**	0.0148 (0.0062)**	0.0331 (0.0065)***
<b>Adopt 1 year earlier</b>	0.0132 (0.0065)**	0.0073 (0.0070)	0.0023 (0.0061)	-0.0002 (0.0075)	0.0123 (0.0075)	0.0270 (0.0087)***	0.0260 (0.0078)***	0.0185 (0.0072)***	0.0444 (0.0073)***
<b>Adopt 2 years earlier</b>	0.0125 (0.0072)*	0.0133 (0.0076)*	0.0037 (0.0069)	0.0037 (0.0083)	0.0106 (0.0087)	0.0338 (0.0089)***	0.0235 (0.0087)***	0.0199 (0.0075)***	0.0418 (0.0079)***
<b>Adopt 3 years earlier</b>	0.0087 (0.0081)	0.0159 (0.0083)*	-0.0039 (0.0076)	-0.0012 (0.0091)	0.0146 (0.0099)	0.0275 (0.0105)***	0.0160 (0.0100)	0.0184 (0.0087)**	0.0400 (0.0095)***
<b>Adopt 4 years earlier</b>	0.0004 (0.0091)	0.0048 (0.0093)	-0.0090 (0.0084)	-0.0142 (0.0102)	0.0075 (0.0121)	0.0280 (0.0108)***	0.0147 (0.0112)	0.0078 (0.0098)	0.0383 (0.0104)***
<b>Adopt 5 years earlier</b>	-0.0016 (0.0105)	0.0078 (0.0105)	-0.0141 (0.0098)	-0.0164 (0.0115)	0.0004 (0.0130)	0.0244 (0.0135)*	0.0148 (0.0135)	0.0018 (0.0111)	0.0432 (0.0129)***
<b>Adopt at least 6 years earlier</b>	0.0028 (0.0122)	0.0007 (0.0123)	-0.0158 (0.0112)	-0.0192 (0.0132)	-0.0056 (0.0165)	-0.0197 (0.0144)	-0.0232 (0.0145)	0.0050 (0.0133)	0.0145 (0.0151)
<b>Observations</b>	31175	27849	33388	23418	38167	37519	34407	23418	34407
<b># of hospitals</b>	2964	2679	3161	2228	3653	3597	3306	2228	3306
<b>R-squared</b>	0.58	0.57	0.58	0.58	0.56	0.56	0.56	0.74	0.71

Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.6: Leads and lags to get timing of impact**

	(1)	(2)	(3)	(4)	(5)	(6)
<b>Technology</b>	<b>Basic EMR adoption</b>			<b>Advanced EMR adoption</b>		
<b>Sample</b>	<b>All firms</b>	<b>Bottom 3 quartiles IT-intensive counties</b>	<b>Top quartile IT-intensive counties</b>	<b>All firms</b>	<b>Bottom 3 quartiles IT-intensive counties</b>	<b>Top quartile IT-intensive counties</b>
<b>Will adopt in 3 years</b>	-0.0034 (0.0072)	-0.0100 (0.0105)	0.0038 (0.0096)	0.0016 (0.0081)	0.0031 (0.0122)	-0.0019 (0.0103)
<b>Will adopt in 2 years</b>	-0.0055 (0.0083)	-0.0147 (0.0120)	0.0025 (0.0112)	0.0093 (0.0104)	0.0040 (0.0159)	0.0095 (0.0129)
<b>Will adopt in 1 year</b>	-0.0011 (0.0099)	-0.0025 (0.0150)	0.0040 (0.0128)	0.0088 (0.0136)	0.0083 (0.0221)	0.0100 (0.0164)
<b>Adopt this year</b>	-0.0060 (0.0111)	-0.0013 (0.0159)	-0.0085 (0.0147)	0.0134 (0.0145)	0.0264 (0.0239)	-0.0043 (0.0168)
<b>Adopt 1 year earlier</b>	-0.0101 (0.0120)	-0.0172 (0.0171)	-0.0008 (0.0165)	0.0209 (0.0159)	0.0315 (0.0238)	0.0042 (0.0208)
<b>Adopt 2 years earlier</b>	-0.0080 (0.0133)	-0.0085 (0.0187)	-0.0066 (0.0187)	0.0182 (0.0183)	0.0325 (0.0269)	-0.0031 (0.0246)
<b>Adopt 3 years earlier</b>	-0.0137 (0.0144)	-0.0033 (0.0203)	-0.0221 (0.0198)	0.0114 (0.0203)	0.0388 (0.0298)	-0.0224 (0.0274)
<b>Adopt 4 years earlier</b>	-0.0271 (0.0160)*	-0.0129 (0.0233)	-0.0360 (0.0211)*	0.0135 (0.0225)	0.0504 (0.0331)	-0.0276 (0.0301)
<b>Adopt 5 years earlier</b>	-0.0311 (0.0175)*	-0.0154 (0.0251)	-0.0407 (0.0240)*	0.0113 (0.0258)	0.0489 (0.0374)	-0.0302 (0.0349)
<b>Adopt at least 6 years earlier</b>	-0.0393 (0.0198)**	-0.0220 (0.0291)	-0.0478 (0.0259)*	-0.0278 (0.0283)	0.0171 (0.0413)	-0.0750 (0.0391)*
<b>Observations</b>	21086	11002	10084	11178	5375	5803
<b># of hospitals</b>	1934	1052	882	1009	501	508
<b>R-squared</b>	0.62	0.65	0.60	0.64	0.67	0.62

