

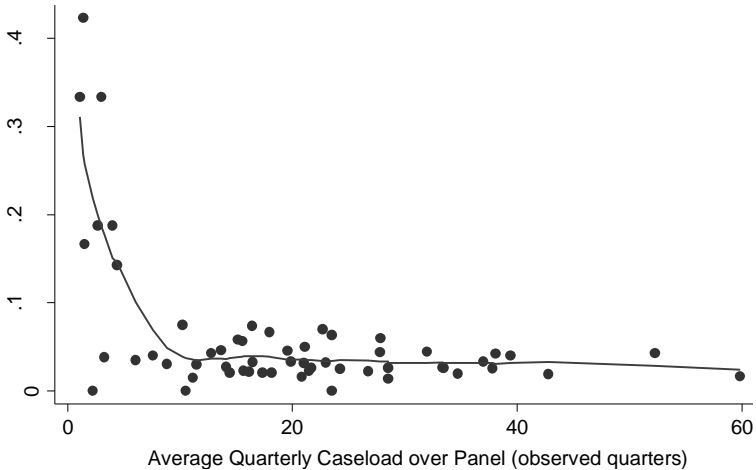
# WEB DATA APPENDIX

## *Validation and Sample Restrictions*

Initial dataset spanning the 1998-2006 period acquired from the Florida State Department of Health Agency for Healthcare Administration comprised 229,153 records. 20 patient records were removed where the hospital had admitted less than 5 records over the panel, a further 22 records where the patient's age was less than 18 years, and 33 records where the admitting hospital was not able to be matched to any known facility characteristics data. The remaining 229,078 involved an adult admission with at least one CABG operation of any sort between 1998 Q1 and 2006 Q4. 1,377 patient records were discarded where the operating medical practitioner was only observed once. Almost all of these were singleton observations attributed to data entry error. A further 1,661 patient records were discarded where the average number of cases per period per was 1.

A further 4,713 observations were dropped where publicly available information from the Florida department of health confirms that the operating medical license was a non-surgeon (e.g. an internist, or a cardiologist, or a family physician). These may be due either to erroneous data entry or assistants wrongly entered as the operating surgeon, or cases which had both major medical and surgical treatment. This brought the validated number of records to 221,327. Finally, records were merged for 6 clearly identified (name, history) surgeons who held both a "Medical Faculty Certificate" and a "Medical Physician" license over the panel, treating patients under both licenses. Of the remaining 398 surgeons identified in this restricted panel, publicly available information on residency training was used to further restrict the panel to the 19,978 patients treated by 57 operating cardiac surgeons whose last specialist residency ended in 1998 or later.

Figure A1: Average Quarterly Volume – Outcome Relationship



**Table A1: Medical and Surgical Risk Factors by Quintiles of Surgeon Total Cases Treated over Panel.**

Panel cases	Quintiles of Panel Cases				
	1	2	3	4	5
Mean	42.8	118.7	216.0	438.8	1,076.8
Range	(6 - 67)	(84 - 144)	(145 - 285)	(312 - 569)	(670 - 1,359)
Total Cases	348	1,266	2,479	4,647	11,238
<b>Medical risk factors</b>					
<i>Number of chronic diseases</i>	6.2	5.7	6.0	6.2	6.0
Diagnosed coronary artery disease	91%	94%	95%	93%	95%
Hypertension	46%	57%	58%	57%	60%
Cardiac dysrhythmia	39%	33%	36%	39%	37%
Acute myocardial infraction	27%	33%	28%	29%	28%
Congestive heart failure	27%	24%	26%	26%	23%
Psychiatric and psychological disorders	27%	24%	27%	26%	30%
Fluid disorders	25%	18%	15%	18%	16%
Acute kidney failure	19%	10%	9%	9%	8%
Coagulation disorders	19%	11%	9%	12%	10%
Cardiac arrest or ventricular fibrillation	5%	5%	3%	3%	3%
Neurological disease	4%	2%	3%	3%	3%
Pacemaker in situ	4%	3%	3%	4%	3%
Prior CABG	3%	3%	4%	3%	3%
Cerebrovascular disorders	3%	1%	2%	2%	1%
Arterial aneurysms	2%	2%	4%	3%	2%
Pulmonary hypertension	2%	2%	3%	2%	1%
Liver disease	1%	2%	1%	2%	1%
Venous embolic disease	1%	1%	0%	1%	0%
<b>Surgical risk factors</b>					
<i>Non-OR procedures performed</i>	5.0	5.1	5.4	5.4	5.2
<i>OR procedures performed</i>	2.6	2.4	2.4	2.3	2.3
Single mammary artery used	82.5%	83.6%	80.7%	83.2%	86.7%
On-pump perfusion	68.1%	70.1%	81.7%	88.9%	77.1%
Cardiac catheterized	55.2%	66.4%	58.9%	62.2%	64.9%
2 vessel grafts	44.0%	38.9%	34.6%	36.2%	35.2%
3 vessel grafts	23.9%	28.5%	33.7%	29.7%	32.8%
1 vessel graft	21.8%	20.5%	15.3%	17.2%	16.2%
Other cardiac procedure	19.0%	17.1%	15.3%	14.7%	13.7%
Concomitant valve operation	16.7%	9.9%	13.0%	15.8%	10.6%
Dialyzed	6.6%	2.4%	2.3%	2.6%	1.8%
Other thoracic surgery	7.2%	3.9%	3.6%	3.9%	3.4%
4 vessel grafts	4.6%	8.8%	13.9%	12.9%	12.1%
PTCA same stay	5.2%	4.3%	2.6%	3.0%	3.3%
Cardioversion	3.4%	4.0%	3.1%	3.1%	2.5%
Aortic artery surgery	0.9%	0.2%	0.6%	0.3%	0.2%
Peripheral vascular surgery	0.0%	0.3%	0.2%	0.1%	0.1%

*Note: All means are calculated at the patient-level. Risk factors represent the union of covariates included in forward stepwise probit and logit regressions (with inclusion criteria of  $p < 0.2$ ). Total patients included 19,978, treated by a total of 57 operating surgeons with last residency since 1998. 'Prior CABG' is proxied by ICD9 codes representing blockages in non-native vessels, hence systematically underestimates actual history of previous CABG operation. Difference between 100% and sum of incidence of 4, 3, 2 and 1 vessel grafts represents five or higher grafts.*