The coefficients in columns 2, 3, 5, and 6 are graphed in Figure 2 of the paper. Dependent variable is total operating costs per admission. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Sample restricted to those that eventually adopt. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.7: Continuous specifications**

	(1)	(2)	(3)	(4)
	Use % workers in IT-intensive industries		Use percentile of distribution of workers in IT-intensive industries	
Technology	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
<b>Adopt in previous 3 year period</b>	0.0235 (0.0218)	0.0840 (0.0251)***	0.0243 (0.0167)	0.0714 (0.0209)***
<b>Adopt at least 3 years earlier</b>	0.0479 (0.0325)	0.1048 (0.0373)***	0.0381 (0.0251)	0.0913 (0.0315)***
<b>Adopt in previous 3 yr pd x IT-intensive location</b>	-0.0680 (0.0799)	-0.2186 (0.0864)**	-0.0286 (0.00024)	-0.0672 (0.0278)**
<b>Adopt at least 3 yrs earlier x IT-intensive location</b>	-0.2094 (0.1180)*	-0.3644 (0.1269)***	-0.0682 (0.0351)**	-0.1230 (0.0409)***
<b>Observations</b>	23361	34336	23361	34336
<b># of hospitals</b>	2223	3300	2223	3300
<b>R-squared</b>	0.58	0.56	0.58	0.56

Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus a time trends for location IT intensity characteristics used in the regression. % workers in IT-intensive industries ranges from zero to 0.57 with an average of 0.25. The percentile of workers ranges from 0 to 1. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%



**Appendix Table A.8: Control for concurrent levels of hospital characteristics**

	(1)	(2)	(3)	(4)
<b>Technology</b>	<b>Basic EMR adoption</b>	<b>Advanced EMR adoption</b>	<b>Basic EMR adoption</b>	<b>Advanced EMR adoption</b>
<b>Adopt in previous 3 year period</b>	0.0151 (0.0056)***	0.0327 (0.0060)***	0.0263 (0.0079)***	0.0445 (0.0092)***
<b>Adopt at least 3 years earlier</b>	0.0074 (0.0080)	0.0244 (0.0089)***	0.0346 (0.0111)***	0.0490 (0.0129)***
<b>Adopt in previous 3 year period x IT-intensive county</b>			-0.0235 (0.0111)**	-0.0223 (0.0120)*
<b>Adopt at least 3 years earlier x IT-intensive county</b>			-0.0566 (0.0158)***	-0.0462 (0.0173)***
<b>Observations</b>	23361	34262	23361	34262
<b># of hospitals</b>	2228	3306	2228	3306
<b>R-squared</b>	0.73	0.71	0.73	0.71

Dependent variable is total operating costs per admission. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. Columns 3 and 4 include time trends for IT-intensive location. All columns include the same set of controls as in Table 3 plus the concurrent values by year for all hospital-level controls from Table 3. \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%

**Appendix Table A.9: Include health insurance programmers in definition of healthcare IT workers**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Definition of IT-intensive location	Top quartile IT-intensive workers defined in 1996 data		Top quartile IT-intensive workers defined in 2002 data		Top quartile IT-intensive workers defined in 1996 data		Top quartile IT-intensive workers defined in 2002 data	
Technology	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
Adopt in previous 3 year period	0.0094 (0.0075)	0.0369 (0.0087)***	0.0096 (0.0074)	0.0336 (0.0089)***	0.0133 (0.0087)	0.0395 (0.0104)***	0.0125 (0.0086)	0.0394 (0.0104)***
Adopt at least 3 years earlier	0.0037 (0.0108)	0.0277 (0.0127)**	0.0052 (0.0110)	0.0255 (0.0130)*	0.0171 (0.0124)	0.0383 (0.0147)***	0.0167 (0.0125)	0.0386 (0.0147)***
Adopt in previous 3 yr pd x top quartile HIT workers	-0.0347 (0.0190)*	-0.0278 (0.0199)	-0.0099 (0.0197)	-0.0133 (0.0185)	-0.0211 (0.0171)	-0.0302 (0.0167)*	-0.0054 (0.0162)	-0.0056 (0.0169)
Adopt at least 3 yrs earlier x top quartile HIT workers	-0.0382 (0.0246)	-0.0361 (0.0246)	-0.0287 (0.0273)	-0.0353 (0.0249)	-0.0190 (0.0239)	-0.0308 (0.0228)	-0.0096 (0.0224)	-0.0176 (0.0233)
Adopt in previous 3 yr pd x top quartile non-hospital IT workers	0.0172 (0.0183)	-0.0085 (0.0200)	-0.0033 (0.0201)	-0.0120 (0.0190)				
Adopt at least 3 yrs earlier x top quartile non-hospital IT workers	-0.0049 (0.0232)	-0.0253 (0.0242)	-0.0124 (0.0276)	-0.0173 (0.0248)				
Adopt in previous 3 yr pd x IT-intensive location					-0.0046 (0.0140)	-0.0098 (0.0156)	-0.0112 (0.0141)	-0.0248 (0.0163)
Adopt at least 3 yrs earlier x IT-intensive location					-0.0409 (0.0201)**	-0.0404 (0.0217)*	-0.0445 (0.0203)**	-0.0492 (0.0229)**
<b>Observations</b>	22552	33133	23220	34161	22552	33133	23220	34161
<b># of hospitals</b>	2114	3133	2206	3278	2114	3133	2206	3278
<b>R-squared</b>	0.59	0.57	0.58	0.56	0.59	0.57	0.58	0.56

Dependent variable is total operating costs per admission. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus time trends for the location IT intensity characteristics used in the regression. \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%

**Appendix Table A.10: Include adjustments for severity using the Medicare case mix**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Add Medicare case mix index as control				Weight dependent variable by the Medicare case mix index			
Technology	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
<b>Adopt in previous 3 year period</b>	0.0045 (0.0063)	0.0269 (0.0068)***	0.0125 (0.0087)	0.0371 (0.0108)***	0.0034 (0.0064)	0.0248 (0.0069)***	0.0090 (0.0088)	0.0286 (0.0109)***
<b>Adopt at least 3 years earlier</b>	-0.0070 (0.0090)	0.0137 (0.0097)	0.0208 (0.0125)*	0.0410 (0.0149)***	-0.0055 (0.0091)	0.0151 (0.0097)	0.0195 (0.0127)	0.0383 (0.0145)***
<b>Adopt in previous 3 year period x IT-intensive county</b>			-0.0163 (0.0124)	-0.0188 (0.0137)			-0.0117 (0.0125)	-0.0070 (0.0139)
<b>Adopt at least 3 years earlier x IT-intensive county</b>			-0.0562 (0.0177)***	-0.0503 (0.0190)***			-0.0507 (0.0178)***	-0.0427 (0.0190)**
<b>Medicare case mix index</b>	0.2013 (0.0303)***	0.1899 (0.0309)***	0.1977 (0.0304)***	0.1871 (0.0309)***				
<b>Observations</b>	20214	29545	20214	29545	20214	29545	20214	29545
<b># of hospitals</b>	1642	2403	1642	2403	1642	2403	1642	2403
<b>R-squared</b>	0.62	0.60	0.62	0.60	0.62	0.60	0.62	0.60

In columns 1-4, dependent variable is total operating costs per admission. In columns 5-8, dependent variable is total operating costs per admission, weighted by the Medicare case mix index. Note that the Medicare case mix is a weak proxy for the total case mix. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009, subject to having data on the Medicare case mix (eliminating over 25% of hospitals in the sample). Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus time trends for IT-intensive location (columns 3, 4, 7, 8). \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%

**Appendix Table A.11: Hospital-specific time trends**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Technology</b>	<b>Basic EMR adoption</b>	<b>Advanced EMR adoption</b>	<b>Basic EMR adoption</b>	<b>Advanced EMR adoption</b>	<b>Basic EMR adoption</b>	<b>Advanced EMR adoption</b>	<b>Basic EMR adoption</b>	<b>Advanced EMR adoption</b>
<b>Adopt in previous 3 year period</b>	-0.0089 (0.0068)	-0.0021 (0.0082)	0.0031 (0.0088)	0.0052 (0.0113)	-0.0090 (0.0061)	0.0013 (0.0069)	-0.0041 (0.0087)	-0.000015 (0.0108)
<b>Adopt at least 3 years earlier</b>	-0.0218 (0.0091)**	-0.0078 (0.0123)	-0.0003 (0.0127)	0.0075 (0.0179)	-0.0191 (0.0089)**	-0.0036 (0.0117)	-0.0032 (0.0128)	0.0059 (0.0174)
<b>Adopt in previous 3 year period x IT-intensive county</b>			-0.0237 (0.0137)*	-0.0137 (0.0159)			-0.0094 (0.0122)	0.0020 (0.0136)
<b>Adopt at least 3 years earlier x IT-intensive county</b>			-0.0423 (0.0181)**	-0.0289 (0.0235)			-0.0313 (0.0177)*	-0.0182 (0.0227)
<b>Hospital-specific time trends</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Controls</b>	No	No	No	No	Yes	Yes	Yes	Yes
<b>Observations</b>	24284	35733	24284	35733	23418	34407	23418	34407
<b># of hospitals</b>	2247	3334	2247	3334	2228	3306	2228	3306
<b>R-squared</b>	0.68	0.66	0.68	0.66	0.72	0.70	0.72	0.70

Dependent variable is total operating costs per admission. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. Columns 5-8 include the same set of controls as in Table 3. Columns 7 and 8 include time trends for IT-intensive location. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.12: Balanced panel of only hospitals that appear in all years**

	(1)	(2)	(3)	(4)
Technology	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
Adopt in previous 3 year period	0.0026 (0.0083)	0.0323 (0.0082)***	0.0093 (0.0111)	0.0396 (0.0130)***
Adopt at least 3 years earlier	-0.0097 (0.0119)	0.0132 (0.0118)	0.0189 (0.0156)	0.0447 (0.0183)**
Adopt in previous 3 year period x IT-intensive county			-0.0146 (0.0164)	-0.0141 (0.0168)
Adopt at least 3 years earlier x IT-intensive county			-0.0608 (0.0231)***	-0.0612 (0.0228)***
<b>Observations</b>	11788	20160	11788	20160
<b># of hospitals</b>	842	1440	842	1440
<b>R-squared</b>	0.65	0.64	0.65	0.64

Dependent variable is total operating costs per admission. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus time trends for IT-intensive location (columns 3, 4). \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.13: Split by 1996 cost levels**

	(1)	(2)	(3)	(4)	(5)	(6)
	Top quartile		Bottom three quartiles		Bottom quartile	
Technology	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
<b>Adopt in previous 3 year period</b>	-0.0154 (0.0231)	0.0492 (0.0295)*	0.0196 (0.0094)**	0.0396 (0.0118)***	0.0382 (0.0162)**	0.0704 (0.0244)***
<b>Adopt at least 3 years earlier</b>	0.0390 (0.0346)	0.0518 (0.0355)	0.0173 (0.0136)	0.0381 (0.0174)**	0.0611 (0.0234)***	0.0750 (0.0336)**
<b>Adopt in previous 3 year period x IT-intensive county</b>	0.0011 (0.0269)	-0.0434 (0.0323)	-0.0194 (0.0153)	-0.0102 (0.0164)	-0.0177 (0.0298)	-0.0145 (0.0369)
<b>Adopt at least 3 years earlier x IT-intensive county</b>	-0.1079 (0.0399)***	-0.0797 (0.0414)*	-0.0455 (0.0215)**	-0.0497 (0.0228)**	-0.0906 (0.0454)*	-0.0532 (0.0480)
<b>Observations</b>	5003	6899	14210	21153	4368	7090
<b># of hospitals</b>	399	549	1078	1608	330	537
<b>R-squared</b>	0.59	0.54	0.66	0.64	0.68	0.69

Dependent variable is total operating costs per admission. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus time trends for IT-intensive location. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.14: Drop locations where hospital IT employment is over 10% of IT employment**

	(1)	(2)	(3)	(4)	(5)	(6)
Technology	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
Adopt in previous 3 year period	0.0067 (0.0066)	0.0230 (0.0073)***	0.0138 (0.0089)	0.0368 (0.0107)***	0.0148 (0.0090)*	0.0384 (0.0108)***
Adopt at least 3 years earlier	-0.0066 (0.0092)	0.0054 (0.0100)	0.0172 (0.0128)	0.0372 (0.0151)**	0.0186 (0.0129)	0.0395 (0.0152)***
Adopt in previous 3 year period x IT-intensive county			-0.0145 (0.0131)	-0.0259 (0.0147)*	-0.0009 (0.0141)	-0.0080 (0.0159)
Adopt at least 3 years earlier x IT-intensive county			-0.0476 (0.0184)***	-0.0593 (0.0196)***	-0.0300 (0.0198)	-0.0378 (0.0215)*
Adopt in previous 3 yr pd x top quartile HIT workers					-0.0310 (0.0180)*	-0.0375 (0.0178)**
Adopt at least 3 yrs earlier x top quartile HIT workers					-0.0419 (0.0244)*	-0.0455 (0.0233)*
<b>Observations</b>	21193	31336	21193	31336	21193	31336
<b># of hospitals</b>	2000	2980	2000	2980	2000	2980
<b>R-squared</b>	0.59	0.57	0.59	0.57	0.59	0.57

Dependent variable is total operating costs per admission. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus time trends for IT-intensive location (columns 3, 4, 5, 6). \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.15: Alternative cost measures as dependent variables**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable→	Log total costs without MD salaries per admission		Log total labor costs per admission		Log total direct costs per admission		Log total costs (not per admission)	
Technology	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
<b>Adopt in previous 3 year period</b>	0.0120 (0.0084)	0.0398 (0.0100)***	0.0052 (0.0085)	0.0365 (0.0105)***	0.0121 (0.0085)	0.0380 (0.0103)***	0.0306 (0.0086)***	0.0517 (0.0102)***
<b>Adopt at least 3 years earlier</b>	0.0180 (0.0123)	0.0377 (0.0142)***	0.0121 (0.0128)	0.0454 (0.0149)***	0.0154 (0.0123)	0.0322 (0.0146)**	0.0393 (0.0119)***	0.0561 (0.0140)***
<b>Adopt in previous 3 year period x IT-intensive county</b>	-0.0148 (0.0125)	-0.0268 (0.0138)*	-0.0171 (0.0127)	-0.0196 (0.0145)	-0.0123 (0.0126)	-0.0238 (0.0141)*	-0.0232 (0.0120)*	-0.0202 (0.0131)
<b>Adopt at least 3 years earlier x IT-intensive county</b>	-0.0482 (0.0177)***	-0.0512 (0.0187)***	-0.0566 (0.0186)***	-0.0572 (0.0194)***	-0.0488 (0.0178)***	-0.0536 (0.0190)***	-0.0578 (0.0171)***	-0.0415 (0.0193)**
<b>Observations</b>	22948	33690	23416	34405	23418	34407	23418	34407
<b># of hospitals</b>	2211	3281	2228	3306	2228	3306	2228	3306
<b>R-squared</b>	0.59	0.56	0.53	0.50	0.56	0.54	0.74	0.71

Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus time trends for IT-intensive location. Direct costs are equal to total operating expenses excluding capital depreciation expense. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%



**Appendix Table A.16: Other changes in the hospital with IT adoption (alternative dependent variables)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable→	Log(# hospital beds)		Log(MD Compensation per admission)		Log(admissions)		Medicare share of discharges		Case Mix Index	
Technology	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
<b>Adopt in previous 3 year period</b>	-0.0172 (0.0075)**	0.0060 (0.0084)	-0.0188 (0.0362)	0.0211 (0.0446)	0.0178 (0.0073)**	0.0114 (0.0092)	-0.0198 (0.0223)	-0.0058 (0.0260)	0.0043 (0.0036)	0.0133 (0.0044)***
<b>Adopt at least 3 years earlier</b>	-0.0175 (0.0111)	0.0091 (0.0134)	-0.0643 (0.0524)	-0.0978 (0.0666)	0.0223 (0.0102)**	0.0178 (0.0128)	-0.0100 (0.0322)	-0.0295 (0.0337)	-0.0005 (0.0054)	0.0026 (0.0064)
<b>Adopt in previous 3 year period x IT-intensive county</b>	0.0197 (0.0105)*	-0.0071 (0.0114)	-0.0274 (0.0503)	-0.0958 (0.0609)	-0.0075 (0.0107)	0.0083 (0.0128)	0.0120 (0.0264)	0.0165 (0.0309)	-0.0065 (0.0054)	-0.0203 (0.0063)***
<b>Adopt at least 3 years earlier x IT-intensive county</b>	0.0168 (0.0153)	-0.0065 (0.0167)	-0.1010 (0.0726)	-0.1318 (0.0867)	-0.0065 (0.0153)	0.0182 (0.0174)	-0.0143 (0.0388)	0.0450 (0.0398)	-0.0092 (0.0087)	-0.0131 (0.0095)
<b>Observations</b>	23361	34262	22948	33690	23418	34407	23418	34407	20214	29545
<b># of hospitals</b>	2228	3306	2211	3281	2228	3306	2228	3306	1642	2403
<b>R-squared</b>	0.29	0.31	0.18	0.15	0.36	0.36	0.01	0.01	0.08	0.07

Unit of observation is a hospital-year. Not all hospitals report number of physicians. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus time trends for IT-intensive location. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.17: Comparison of coefficients when only eventual adopters included in the estimation**

Technology	(1)	(2)	(3)	(4)
	Basic EMR adoption		Advanced EMR adoption	
	All data	Only adopters	All data	Only adopters
<b>Adopt in previous 3 year period</b>	0.0128 (0.0085)	0.0106 (0.0087)	0.0403 (0.0102)***	0.0338 (0.0118)***
<b>Adopt at least 3 years earlier</b>	0.0170 (0.0123)	0.0125 (0.0125)	0.0382 (0.0145)***	0.0363 (0.0173)**
<b>Adopt in previous 3 year period x IT-intensive county</b>	-0.0157 (0.0126)	-0.0141 (0.0123)	-0.0285 (0.0140)**	-0.0304 (0.0161)*
<b>Adopt at least 3 years earlier x IT-intensive county</b>	-0.0513 (0.0178)***	-0.0474 (0.0173)***	-0.0597 (0.0189)***	-0.0617 (0.0228)***
<b>Observations</b>	23418	21086	34407	11178
<b># of hospitals</b>	2228	1934	3306	1009
<b>R-squared</b>	0.58	0.62	0.56	0.64
<b>CONTROLS</b>				
<b>IT-intensive county x year</b>	0.00004 (0.0019)	-0.0006 (0.0020)	-0.0013 (0.0014)	0.0016 (0.0027)
<b>Log inpatient days</b>	-0.4578 (0.1870)**	-0.4134 (0.2109)*	-0.6154 (0.1426)***	-0.6742 (0.2969)**
<b>Log outpatient visits</b>	-0.0600 (0.1191)	-0.2506 (0.1525)	-0.0590 (0.0902)	-0.0770 (0.2072)
<b>Log inpatient days x Log inpatient days</b>	0.0304 (0.0086)***	0.0367 (0.0094)***	0.0301 (0.0069)***	0.0331 (0.0151)**
<b>Log outpatient visits x Log outpatient visits</b>	0.0170 (0.0067)**	0.0329 (0.0101)***	0.0103 (0.0050)**	0.0130 (0.0098)
<b>Log inpatient days x Log outpatient visits</b>	-0.0306 (0.0143)**	-0.0463 (0.0146)***	-0.0163 (0.0118)	-0.0191 (0.0196)
<b>Log total costs per admission in 1996 x year</b>	-0.0202 (0.0030)***	-0.0202 (0.0028)***	-0.0231 (0.0024)***	-0.0285 (0.0047)***
<b>Log total hospital beds x year</b>	-0.0081 (0.0023)***	-0.0069 (0.0024)***	-0.0098 (0.0020)***	-0.0056 (0.0038)
<b>Independent practice assn. hospital x year</b>	-0.0009 (0.0015)	-0.0010 (0.0015)	0.0001 (0.0013)	-0.0011 (0.0020)
<b>Mngmt service org. hospital x year</b>	-0.0022 (0.0015)	-0.0020 (0.0015)	-0.0030 (0.0013)**	-0.0010 (0.0020)
<b>Equity model hospital x year</b>	-0.0025	-0.0002	-0.0017	-0.0036

	(0.0032)	(0.0031)	(0.0025)	(0.0043)
<b>Foundation hospital x year</b>	0.0019	0.0022	0.0014	-0.0005
	(0.0019)	(0.0020)	(0.0016)	(0.0027)
<b>Log admissions x year</b>	0.0023	-0.0005	0.0039	0.0008
	(0.0022)	(0.0024)	(0.0020)**	(0.0040)
<b>Births (000s) x year</b>	0.0019	0.0024	0.0018	0.0017
	(0.0008)**	(0.0008)**	(0.0007)**	(0.0009)*
<b>For-profit ownership x year</b>	-0.0101	-0.0092	-0.0097	-0.0210
	(0.0022)**	(0.0022)**	(0.0019)**	(0.0037)**
<b>Non-secular nonprofit ownership x year</b>	0.0006	0.0006	-0.0004	-0.0007
	(0.0016)	(0.0016)	(0.0014)	(0.0023)
<b>Non-profit church ownership x year</b>	-0.0003	0.0001	0.00002	-0.0036
	(0.0021)	(0.0021)	(0.0018)	(0.0027)
<b>Number of discharges Medicare (000s) x year</b>	0.0001	0.0001	0.0002	0.0000
	(0.0004)	(0.0004)	(0.0003)	(0.0005)
<b>Number of discharges Medicaid (000s) x year</b>	0.0002	0.00004	0.0005	0.0001
	(0.0005)	(0.0005)	(0.0004)	(0.0006)
<b>Residency/Mmbr Council Teaching Hosps x year</b>	0.0036	0.0039	0.0032	0.0056
	(0.0018)**	(0.0018)**	(0.0015)**	(0.0025)**
<b>Log population in 2000 census x year</b>	-0.0009	-0.0007	-0.0011	-0.0017
	(0.0007)	(0.0007)	(0.0006)*	(0.0009)*
<b>% Black in 2000 census x year</b>	-0.0192	-0.0160	-0.0173	-0.0211
	(0.0046)**	(0.0049)**	(0.0041)**	(0.0075)**
<b>% age 65+ in 2000 census x year</b>	-0.0301	-0.0261	-0.0319	-0.0383
	(0.0189)	(0.0194)	(0.0167)*	(0.0248)
<b>% age 25-64 in 2000 census x year</b>	-0.0306	-0.0246	-0.0163	0.0177
	(0.0135)**	(0.0132)*	(0.0138)	(0.0230)
<b>% university education in 2000 census x year</b>	0.0343	0.0488	0.0565	0.0685
	(0.0157)**	(0.0156)**	(0.0134)**	(0.0216)**
<b>Log median hh income in 2000 census x year</b>	0.0109	0.0076	0.0075	-0.0033
	(0.0045)**	(0.0045)*	(0.0040)*	(0.0067)

Dependent variable is total operating costs per admission. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means and year fixed effects. Robust standard errors, clustered by hospital, in parentheses. The controls are the same as those listed in Table 3. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A18: Instrumental variables results (second stage)**

	(1)	(2)	(3)	(4)
<b>Technology</b>	<b>Basic EMR adoption</b>	<b>Advanced EMR adoption</b>	<b>Basic EMR adoption</b>	<b>Advanced EMR adoption</b>
<b>Adopted EMR at least 3 years earlier</b>	-0.0652 (0.1073)	0.5014 (0.4985)	0.1813 (0.1424)	0.9304 (0.6882)
<b>Adopted EMR at least 3 years earlier x IT-intensive county</b>			-0.3867 (0.2177)*	-0.6318 (0.5814)
<b>Observations</b>	23407	34385	23407	34385
<b># of hospitals</b>	2217	3284	2217	3284
<b>Overidentification test (p-value)</b>	0.28	0.41	0.31	0.75
<b>Hausman test (p-value)</b>	1.00	1.00	1.00	1.00
<b>R-squared</b>	0.58	0.45	0.55	0.38

Dependent variable is total operating costs per admission. Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus time trends for IT-intensive location (in columns 3 and 4). First stage results shown in Appendix Table A.19. Instruments are log distance to nearest vendor in 1996 multiplied by a time trend and EMR adoption by competitors in other markets where hospital operates. The identification assumption for the first instrument is that hospitals near EMR vendor offices will have lower costs for learning about EMR systems. The second instrument is similar to the one used in Forman, Goldfarb, and Greenstein (2008) to examine the impact of internal expertise in IT on advanced internet adoption by U.S. businesses. The identification assumption is that adoption by competing hospitals in other geographic markets will increase the likelihood of EMR adoption by hospitals within the same system but in those other geographic markets. This will decrease the costs of EMR adoption by the focal hospital but should not affect its other costs. Because the instruments are at the hospital level rather than the hospital-year level, we focus on one covariate for EMR adoption: whether the hospital adopted EMR at least three years earlier. Overidentification test uses Hansen J statistic. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Table A.19: First stage of Table A.18 (instrumental variables results)**

	(1)	(2)	(3)	(4)	(3a)	(4a)
	First stage for EMR adoption			First stage for EMR adoption x IT-intensive county		
Technology	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption	Basic EMR adoption	Advanced EMR adoption
<b>EMR adoption by competitors in other markets</b>	0.1981 (0.0313)***	0.0875 (0.0474)*	0.1802 (0.0435)***	0.0499 (0.0510)	0.00004 (0.0066)	-0.0047 (0.0125)
<b>EMR adoption by competitors in other markets x IT-intensive county</b>			0.0339 (0.0603)	0.0857 (0.0970)	0.2057 (0.0427)***	0.1298 (0.0827)
<b>Distance to nearest EMR vendor</b>	-0.0014 (0.0006)**	0.0004 (0.0005)	0.0036 (0.0013)***	0.0022 (0.0010)**	0.0003 (0.0002)	0.0010 (0.0002)***
<b>Distance to nearest EMR vendor x IT-intensive county</b>			-0.0028 (0.0014)*	-0.0023 (0.0011)**	-0.0003 (0.0007)	-0.0015 (0.0006)***
<b>Partial R-squared</b>	0.006	0.001	0.006	0.002	0.006	0.002
<b>F-statistic</b>	23.23	2.00	12.67	2.17	6.41	6.83

Unit of observation is a hospital-year. Sample includes annual data from 1996 to 2009. Regressions include hospital-specific fixed effects, differenced out at means. Robust standard errors, clustered by hospital, in parentheses. All regressions include the same set of controls as in Table 3 plus time trends for IT-intensive location (columns 3, 4, 3a, 4a). \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Appendix Figure A.1: Number of data points by year**

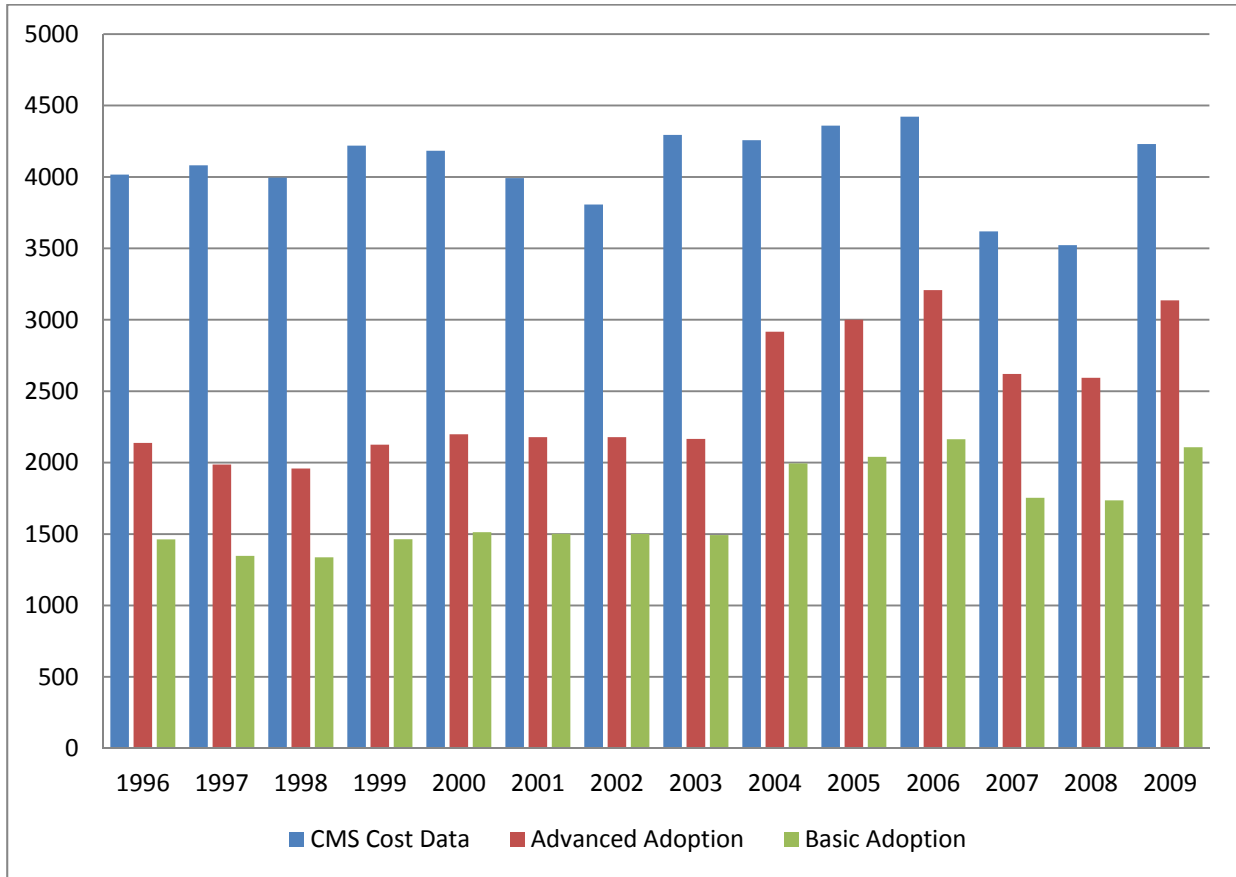


Figure documents the number of data points for CMS cost, HIMSS advanced adoption, and HIMSS basic adoption by year.